

January 29, 2026

Ms. Karla Murrieta  
Manager of Air Quality Permits, Air Quality Division  
Arizona Department of Environmental Quality  
1110 West Washington Street  
Phoenix, Arizona 85007

*RE: Significant Permit Revision Application – South32 Hermosa Mine, Class I Air Quality Permit #96653*

Dear Ms. Murrieta,

South32 Hermosa Inc. (South32) owns and operates the Hermosa project near Patagonia in Santa Cruz County. South32 is currently authorized to construct and operate the Hermosa Mine under Arizona Department of Environmental Quality (ADEQ) Air Quality Class I Permit No. 96653, as amended by Minor Permit Revision No. 106420 on May 23, 2024 and No 109292 submitted on May 6, 2025.

South32 is proposing to reduce the permitted natural gas engines from 58 to 44 total (40 operating and 4 backups) and allow up to 14 of them to run at 50-100% load to align with updated power needs and improve operational flexibility. South32 also proposes to update the diesel engines and tailings source representation in the facility's potential-to-emit calculations.

South32 proposes to expand the operating range for up to 14 engines to 50 to 100% instead of the current 75 to 100% range. The reason for this change is that certain operations, such as hoisting, require considerable power upon start. Under the current permit condition, South32 must use load banks to increase demand to bring generators online and hold them above the 75% limit until demand hits and then rapidly scale the load banks down and then back up to balance the change in load on the system. The net result is that South32 must operate multiple engines on load banks – burning fuel and generating emissions – solely for the purpose of maintaining 75% load. If this change is made, South32 can eliminate substantial time running load banks to balance load swings, likely reducing actual emissions over time and reducing system interruptions with corresponding startups and shutdowns.

In accordance with Arizona Administrative Code (A.A.C.) R18-2-320, South32 is submitting the enclosed significant permit revision (SPR) application and modeling analysis report to incorporate the above changes.

If you have any questions concerning this application or need additional details, please feel free to contact Sarah Richman at [Sarah.Richman@south32.net](mailto:Sarah.Richman@south32.net).

Sincerely,

**Brent**

**Musslewhite**

Brent Musslewhite

Director, Environment and Permitting

[Brent.musslewhite@south32.net](mailto:Brent.musslewhite@south32.net)

 Digitally signed by Brent  
Musslewhite  
Date: 2026.01.29 16:16:09 -07'00'

cc: Sarah Richman, South32

# ADEQ CLASS I PERMIT 96653 SIGNIFICANT PERMIT REVISION APPLICATION

**South32 Hermosa Inc.**



South32 Hermosa Inc.  
1860 E. River Road  
Suite 200  
Tucson, AZ 85718  
Phone: (520) 485-1300

**Prepared By:**

**TRINITY CONSULTANTS**  
702 E Osborn Rd., Suite 160  
Phoenix, AZ 85014  
(602) 274-2900

January 29, 2026



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## 1. EXECUTIVE SUMMARY

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South32 Hermosa Inc. (South32) is a mineral exploration and development company focused on the development of the Hermosa Mine (the Facility) near Patagonia, Arizona in Santa Cruz County. South32 is constructing an underground mine that would lead to the production or beneficiation of mined ores (zinc, silver, manganese, and lead) into crushed ore or concentrates for further beneficiation off-site. These operations are referred to as “the Hermosa Mine” and are located in an area of Santa Cruz County considered to be in attainment or unclassifiable for all national ambient air quality standards (NAAQS).

South32 is currently authorized to construct and operate the Hermosa Mine under Arizona Department of Environmental Quality (ADEQ) Air Quality Class I Permit No. 96653<sup>1</sup>. The operations fall under the SIC codes 1031 (mining – lead and zinc ore), 1044 (mining – silver ore), and 1061 (mining – ferroalloy ores, except vanadium) and North American Industry Classification Systems (NAICS) codes 212230 (Copper, nickel, lead and zinc mining) and 212290 (Other metal ore mining). The primary products from the Hermosa Mine are zinc concentrate, lead concentrate, silver concentrate and crushed manganese ore.

South32 is proposing to authorize the following changes (the Project):

- ▶ Reduce the number of permitted 2.6 MW Natural gas engines from 58 to 40, with 4 additional backup engines (44 total, only 40 operating) and authorize up to 14 of the engines to operate in the 50-100% load range rather than the 75-100% range.
- ▶ Update emission calculations to reflect the natural gas engine update above, clarify CAT XQ1140 genset (ID: ENGINE 0007-0012) references with engine references (with no change to existing emissions limits), and make similar minor corrections detailed in the emissions calculation section.
- ▶ Update the moisture content for the tailings and associated sources to 11.8% to align with latest (Mine Plan of Operations) MPO<sup>2</sup>.

Both Project and Sitewide PTE estimates are summarized in Table 1-1. The non-fugitive PTE of regulated air pollutant emissions of the Hermosa Mine, remain below the applicable Prevention of Significant Deterioration (PSD) thresholds. However, the overall increase in particulate matter emissions exceed the thresholds for mNSR under R18-2-334. South32 is electing to demonstrate compliance with R18-2-334 by demonstrating that the Project will comply with the NAAQS through air dispersion modeling.

Accordingly, South32 is therefore submitting this Class I Significant Permit Revision (SPR) application pursuant to Arizona Administrative Code A.A.C R18-2-320.A. As clarified by A.A.C. R18-2-304.E.1, an application for permit revision needs only supply information related to the proposed change and therefore this application includes only that information related to the Project. The enclosed permit application includes ADEQ’s Class I permit standard application form and includes an air quality modeling report (under separate cover) demonstrating that the proposed Project will not interfere with the attainment or maintenance of the PM<sub>10</sub> and PM<sub>2.5</sub> NAAQS. Furthermore, the revised equipment list is included in Appendix D and the proposed draft permit language is included in Appendix E.

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<sup>1</sup> As amended by MPRs 106420 and 109292

<sup>2</sup> Revised MPO dated April 15, 2025

Table 1-1 Project Potential to Emit Summary – Plan I

| Emissions                                                                      | PM     | PM <sub>10</sub> | PM <sub>2.5</sub> | NO <sub>x</sub> | SO <sub>2</sub> | CO     | VOC    | Lead Compounds | Max Single HAP (Acetaldehyde) | Total HAPs | CO <sub>2</sub> e |
|--------------------------------------------------------------------------------|--------|------------------|-------------------|-----------------|-----------------|--------|--------|----------------|-------------------------------|------------|-------------------|
| Project Emissions                                                              |        |                  |                   |                 |                 |        |        |                |                               |            |                   |
| Project Non-Fugitive PTE                                                       | 14.39  | 14.39            | 14.39             | -50.88          | 1.05            | -49.81 | -25.82 | 0.00E+00       | -12.33                        | -26.95     | -344,755          |
| Project Fugitive PTE                                                           | -2.83  | -0.73            | -0.15             | 0.00            | 0.00            | 0.00   | 0.00   | -4.34E-03      | 0.00                          | -0.05      | 0.00              |
| Permitting Threshold Comparison                                                |        |                  |                   |                 |                 |        |        |                |                               |            |                   |
| Minor New Source Review (mNSR) Thresholds <sup>1</sup>                         | --     | 7.50             | 5.00              | 20.00           | 20.00           | 50.00  | 20.00  | 0.30           | --                            | --         | --                |
| Does Project Non-Fugitive PTE exceed mNSR Thresholds?                          | --     | Yes              | Yes               | No              | No              | No     | No     | No             | --                            | --         | --                |
| Permitted Non-Fugitive PTE <sup>2</sup>                                        | 212.39 | 92.33            | 54.59             | 205.61          | 6.87            | 220.37 | 107.94 | 1.85           | 39.84                         | 73.53      | 1,176,929         |
| Permitted Non-Fugitive PTE + Project Non-Fugitive PTE Increases                | 226.78 | 106.71           | 68.97             | 154.74          | 7.92            | 170.56 | 82.11  | 1.85           | 27.50                         | 46.58      | 832,174           |
| Class I Title V Major Source Thresholds <sup>1</sup>                           | 100    | 100              | 100               | 100             | 100             | 100    | 100    | 10             | 10                            | 25         | --                |
| Does Non-Fugitive PTE exceed Class I Title V Major Source Thresholds?          | Yes    | Yes              | No                | Yes             | No              | Yes    | No     | No             | Yes                           | Yes        | --                |
| Class I PSD Major Source Thresholds                                            | 250    | 250              | 250               | 250             | 250             | 250    | 250    | --             | --                            | --         | 100,000           |
| Does Non-Fugitive PTE exceed Class I PSD Major Source Thresholds? <sup>3</sup> | No     | No               | No                | No              | No              | No     | No     | --             | --                            | --         | No                |

1. Per Arizona Administrative Code (A.A.C.)  
R18-2-101.110 - For "Potential to emit" (PTE)  
R18-2-101.75 - For "Major Source"  
R18-2-101.101 - For "Permitting Exemption Thresholds" which is the mNSR Threshold per R18-2-334.A.3

2. Permitted PTE is based on post MPR No. 109292 PTE.

3. Sources exceeding 100,000 tons of CO<sub>2</sub>e are only subject to PSD if they also trigger PSD for another regulated NSR pollutant. The Hermosa Project does not trigger PSD for any other NSR pollutant. While CO<sub>2</sub>e is not included under the definition of "regulated NSR pollutant" at A.A.C. R18-2-101.124, GHGs are considered a "regulated NSR pollutant" under the federal Prevention of Significant Deterioration (PSD) program at 40 C.F.R. § 52.21(b)(50). South32 is therefore providing estimates of GHG (i.e., CO<sub>2</sub>e) emissions for purposes of demonstrating non-applicability of the federal PSD program for GHGs, which ADEQ implements via a delegation agreement with EPA.

Table 1-2 Project Potential to Emit Summary – Plan II

| Emissions                                                                      | PM     | PM <sub>10</sub> | PM <sub>2.5</sub> | NO <sub>x</sub> | SO <sub>2</sub> | CO     | VOC    | Lead<br>Compounds | Max Single<br>HAP<br>(Acetaldehyde) | Total HAPs | CO <sub>2e</sub> |
|--------------------------------------------------------------------------------|--------|------------------|-------------------|-----------------|-----------------|--------|--------|-------------------|-------------------------------------|------------|------------------|
| Project Emissions                                                              |        |                  |                   |                 |                 |        |        |                   |                                     |            |                  |
| Project Non-Fugitive PTE                                                       | 14.39  | 14.39            | 14.39             | -50.88          | 1.05            | -49.81 | -25.82 | 0.00              | -12.33                              | -26.95     | -344,755         |
| Project Fugitive PTE                                                           | -8.50  | -2.16            | -0.43             | 0.00            | 0.00            | 0.00   | 0.00   | -0.01             | 0.00                                | -0.14      | 0.00             |
| Permitting Threshold Comparison                                                |        |                  |                   |                 |                 |        |        |                   |                                     |            |                  |
| Minor New Source Review (mNSR) Thresholds <sup>1</sup>                         | --     | 7.50             | 5.00              | 20.00           | 20.00           | 50.00  | 20.00  | 0.30              | --                                  | --         | --               |
| Does Non-Fugitive PTE exceed mNSR Thresholds?                                  | --     | Yes              | Yes               | No              | No              | No     | No     | No                | --                                  | --         | --               |
| Permitted Non-Fugitive PTE <sup>2</sup>                                        | 212.39 | 92.33            | 54.59             | 205.61          | 6.87            | 220.37 | 107.94 | 2.09              | 39.84                               | 81.58      | 1,176,929        |
| Permitted Non-Fugitive PTE + Project Non-Fugitive PTE Increases                | 226.78 | 106.71           | 68.97             | 154.74          | 7.92            | 170.56 | 82.11  | 2.09              | 27.51                               | 54.63      | 832,174          |
| Class I Title V Major Source Thresholds <sup>1</sup>                           | 100    | 100              | 100               | 100             | 100             | 100    | 100    | 10                | 10                                  | 25         | --               |
| Does Non-Fugitive PTE exceed Class I Title V Major Source Thresholds?          | Yes    | Yes              | No                | Yes             | No              | Yes    | No     | No                | Yes                                 | Yes        | No               |
| Class I PSD Major Source Thresholds                                            | 250    | 250              | 250               | 250             | 250             | 250    | 250    | --                | --                                  | --         | 100,000          |
| Does Non-Fugitive PTE exceed Class I PSD Major Source Thresholds? <sup>3</sup> | No     | No               | No                | No              | No              | No     | No     | --                | --                                  | --         | No               |

1. Per Arizona Administrative Code (A.A.C.)  
R18-2-101.110 - For "Potential to emit" (PTE)  
R18-2-101.75 - For "Major Source"  
R18-2-101.101 - For "Permitting Exemption Thresholds" which is the mNSR Threshold per R18-2-334.A.3

2. Permitted PTE is based on post MPR No. 109292 PTE.

3. Sources exceeding 100,000 tons of CO<sub>2e</sub> are only subject to PSD if they also trigger PSD for another regulated NSR pollutant. The Hermosa Project does not trigger PSD for any other NSR pollutant. While CO<sub>2e</sub> is not included under the definition of “regulated NSR pollutant” at A.A.C. R18-2-101.124, GHGs are considered a “regulated NSR pollutant” under the federal Prevention of Significant Deterioration (PSD) program at 40 C.F.R. § 52.21(b)(50). South32 is therefore providing estimates of GHG (i.e., CO<sub>2e</sub>) emissions for purposes of demonstrating non-applicability of the federal PSD program for GHGs, which ADEQ implements via a delegation agreement with EPA.

## **2. ADEQ STANDARD PERMIT APPLICATION FORM**

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According to A.A.C. R18-2-320.D, an application for an SPR must meet all requirements of Article 3 of A.A.C. Title 18, Chapter 2 for applications, public participation, review by affected states, and review by the Administrator that apply to permit issuance and renewal (i.e., complying with all subsections of R18-2-304.B). Pursuant to A.A.C R18-2-304.B, to apply for any permit required by A.A.C. Title 18, Chapter 2, applicants must complete the applicable standard application form provided by the ADEQ and supply all information required by the form's filing instructions. Section 2 and 3 of this application include a completed ADEQ Standard Permit Application Form and an administrative completeness checklist, respectively, identifying the location of the information required by the associated filing instructions in ADEQ's Application Packet for a Class I Permit.

**Table 2-1 Application Administrative Completeness Checklist**

| Item | Requirement                                                                                                                                                          | Included in Application |    |     | Comments                                                                            |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----|-----|-------------------------------------------------------------------------------------|
|      |                                                                                                                                                                      | Yes                     | No | N/A |                                                                                     |
| 1    | Has the standard application form been completed?                                                                                                                    | ×                       |    |     | Section 2                                                                           |
| 2    | Has the responsible official signed the standard application form?                                                                                                   | ×                       |    |     | Section 2                                                                           |
| 3    | Has a process description been provided?                                                                                                                             | ×                       |    |     | Section 4                                                                           |
| 4    | Are the facility's emissions documented with all appropriate supporting information?                                                                                 | ×                       |    |     | Appendix C and Section 6                                                            |
| 5    | Is the facility subject to Minor NSR requirements? If the answer is "YES" answer 6a, 6b and 6c as applicable. If the answer is "NO", skip to 7.                      | ×                       |    |     | Section 8                                                                           |
| 6.a  | If the facility chooses to implement RACT, is the RACT determination included for the affected pollutants for all affected emission units?                           |                         |    | ×   |                                                                                     |
| 6.b  | If the facility chooses to demonstrate compliance with NAAQS by screen modeling, is the modeling analysis included?                                                  | ×                       |    |     | A modeling report will be submitted under a separate cover                          |
| 6.c  | If refined modeling has been conducted, is a comprehensive modeling report along with all modeling files included?                                                   | ×                       |    |     | A modeling report will be submitted under a separate cover                          |
| 7    | Does the application include an equipment list with the type, name, make, model, serial number, maximum rated capacity, and date of manufacture?                     | ×                       |    |     | Appendix D                                                                          |
| 8    | Does the application include an identification and description of Pollution Controls? (if applicable)                                                                |                         |    | ×   |                                                                                     |
| 9    | For any application component claimed as confidential, are the requirements of AR.S. 49-432 and A.A.C. R18-2-305 addressed?                                          |                         |    | ×   |                                                                                     |
| 10   | For any current non-compliance issue, is a compliance schedule attached?                                                                                             |                         |    | ×   |                                                                                     |
| 11   | For minor permit revision that will make a modification upon submittal of application, has a suggested draft permit been attached?                                   | ×                       |    |     | Suggested draft permit language has been included in Appendix E to expedite review. |
| 12   | For major sources, have all applicable requirements been identified?                                                                                                 | ×                       |    |     | Section 8                                                                           |
| 13   | For major sources, has a CAM applicability analysis been provided? For CAM applicable units, have CAM plans been provided?                                           | ×                       |    |     | Section 8.3.3                                                                       |
| 14   | For major sources subject to requirements under Article 4 of the A.A.C., have all necessary New Source Review analyses identified in the application been presented? |                         |    | ×   |                                                                                     |

## SECTION 2.0

### CLASS I PERMIT APPLICATION PACKAGE

**SECTION 2.1**  
**ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY**  
**Air Quality Division**  
**1110 West Washington • Phoenix, AZ 85007 • Phone: (602) 771-2338**

**STANDARD CLASS I PERMIT APPLICATION FORM**

*(As required by A.R.S. § 49-426, and Chapter 2, Article 3, Arizona Administrative Code)*

1. Permit to be issued to (Business license name of organization that is to receive permit):  
South32 Hermosa Inc.
2. Mailing Address: 1860 E. River Road, Suite 200  
City: Tucson State: Arizona ZIP: 85718
3. Name (or names) of Owners/ Principals: Brent Musslewhite  
Phone: 520-485-1300 Fax: \_\_\_\_\_ Email: brent.musslewhite@south32.net
4. Name of Owner's Agent: Brent Musslewhite  
Phone: 520-485-1300 Fax: \_\_\_\_\_ Email: brent.musslewhite@south32.net
5. Plant/Site Manager/ Contact Person and Title: Brent Musslewhite  
Phone: 520-485-1300 Fax: \_\_\_\_\_ Email: brent.musslewhite@south32.net
6. Plant Site Name: Hermosa Project
7. Plant Site Location Address: 749 Harshaw Road  
City: Patagonia County: Santa Cruz Zip Code: 85624  
Indian Reservation (if applicable, which one): N/A  
Latitude/ Longitude, Elevation: 31.466232°/-110.724594°, 5,085 ft  
Section/ Township/ Range: Section 26 Township 22 South, Range 16 East
8. General Nature of Business: Mining
9. Type of Organization:  
☒ Corporation   ☐ Individual Owner   ☐ Partnership   ☐ Government Entity (Government Facility Code-----)  
☐ Other \_\_\_\_\_
8. Permit Application Basis:   ☐ New Source                      ☒ Revision                      ☐ Renewal of Existing Permit  
(Check all that apply.)  
For renewal or modification, include existing permit number (and exp. date): P96653      August 25, 2029  
Date of Commencement of Construction or Modification: TBD  
Primary Standard Industrial Classification Code: 1031, 1044, 1061
9. I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by ADEQ as public record. I also attest that I am in compliance with the applicable requirements of the Permit and will continue to comply with such requirements and any future requirements that become effective during the life of the Permit. I will present a certification of compliance to ADEQ no less than annually and more frequently if specified by ADEQ. I further state that I will assume responsibility for the construction, modification,



or operation of the source in accordance with Arizona Administrative Code, Title 18, Chapter 2 and any permit issued thereof.

Signature of Responsible Official: Brent Musslewhite

Official Title of Signer: Director, Environment & Permitting

Typed or Printed Name of Brent Musslewhite

Signer: Date: 1/29/2026 Telephone Number: 520-485-1300

## SECTION 2.2 - EMISSION SOURCES

Estimated "Potential to Emit" per A.A.C. R18-2-101.

Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

PAGE \_\_\_\_\_ OF \_\_\_\_\_  
DATE \_\_\_\_\_

| REGULATED AIR POLLUTANT DATA |                              |                                         |                                |                      | EMISSION POINT DISCHARGE PARAMETERS      |                |                 |                                     |                                     |              |               |               |                 |                |
|------------------------------|------------------------------|-----------------------------------------|--------------------------------|----------------------|------------------------------------------|----------------|-----------------|-------------------------------------|-------------------------------------|--------------|---------------|---------------|-----------------|----------------|
| EMISSION POINT<br>[1]        |                              | CHEMICAL COMPOSITION<br>OF TOTAL STREAM | AIR POLLUTANT<br>EMISSION RATE |                      | UTM COORDINATES OF<br>EMISSION POINT [5] |                |                 | STACK SOURCES<br>[6]                |                                     |              |               |               | NONPOINT        |                |
| NUMBER                       | NAME                         | REGULATED AIR<br>POLLUTANT NAME<br>[2]  | #/<br>HR.<br>[3]               | TONS/<br>YEAR<br>[4] | ZONE                                     | EAST<br>(Mtrs) | NORTH<br>(Mtrs) | HEIGHT<br>ABOVE<br>GROUND<br>(feet) | HEIGHT<br>ABOVE<br>STRUC.<br>(feet) | EXIT DATA    |               |               | SOURCES [7]     |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     | DIA<br>(ft.) | VEL.<br>(fps) | TEMP.<br>(°F) | LENGTH<br>(ft.) | WIDTH<br>(ft.) |
| See appendix C               | and separate modeling report |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |
|                              |                              |                                         |                                |                      |                                          |                |                 |                                     |                                     |              |               |               |                 |                |

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL \_\_\_\_\_ feet

ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

**\*\*Submit emission calculations spreadsheet with your application\*\***

### General Instructions:

- Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.
- Components to be listed include regulated air pollutants as defined in A.A.C. R18-2-101. Examples of typical component names are: Carbon Monoxide (CO), Nitrogen Oxides (NO<sub>x</sub>), Sulfur Dioxide (SO<sub>2</sub>), Volatile Organic Compounds (VOC), particulate matter (PM), particulate less than 10 microns (PM<sub>10</sub>), etc. Abbreviations are O.K.
- Pounds per hour (#/HR) is maximum potential emission rate expected by applicant.
- Tons per year is annual maximum potential emission expected by applicant, which takes into account process operating schedule.
- As a minimum applicant shall furnish a facility plot plan as described in the filing instructions. UTM coordinates are required only if the source is a major source or is required to perform refined modeling for the purposes of demonstrating compliance with ambient air quality guidelines.
- Supply additional information as follows if appropriate:
  - Stack exit configuration other than a round vertical stack. Show length and width for a rectangular stack. Indicate if horizontal discharge with a note.
  - Stack's height above supporting or adjacent structures if structure is within 3 "stack height above the ground" of stack.
- Dimensions of nonpoint sources as defined in A.A.C. R18-2-101.

## SECTION 2.3 - EQUIPMENT LIST

The following table should include all equipment utilized at the facility, and should be completed with all the requested information. Be sure to notate the units (tons/hour, horsepower, etc.) when recording the Maximum Rated Capacity information, the Serial Number and/or the Equipment ID Number. The date of manufacture must be included in order to determine if portions of the facility are NSPS applicable. Make additional copies of this form if necessary.

**\*Submit photographs of the faceplates for all engines listed below. If an engine is certified, please also include a copy of the engine certification with the application. For any newly added equipment, include a copy of the specification sheet. These documents will be used to verify equipment information and determine applicable regulations.\***

| Type of Equipment | Maximum Rated Capacity [1] | Make | Model | Serial Number | Date of Manufacture | Equipment ID Number |
|-------------------|----------------------------|------|-------|---------------|---------------------|---------------------|
| See appendix D    |                            |      |       |               |                     |                     |
|                   |                            |      |       |               |                     |                     |
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[1] For generator sets, enter the maximum rated capacity of the engine rather than the maximum rated capacity of the generator.

### 3. APPLICATION ADMINISTRATIVE COMPLETENESS

Table 3-1 provides a list of the permit application items required by Section 2.4 of ADEQ's Application Packet for a Class I Permit along with a reference to where the information is located in this application.

**Table 3-1 Permit Application Completion Summary**

| <b>Section 2.4 of Class I Application Packet</b> | <b>Information Required</b>                                                                      | <b>Application Section</b> |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------|
| 1,2                                              | Process/Product Description including Standard Industrial Classification (SIC) code              | 1                          |
| 3,4                                              | Alternate operating process/product description including SIC code                               | 1                          |
| 5                                                | Process Flow Diagram                                                                             | 5                          |
| 6                                                | Material Balance Calculations                                                                    | N/A <sup>a</sup>           |
| 7                                                | Emission Calculations                                                                            | 6, Appendix C              |
| 8                                                | Applicable Requirements                                                                          | 8                          |
| 9                                                | Proposed Exemptions from Applicable Requirements                                                 | N/A <sup>b</sup>           |
| 10(a)-(f), (h)                                   | Annual and Hourly Process Rates, Fuel Usage, Raw Material Information, Operational Limits        | 6, Appendix C              |
| 10(g)                                            | Operating Schedule                                                                               | 4                          |
| 11                                               | Equipment and Control Device List                                                                | Appendix D                 |
| 12                                               | Stack Information                                                                                | N/A <sup>c</sup>           |
| 13                                               | Site Diagram                                                                                     | 5                          |
| 14                                               | Air Pollution Control Information                                                                | Appendix B                 |
| 15                                               | Acceptable Documentation for Equipment                                                           | N/A                        |
| 16                                               | Compliance Plan                                                                                  | 10                         |
| 17                                               | Compliance Certification                                                                         | 10                         |
| 18                                               | Acid Rain Program Compliance Plan                                                                | N/A <sup>d</sup>           |
| 19                                               | Major Source Requirements – Best Available Control Technology (BACT) and Ambient Impact Analysis | N/A                        |

<sup>a</sup> South32 did not base any emission calculations on a material balance.

<sup>b</sup> South32 is not proposing to be exempt from any otherwise applicable requirements.

<sup>c</sup> Stack parameters are included under a separate Air Quality Impact Analysis (AQIA) submittal.

<sup>d</sup> Acid rain information is required only for facilities subject to federal acid rain regulations. South32 is not subject to acid rain regulations.

## 4. PROJECT DESCRIPTION

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South32 has permitted fifty-eight (58) natural-gas fired reciprocating engines to provide the onsite power needed to operate the Facility. South32 is proposing to update the permitted number and representation of the natural gas engines in the air permit.

South32 is proposing to authorize the following changes:

- ▶ Reduce the number of permitted 2.6 MW Natural gas engines from 58 to 40, with 4 additional backup engines (44 total, only 40 operating) and authorize up to 14 of the engines to operate in the 50-100% load range rather than the 75-100% range.
- ▶ Update emission calculations to reflect the natural gas engine update above, clarify CAT XQ1140 genset (ID: ENGINE 0007-0012) references with engine references (with no change to existing emissions limits), and make similar minor corrections detailed in the emissions calculation section.
- ▶ Update the moisture content for the tailings and associated sources to 11.8% to align with latest Mine Plan of Operations (MPO)<sup>3</sup>.
- ▶ Revise permit conditions to incorporate the above-mentioned changes (explained below and as noted in Appendix E).

### 4.1 Changes to Natural Gas Engines

South32 is currently authorized to use up to 58 natural gas engines (plus 1 backup) with engines limited to an operating range of 75 to 100% and a requirement to operate the selective catalytic reduction (SCR) and oxidation catalyst units at all times, exclusive of startup and shutdown. Experience has shown that these conditions are too rigid, may create safety risks, and result in unnecessary emissions. South32 is proposing changes to the permit to reduce actual overall emissions while providing needed operational flexibility.

First, South32 proposes to replace the “interlock” requirement with a “program and monitor” requirement that requires South32 to monitor engine performance and take corrective action to restore engines to the operating range within a short period. The interlock requirement could force engines off-line while South32 is hoisting personnel or material from underground operations. Power interruption could result in personnel being trapped below ground or in the hoist. Additionally, abrupt termination of an engine increases the risk of tripping other units or engines risking a cascade failure. In lieu of the interlock, South32 will implement a program and monitor system that tracks engine performance, alarms if an engine falls below the permit load threshold, and requires South32 to determine, within 15 minutes, whether the engine can be brought back up to load or must be shutdown and another unit started. This allows smoother management of power transitions and reduces the number of startups and shutdowns.

Second, South32 proposes to expand the operating range for 14 engines to 50 to 100% instead of the current 75 to 100% range. The reason for this change is that certain operations, such as hoisting, require considerable power upon start. Under the current permit condition, South32 must use load banks to increase demand to bring generators online and hold them above the 75% limit until demand hits and then rapidly scale the load banks down and then back up to balance the change in load on the system. The net result is that South32 must operate multiple engines on load banks – burning fuel and generating emissions – solely for the purpose of maintaining 75% load. Discussion with the vendors has determined that the

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<sup>3</sup> Revised MPO date April 15, 2024.

engines are fully controlled within a wider operating range of 50 to 100% albeit with somewhat higher particulate matter emissions on a lb/MWh basis at the 50-75% range. South32's electrical engineers, vendors and consultants have concluded that if 14 engines can operate in the wider 50-100% range, that the total number of engines can be reduced from 58 with 1 backup to 40 with 4 backups. If this change is made, South32 can eliminate substantial time running load banks to balance load swings, likely reducing actual emissions over time and reducing system interruptions with corresponding startups and shutdowns. Trinity Consultants has modeled this revised operating scenario (14 units at 50-100% and 26 units at 75-100%) and determined that the NAAQS are met, as shown in the attached modeling report. South32 has proposed permit language to reduce the number of engines and the need for load bank operation.

Third, South32 and its engine contractor have identified certain required maintenance operations that cannot be conducted either with the engine off or at full operation or to validate proper operation of the SCR units. These maintenance operations are critical to keeping the engines or SCRs unit in good operating order and meeting emissions specifications. South32 has proposed to allow limited operation as needed to allow this manufacturer-required maintenance, consistent with good air pollution control practice.

Fourth, South32 has proposed clear definitions of startup, shutdown and specified maintenance for the engines and control units. This is necessary to allow for proper accounting of emissions during such periods.

Finally, South32 has proposed to test at 50, 75 and maximum achievable load and use these tests to set emission factors in lb/MWh that will be used in conjunction with the monitoring of MWh to calculate emissions more accurately. Startup and shutdown emissions for NOx are substituted for these values, being based on worst case startup/shutdown values and maximum operation at other times. Startup and shutdown values for CO and VOC are added based on a conservative estimate of time during which combustion may occur while the oxidation catalyst is below temperature. South32 also has provided for use of the NSPS Subpart JJJJ limits during periods when the oxidation catalyst or SCR unit is down while repairs are undertaken or if there is an unsuccessful SCR validation. These steps ensure that the annual emissions are not underestimated.

## **4.2 Diesel Engines**

South32 is proposing the option to use the EPA certified emissions in lieu of stack testing. Many of these units operate infrequently or as emergency-equivalent engines and hours consumed by stack testing would substantially increase the overall emissions from the units. The environmental value of stack testing units operating pursuant to an EPA engine certification where the EPA has determined that stack testing is not required is low. *See, e.g.,* 40 C.F.R. 60.4211(c) (allowing compliance to be demonstrated by use of a certified engine installed and configured according to the manufacturer's emission-related specifications).

## **4.3 Emission Calculation Update**

The emissions calculations are being updated to reflect these changes and the newest data from the Mine Plan of Operations on tailings moisture. These steps ensure consistency among South32 permits and filings.

## **5. SITE & PROCESS FLOW DIAGRAMS**

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Figure 5-1 through Figure 5-16 include overall site plans during Plan I and Plan II, including property boundaries, as well as zoomed-in maps of the beneficiation areas for Taylor and Clark. Figure 5-17 contains a process flow diagram (PFD) of the emission sources undergoing revisions to existing operations.



Figure 5-1: Hermosa Project - Location Map - Plan I

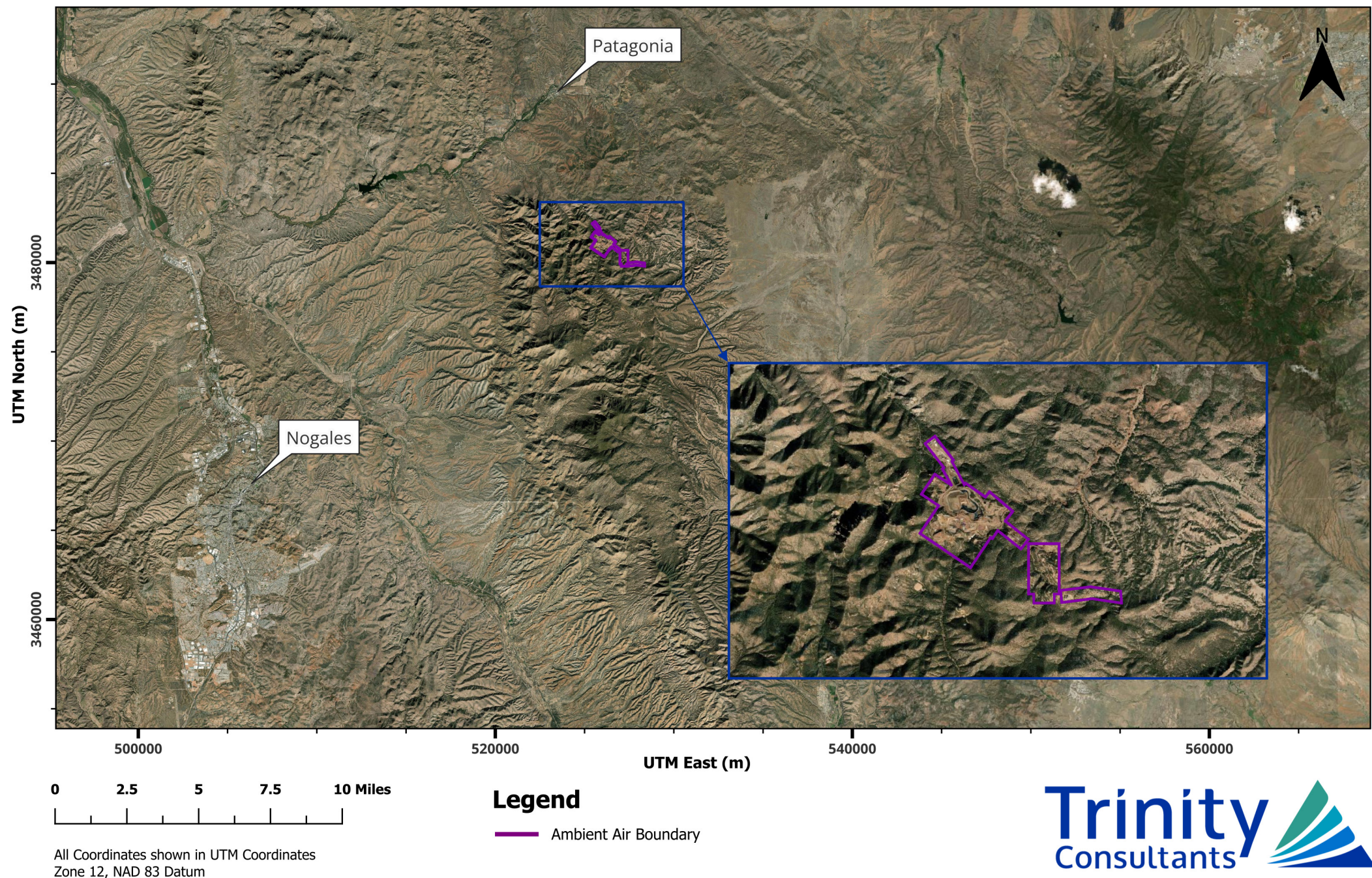




Figure 5-2: Hermosa Project - Location Map - Plan II

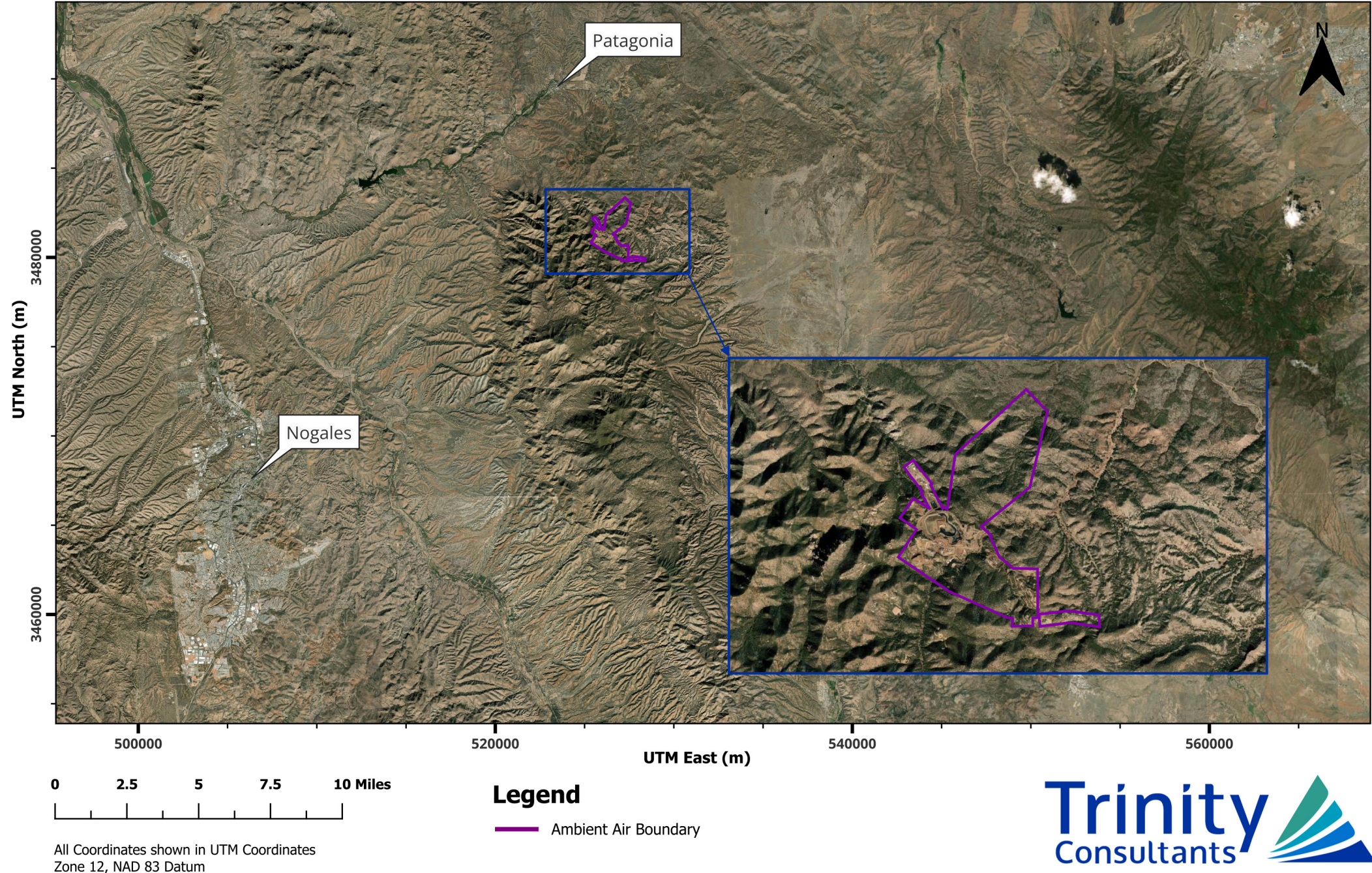
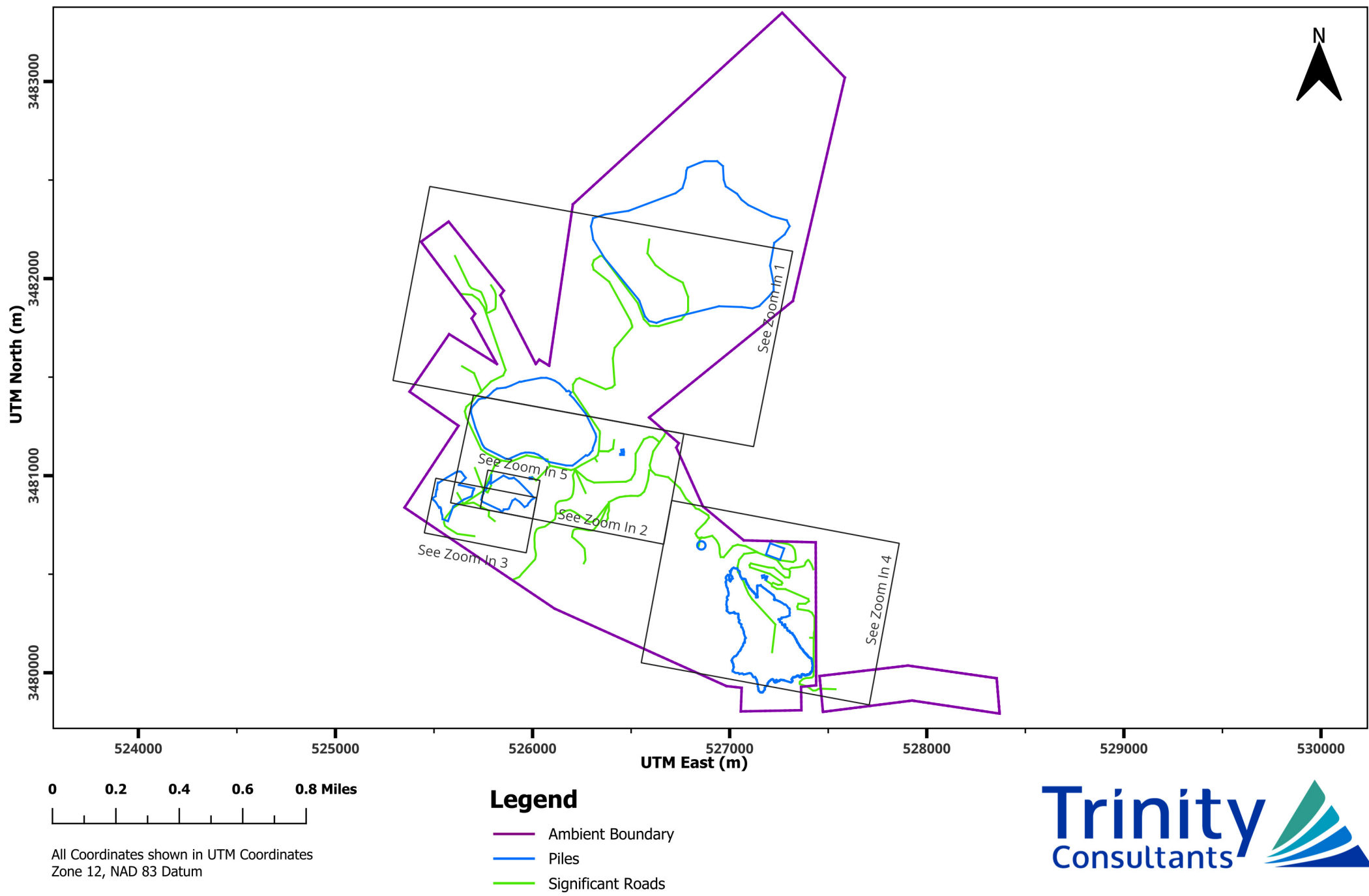




Figure 5-3: Hermosa Project - Zoom In Locations



# Figure 5-4: Hermosa Project - Piles and Roads - Plan I

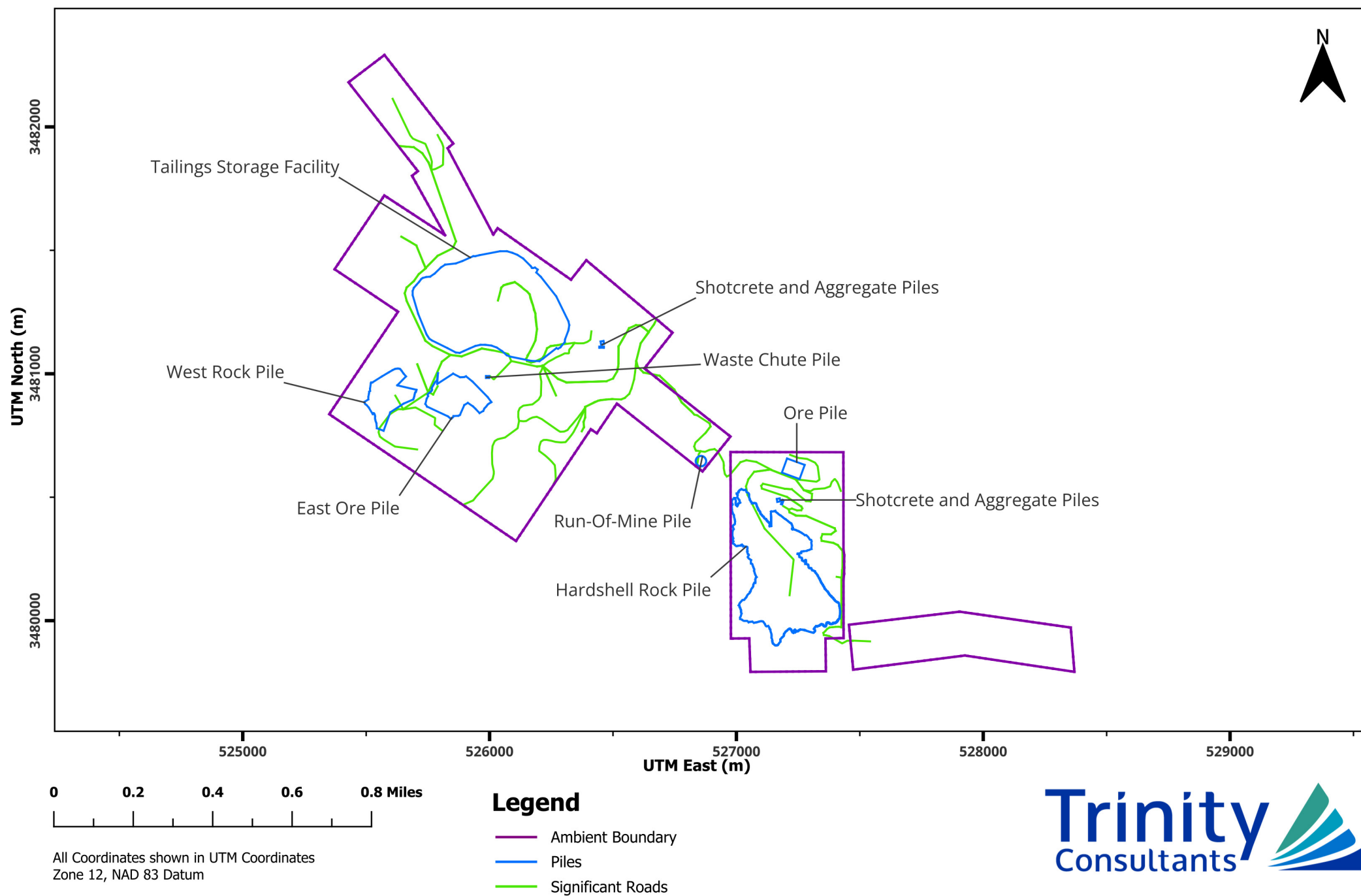


Figure 5-5: Hermosa Project - Piles and Roads - Plan II

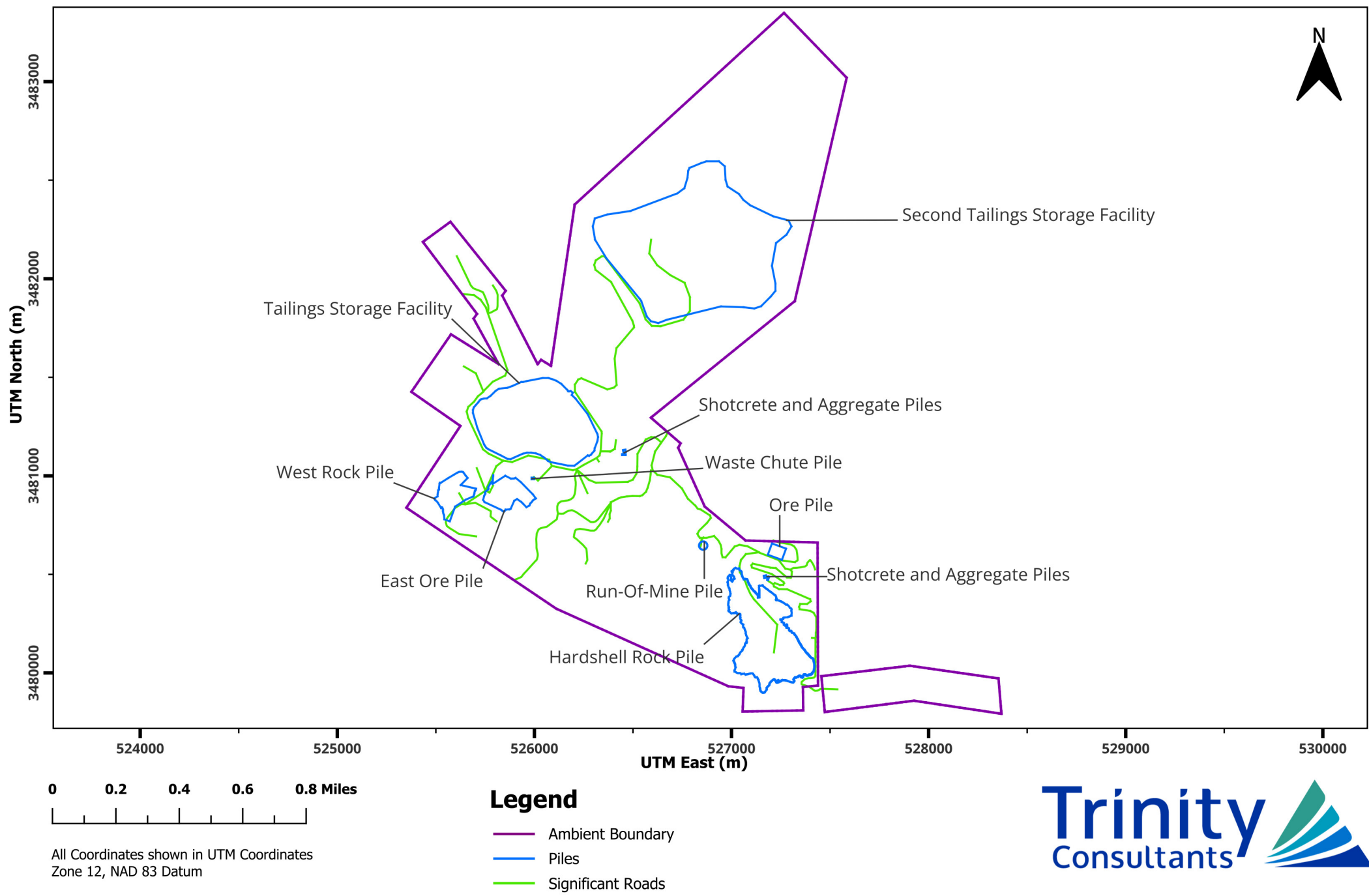


Figure 5-6: Hermosa Project - Building Zoom In 1

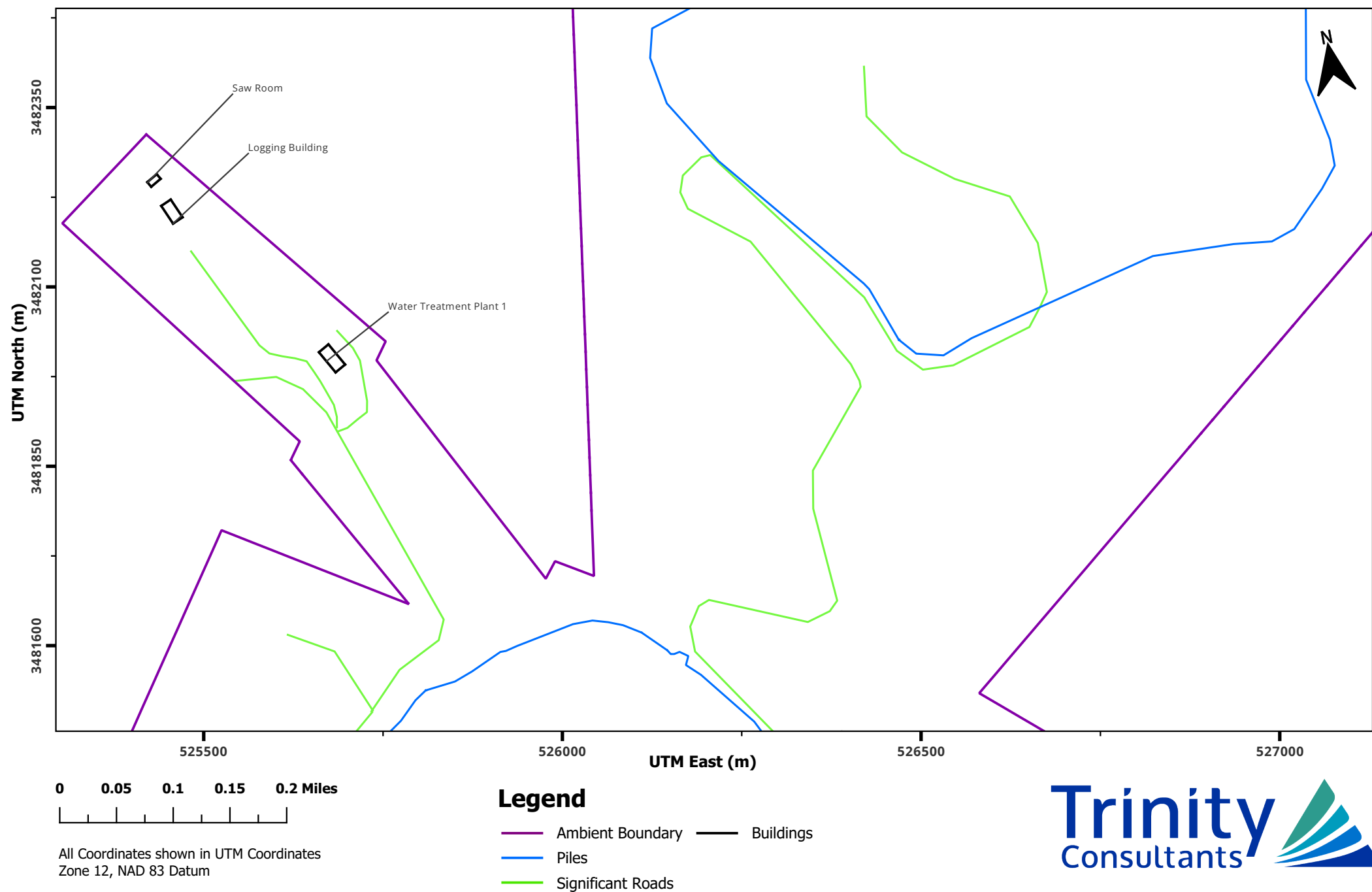


Figure 5-7: Hermosa Project - Building Zoom In 2

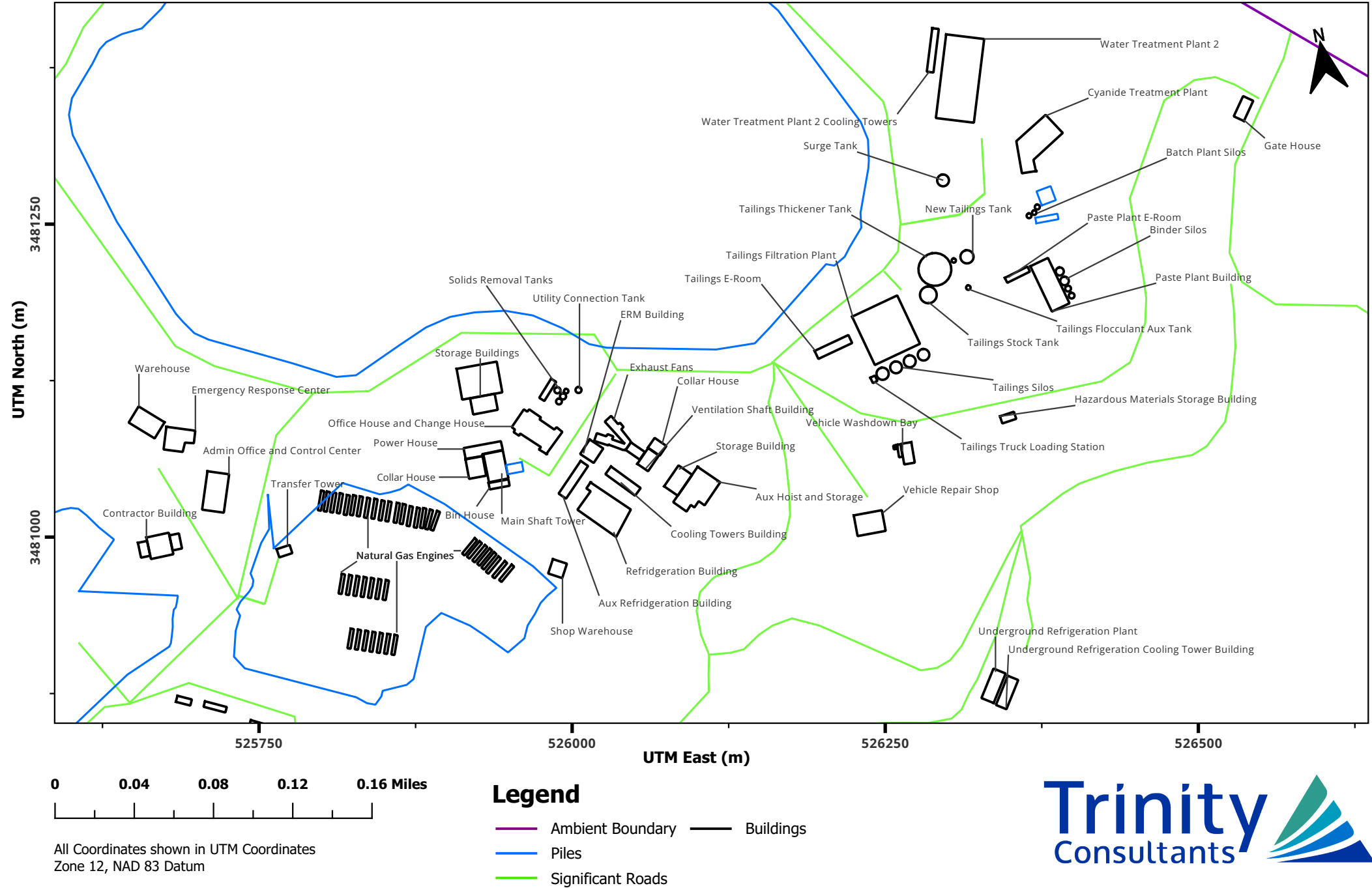






Figure 5-9: Hermosa Project - Building Zoom In 4

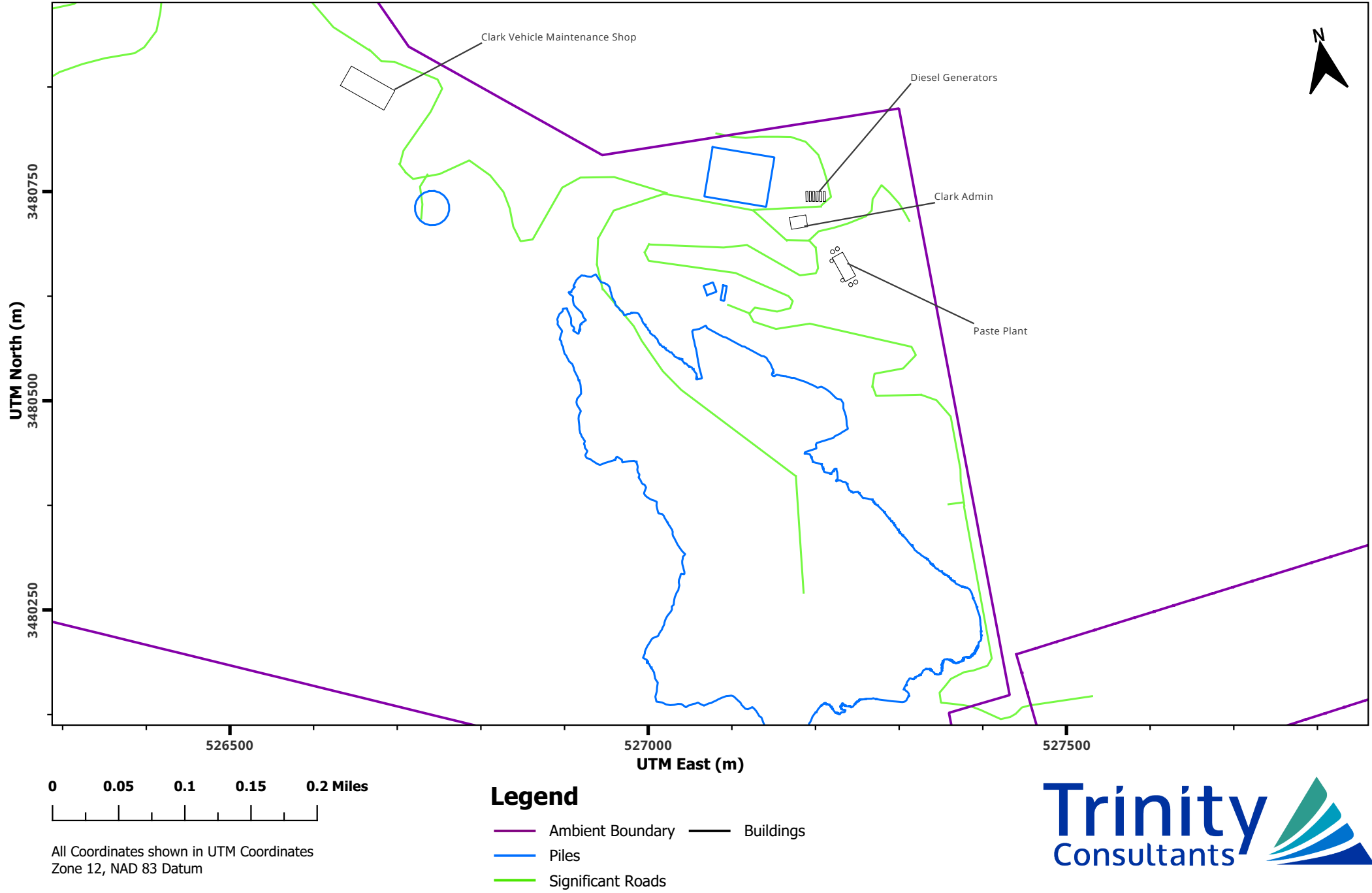


Figure 5-10: Hermosa Project - Building Zoom In 5

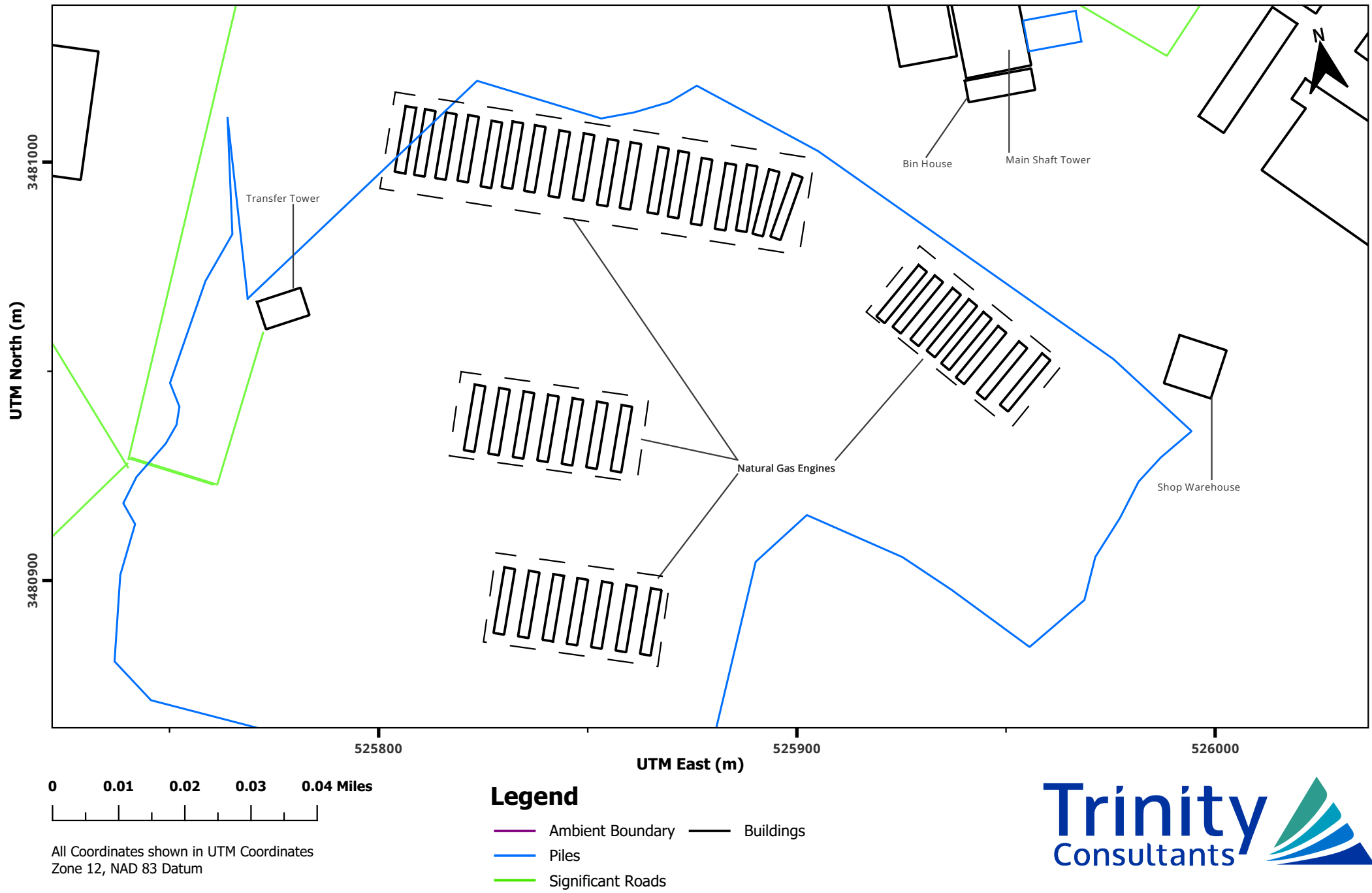


Figure 5-11: Hermosa Project - Emission Sources Zoom In 1

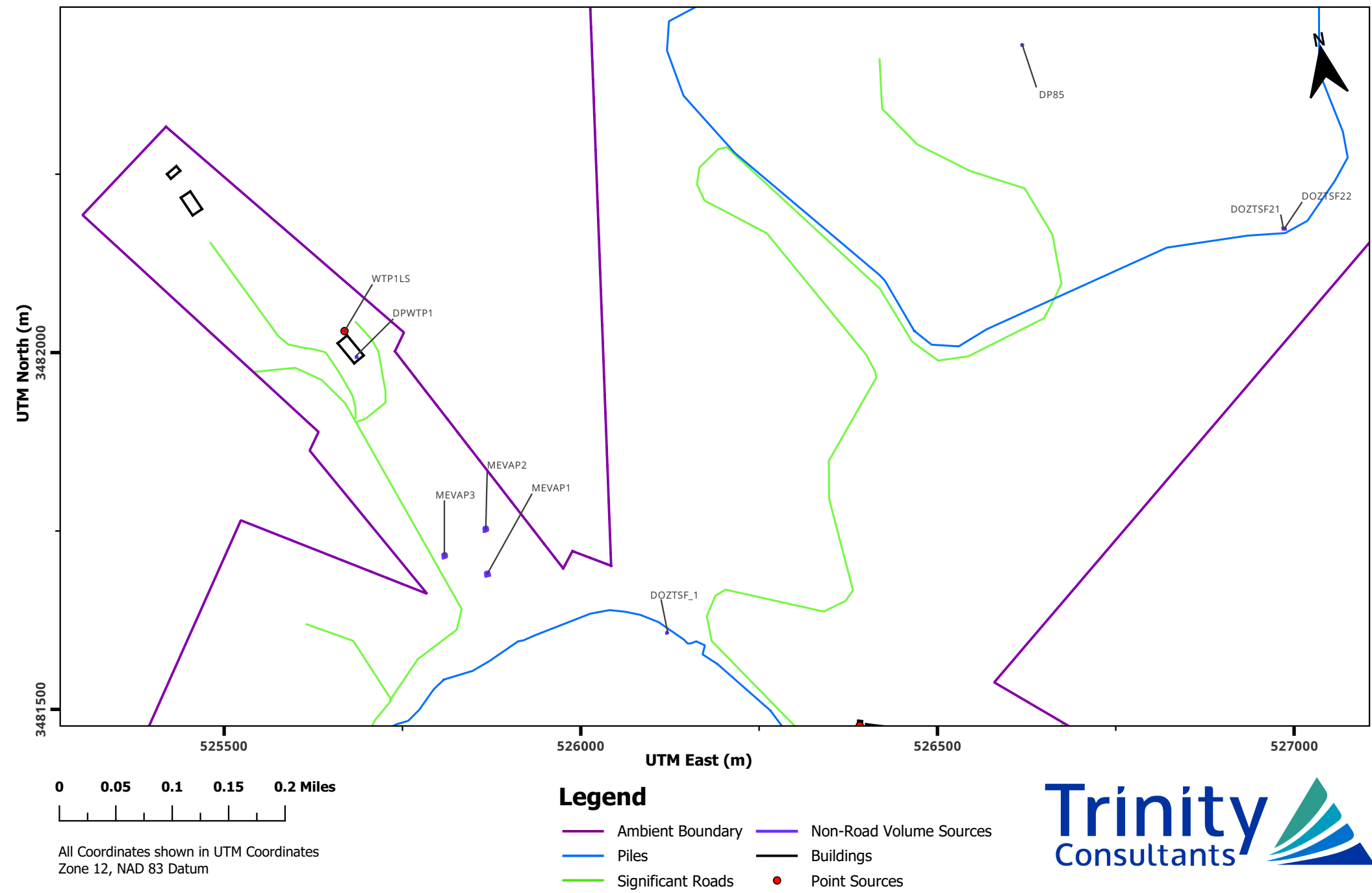


Figure 5-12: Hermosa Project - Emission Sources Zoom In 2

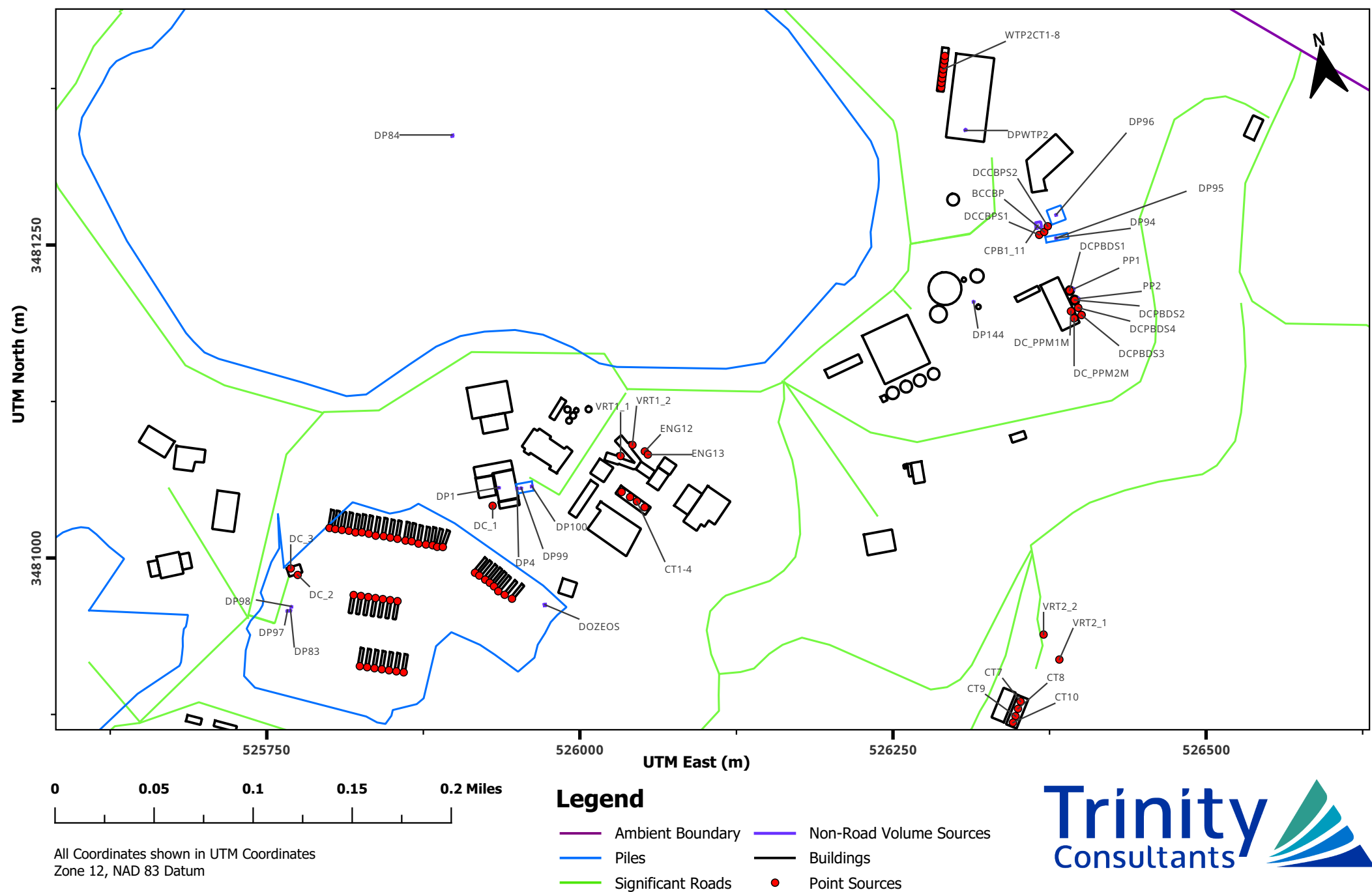


Figure 5-13: Hermosa Project - Emission Sources Zoom In 3

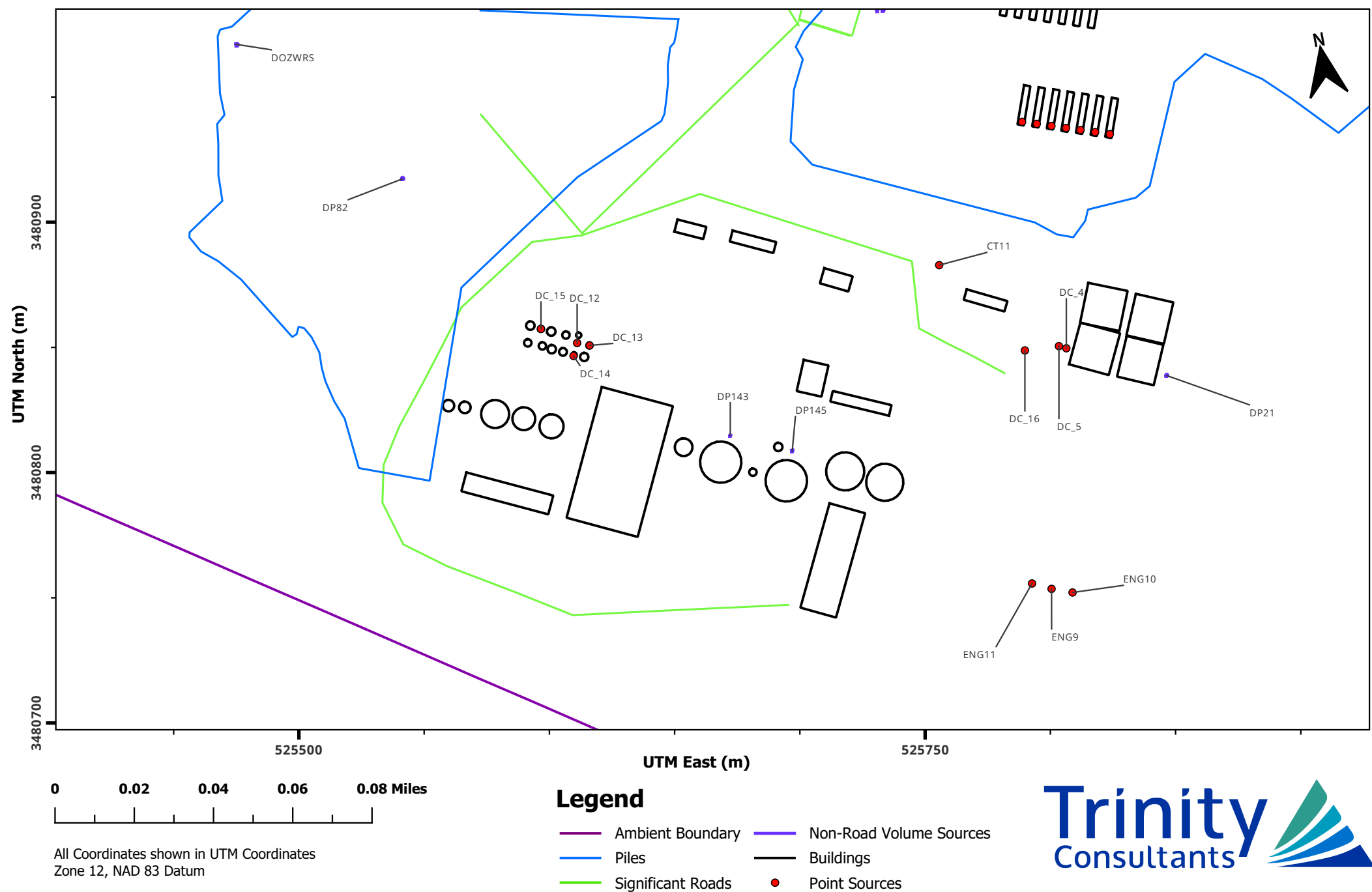


Figure 5-14: Hermosa Project - Emission Sources Zoom In 4 (Plan I)

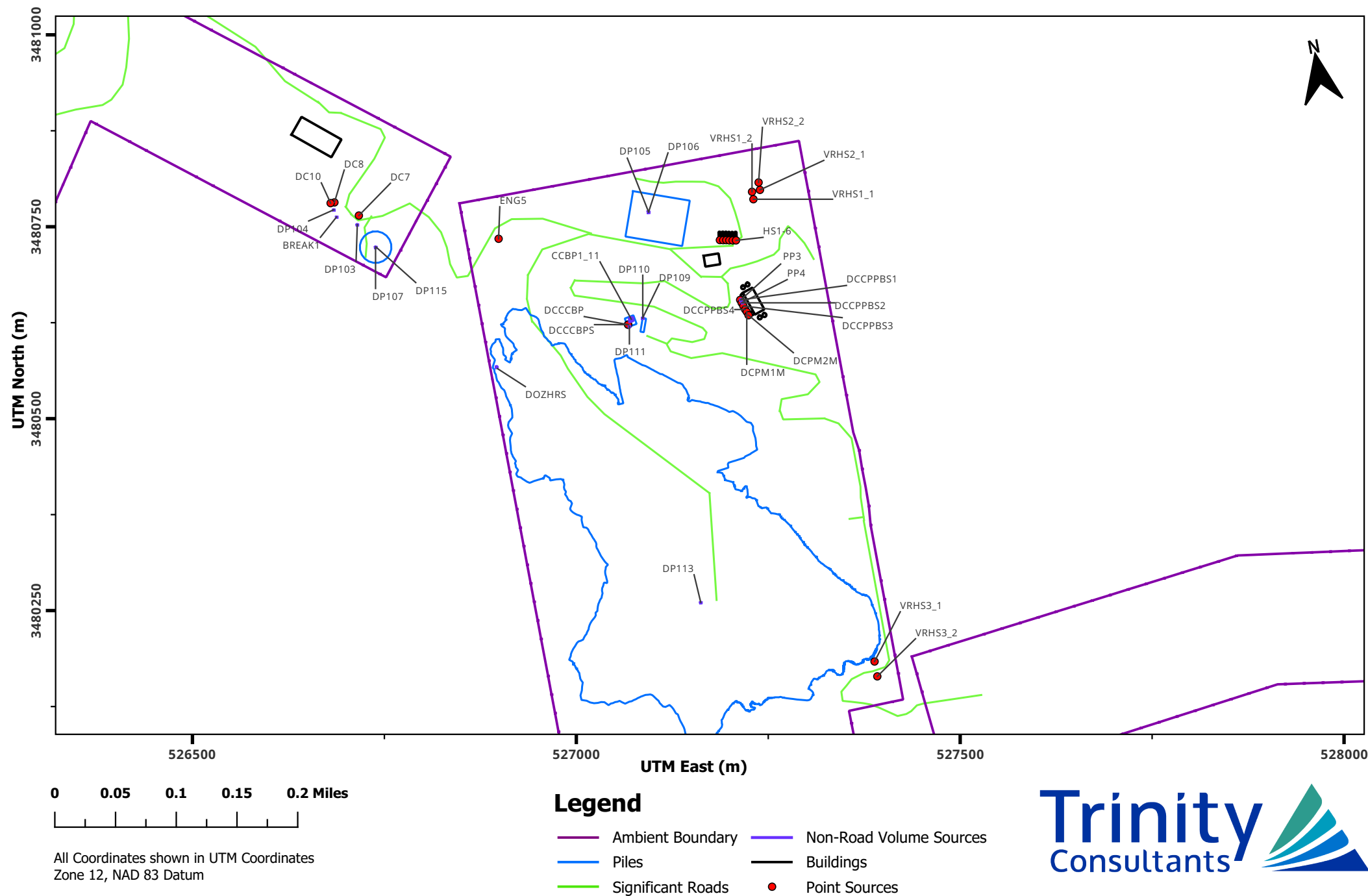




Figure 5-15: Hermosa Project - Emission Sources Zoom In 4 (Plan II)

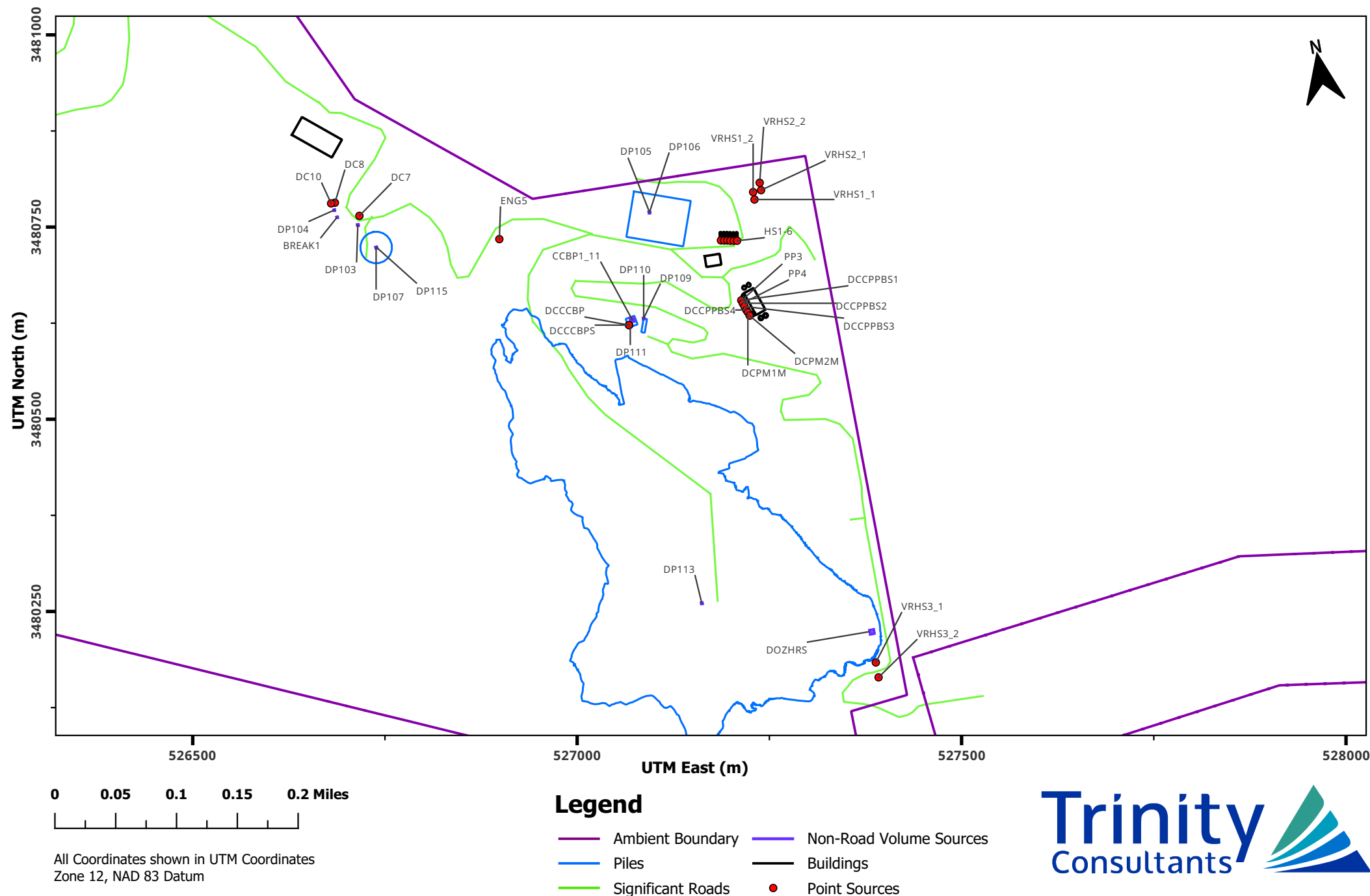
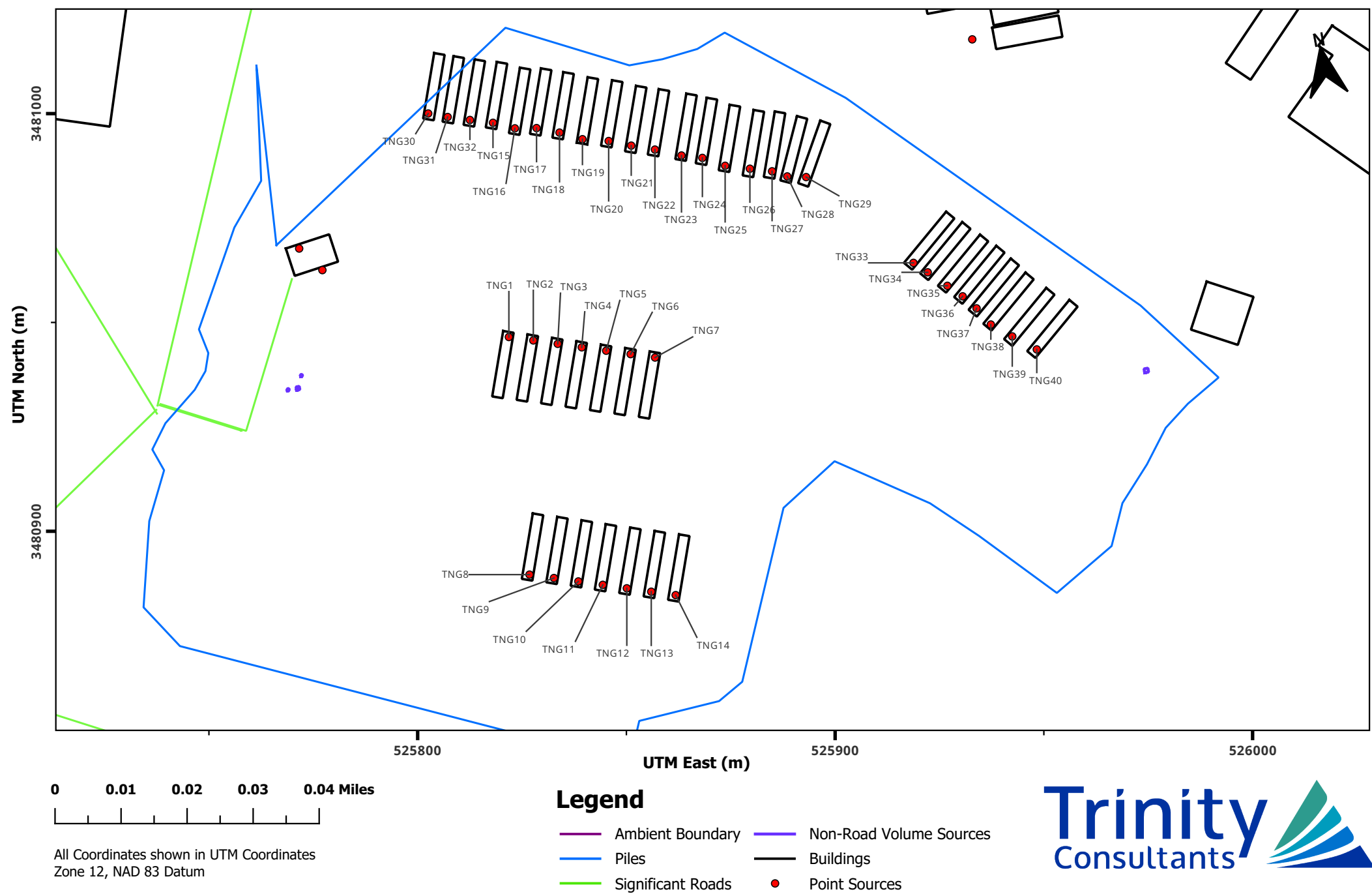


Figure 5-16: Hermosa Project - Emission Sources Zoom In 5

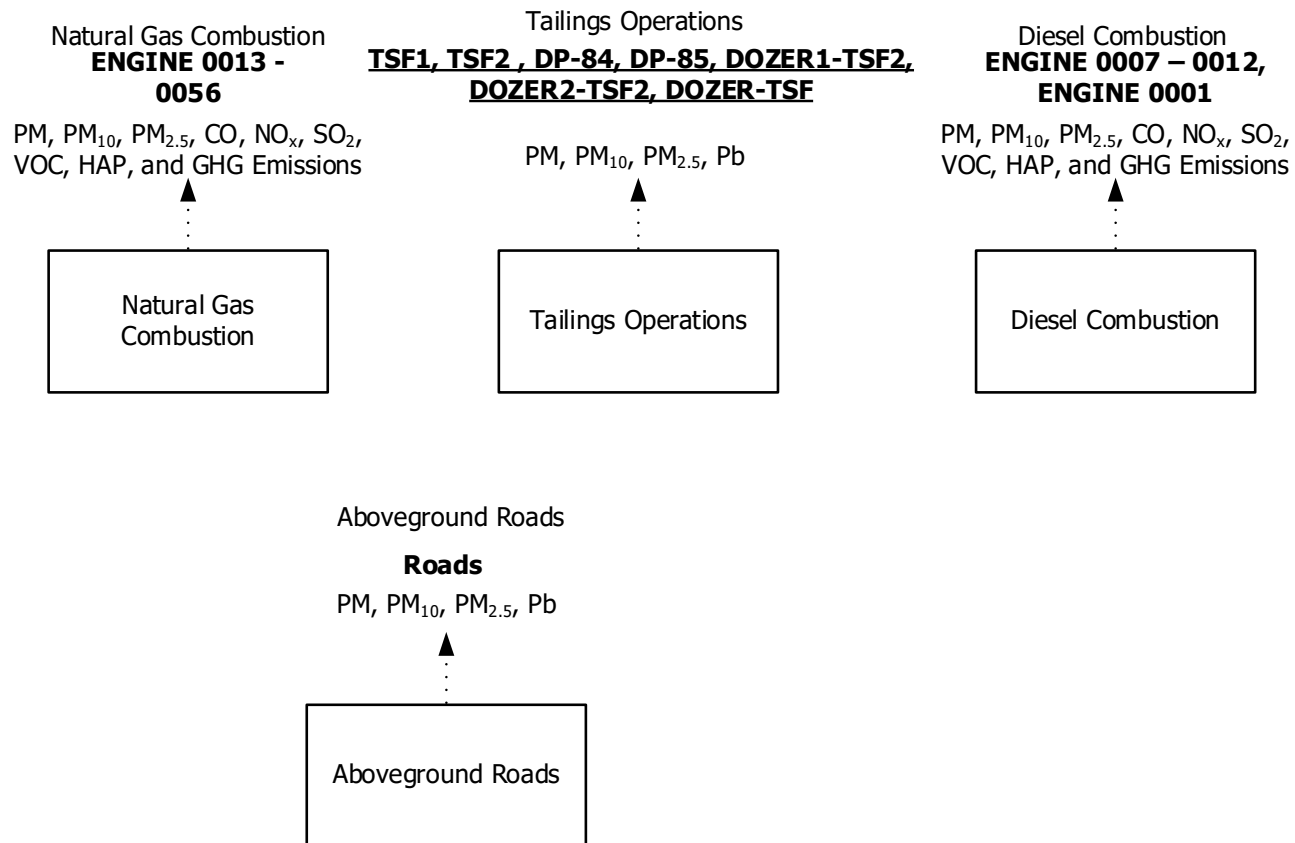


| ID       | Description                                                                     |
|----------|---------------------------------------------------------------------------------|
| AGG      | Clark Agg Stockpile                                                             |
| BCCBP    | CBP Cement Silo                                                                 |
| BREAK1   | Clark Rock Breaker                                                              |
| CBP1_11  | CBP Plant                                                                       |
| CCBP1_11 | Clark CBP Plant                                                                 |
| CHUTE    | Waste Chute Bin                                                                 |
| CT1      | Cooling Tower Cell 1                                                            |
| CT2      | Cooling Tower Cell 2                                                            |
| CT3      | Cooling Tower Cell 3                                                            |
| CT4      | Cooling Tower Cell 4                                                            |
| CT7      | UG Refridgeration CT Cell 1                                                     |
| CT8      | UG Refridgeration CT Cell 2                                                     |
| CT9      | UG Refridgeration CT Cell 3                                                     |
| CT10     | UG Refridgeration CT Cell 4                                                     |
| CT11     | Mill Cooling Tower                                                              |
| DC_PPM1M | Plant Plant Module 1 Mixer                                                      |
| DC_PPM2M | Plant Plant Module 2 Mixer                                                      |
| DC-1     | 21210-CX-00002 Main Shaft Ore Discharge Dust Collector 7                        |
| DC-2     | 21210-CX-00001 Coarse Ore Overland Dust Collector 7                             |
| DC-3     | 21210-CX-00003 Transfer Tower Silo Dust Collector 4                             |
| DC-4     | 21510-CX-00001 Coarse Ore Silo Dust Collector 4                                 |
| DC-7     | Coarse Ore Dust Collection System,23100-FAN-0001                                |
| DC-8     | Coarse Ore Dust Collection System,23100-FAN-0002                                |
| DC-10    | Coarse Ore Dust Collection System,23100-DCD-0005                                |
| DC-12    | 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector                          |
| DC-13    | 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector                        |
| DC-14    | 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector                        |
| DC-15    | 22620-CX-00004 Caustic Mix Tank Dust Collector                                  |
| DC-16    | 22210-CX-00001 Pebble Crusher Dust Collector 4                                  |
| DCCBPS1  | CBP Cement Supplement Silo 1                                                    |
| DCCBPS2  | CBP Cement Supplement Silo 2                                                    |
| DCCCBP   | CBP Cement Silo                                                                 |
| DCCCBPS  | CBP Cement Supplement Silo                                                      |
| DCCPPBS1 | Paste Plant Binder Silo 1                                                       |
| DCCPPBS2 | Paste Plant Binder Silo 2                                                       |
| DCCPPBS3 | Paste Plant Binder Silo 3                                                       |
| DCCPPBS4 | Paste Plant Binder Silo 4                                                       |
| DCPBDS1  | Paste Plant Binder Storage Silo 1                                               |
| DCPBDS2  | Paste Plant Binder Storage Silo 2                                               |
| DCPBDS3  | Paste Plant Binder Dosage Silo 1                                                |
| DCPBDS4  | Paste Plant Binder Dosage Silo 2                                                |
| DCPM1M   | Plant Plant Module 1 Mixer                                                      |
| DCPM2M   | Plant Plant Module 2 Mixer                                                      |
| DOZAREA  | Dozer on Hardrock Storage                                                       |
| DOZEOS   | Dozer on East Ore Stockpile                                                     |
| DOZHRS   | Dozer on Hardshell Rock Stockpile                                               |
| DOZTSF_1 | Dozer on TSF_1                                                                  |
| DOZTSF21 | TSF2 dozer 1                                                                    |
| DOZTSF22 | TSF2 dozer 2                                                                    |
| DOZWRS   | Dozer on West Rock Stockpile                                                    |
| DP1      | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin |
| DP4      | Drop from Shaft to Waste Chute                                                  |
| DP21     | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper        |
| DP82     | Drop on West NAG Stockpile                                                      |
| DP83     | Drop on East NAG Stockpile                                                      |
| DP84     | TSF                                                                             |

| ID     | Description                                                                                                  |
|--------|--------------------------------------------------------------------------------------------------------------|
| DP85   | Drops on TSF2                                                                                                |
| DP94   | Transfer from Agg Stockpile to Loader                                                                        |
| DP95   | Transfer of Agg Material from Loader to Haul Truck                                                           |
| DP96   | Transfer of Shotcrete Aggregate from Stockpile to Loader                                                     |
| DP97   | Transfer of Ore from East Ore Stockpile to Loader                                                            |
| DP98   | Transfer of Ore from Loader to Haul Truck                                                                    |
| DP99   | Transfer of Rock and Ore from Waste Chute to Loader                                                          |
| DP100  | Transfer of Rock and Ore from Loader to Haul Truck                                                           |
| DP103  | Haul Truck Dump into Primary Crusher Feed Hopper from ROM Stockpile (23100-HPR-0001)                         |
| DP104  | Drop from silo to trucks                                                                                     |
| DP105  | Transfer of Development Ore from Ore Stockpile to Loader                                                     |
| DP106  | Transfer of Development Ore Mined from Loader to Haul Truck                                                  |
| DP107  | Transfer from ROM Stockpile to Loader                                                                        |
| DP109  | Transfer from Agg Stockpile to Loader                                                                        |
| DP110  | Transfer of Agg Material from Loader to Haul Truck                                                           |
| DP111  | Transfer of Shotcrete Aggregate from Stockpile to Loader                                                     |
| DP113  | Hardshell NAG Wasterock Storage Drop                                                                         |
| DP114  | Ore Stockpile Drop                                                                                           |
| DP115  | ROM Stockpile Drop                                                                                           |
| DP143  | Drop of 50 lb bag of Lead Concentrate Flocculant to 22620-EP-00002 Concentrate Flocculant Preparation Module |
| DP144  | Drop of 1 ton bag of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module            |
| DP145  | Drop of 50 lb bag of Zinc Concentrate Flocculant to 22620-EP-00002 Concentrate Flocculant Preparation Module |
| DPWTP2 | WTP2 Reagent Drops inside bldg                                                                               |
| ENG5   | CUMMINS Power Generation C200D2RE (ENGINE 0001)                                                              |
| ENG9   | CAT C175 Substation 1 (ENGINE 0002)                                                                          |
| ENG10  | CAT C175 Substation 2 (ENGINE 0003)                                                                          |
| ENG11  | CAT C175 Substation 3 (ENGINE 0004)                                                                          |
| ENG12  | CAT C175 Shaft 1 (ENGINE 0005)                                                                               |
| ENG13  | CAT C175 Shaft 2 (ENGINE 0006)                                                                               |
| EOS    | East Ore Stockpile                                                                                           |
| HRS    | Hardshell Rock Stockpile                                                                                     |
| HS1    | Diesel Hardshell (ENGINE 0007)                                                                               |
| HS2    | Diesel Hardshell (ENGINE 0008)                                                                               |
| HS3    | Diesel Hardshell (ENGINE 0009)                                                                               |
| HS4    | Diesel Hardshell (ENGINE 0010)                                                                               |
| HS5    | Diesel Hardshell (ENGINE 0011)                                                                               |
| HS6    | Diesel Hardshell (ENGINE 0012)                                                                               |
| MEVAP1 | Mechanical Evaporator 1                                                                                      |
| MEVAP2 | Mechanical Evaporator 2                                                                                      |
| MEVAP3 | Mechanical Evaporator 3                                                                                      |
| ORE    | Clark Ore Stockpile                                                                                          |
| PP1    | Truck Pneumatic Loadout to Silo 1                                                                            |
| PP2    | Truck Pneumatic Loadout to Silo 2                                                                            |
| PP3    | Truck Pneumatic Loadout to Silo 1                                                                            |
| PP4    | Truck Pneumatic Loadout to Silo 2                                                                            |
| ROM    | Clark ROM Stockpile                                                                                          |
| SHOT   | Clark Shotcrete Stockpile                                                                                    |
| TAGG   | Taylor Agg Stockpile                                                                                         |
| TNG1   | Natural Gas Engine 1 (ENGINE 0013)                                                                           |
| TNG2   | Natural Gas Engine 2 (ENGINE 0014)                                                                           |
| TNG3   | Natural Gas Engine 3 (ENGINE 0015)                                                                           |
| TNG4   | Natural Gas Engine 4 (ENGINE 0016)                                                                           |
| TNG5   | Natural Gas Engine 5 (ENGINE 0017)                                                                           |
| TNG6   | Natural Gas Engine 6 (ENGINE 0018)                                                                           |
| TNG7   | Natural Gas Engine 7 (ENGINE 0019)                                                                           |
| TNG8   | Natural Gas Engine 8 (ENGINE 0020)                                                                           |

| ID      | Description                                  |
|---------|----------------------------------------------|
| TNG9    | Natural Gas Engine 9 (ENGINE 0021)           |
| TNG10   | Natural Gas Engine 10 (ENGINE 0022)          |
| TNG11   | Natural Gas Engine 11 (ENGINE 0023)          |
| TNG12   | Natural Gas Engine 12 (ENGINE 0024)          |
| TNG13   | Natural Gas Engine 13 (ENGINE 0025)          |
| TNG14   | Natural Gas Engine 14 (ENGINE 0026)          |
| TNG15   | Natural Gas Engine 15 (ENGINE 0027)          |
| TNG16   | Natural Gas Engine 16 (ENGINE 0028)          |
| TNG17   | Natural Gas Engine 17 (ENGINE 0029)          |
| TNG18   | Natural Gas Engine 18 (ENGINE 0030)          |
| TNG19   | Natural Gas Engine 19 (ENGINE 0031)          |
| TNG20   | Natural Gas Engine 20 (ENGINE 0032)          |
| TNG21   | Natural Gas Engine 21 (ENGINE 0033)          |
| TNG22   | Natural Gas Engine 22 (ENGINE 0034)          |
| TNG23   | Natural Gas Engine 23 (ENGINE 0035)          |
| TNG24   | Natural Gas Engine 24 (ENGINE 0036)          |
| TNG25   | Natural Gas Engine 25 (ENGINE 0037)          |
| TNG26   | Natural Gas Engine 26 (ENGINE 0038)          |
| TNG27   | Natural Gas Engine 27 (ENGINE 0039)          |
| TNG28   | Natural Gas Engine 28 (ENGINE 0040)          |
| TNG29   | Natural Gas Engine 29 (ENGINE 0041)          |
| TNG30   | Natural Gas Engine 30 (ENGINE 0042)          |
| TNG31   | Natural Gas Engine 31 (ENGINE 0043)          |
| TNG32   | Natural Gas Engine 32 (ENGINE 0044)          |
| TNG33   | Natural Gas Engine 33 (ENGINE 0045)          |
| TNG34   | Natural Gas Engine 34 (ENGINE 0046)          |
| TNG35   | Natural Gas Engine 35 (ENGINE 0047)          |
| TNG36   | Natural Gas Engine 36 (ENGINE 0048)          |
| TNG37   | Natural Gas Engine 37 (ENGINE 0049)          |
| TNG38   | Natural Gas Engine 38 (ENGINE 0050)          |
| TNG39   | Natural Gas Engine 39 (ENGINE 0051)          |
| TNG40   | Natural Gas Engine 40 (ENGINE 0052)          |
| TSF_1   | Tailing Storage Facility                     |
| TSF2    | USFS Tailings Storage Facility               |
| TSHOT   | Taylor Shotcrete Stockpile                   |
| VRHS1_1 | Ventilation - Exhaust Raises NE Hardshell #1 |
| VRHS1_2 | Ventilation - Exhaust Raises NE Hardshell #1 |
| VRHS2_1 | Ventilation - Exhaust Raises NE Hardshell #2 |
| VRHS2_2 | Ventilation - Exhaust Raises NE Hardshell #2 |
| VRHS3_1 | Ventilation - Exhaust Raise SE Hardshell     |
| VRHS3_2 | Ventilation - Exhaust Raise SE Hardshell     |
| VRT1_1  | Ventilation Shaft - Taylor                   |
| VRT1_2  | Ventilation Shaft - Taylor                   |
| VRT2_1  | Vent Raise - Taylor                          |
| VRT2_2  | Vent Raise - Taylor                          |
| WRS     | West Rock Stockpile                          |
| WTP1LS  | Waste Water Treatment Plant #1 Lime Silo     |
| WTP2CT1 | WTP2 CT Cell 1                               |
| WTP2CT2 | WTP2 CT Cell 2                               |
| WTP2CT3 | WTP2 CT Cell 3                               |
| WTP2CT4 | WTP2 CT Cell 4                               |
| WTP2CT5 | WTP2 CT Cell 5                               |
| WTP2CT6 | WTP2 CT Cell 6                               |
| WTP2CT7 | WTP2 CT Cell 7                               |
| WTP2CT8 | WTP2 CT Cell 8                               |

Figure 5-17



**Legend**

..... Air Emissions

**South32 Hermosa Inc.**

Process Flow Diagrams

**Trinity**  
Consultants

January 2026



## 6. PROJECT EMISSION CALCULATIONS

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The following section contains a detailed description of the methodology used to calculate emissions for the proposed Project. Detailed emission calculations are included in Appendix C and references to supporting documentation for emissions factors and emissions estimating methodologies are included in Appendix A and B. Details are included in the spreadsheets attached in Appendix A.

### 6.1 Emissions from Generators

Emissions of Particulate Matter (PM), Particulate Matter  $\leq 10$  microns (PM<sub>10</sub>), Particulate Matter  $\leq 2.5$  microns (PM<sub>2.5</sub>), Nitrogen Oxides (NO<sub>x</sub>), Carbon Monoxide (CO), Sulfur Dioxide (SO<sub>2</sub>), Volatile Organic Compounds (VOC), Hazardous Air Pollutants (HAPs), and Greenhouse Gases (GHGs) will be generated by the generator engines. Emissions from the natural gas generator(s) are represented based on the highest emissions when pairing engine rating to emission factors assuming 8,760 hours of operation per year. No changes are being proposed to the permitted calculation methodology. The following changes are proposed to be made to the generators:

- ▶ Update the representation of the six (6) Diesel CAT XQ1140 gensets (ENGINE 0007 – 0012) to account for the two (2) Caterpillar C18 engines in each genset. South32 is not proposing to change the voluntarily accepted limits for Nitrogen Oxides (NO<sub>x</sub>), Carbon Monoxide (CO), or Volatile Organic Compounds (VOC) that were accepted for these generator sets.
- ▶ Update mechanical engine rating of C200D2RE (ENGINE 0001) to 213 kW from 218 kW.
- ▶ Update VOC emissions calculations for the C200D2RE engine (ENGINE 0001) to use the EPA Tier 4 emission factor for VOC instead of the Tier 4 emission factor for particulate matter less than 2.5 microns (PM<sub>2.5</sub>).
- ▶ Update the SO<sub>2</sub> emission factor for the CAT G3520 to align with AP-42 Section 3.2, Natural Gas Engines (Maximum Emission Factor Available), dated October 2024.

#### 6.1.1 Emission Factors

The following emission factors were used for natural gas engines:

- ▶ NO<sub>x</sub>, CO, PM, VOC, Acetaldehyde, Formaldehyde, and GHGs emission factors obtained from stack testing performed in July and September of 2021 on a G3520 Caterpillar engine which is included in Appendix B of this application. A safety factor of 30% was added to the calculations to account for stack test variability.
- ▶ SO<sub>2</sub> emission factor was obtained from AP-42 for Natural Gas Engines (maximum emission factor available) dated October 2024.
- ▶ HAP emission factors were referenced from AP-42 Chapter 3.2 for 4 Stroke Lean Burn Natural Gas Engines. As these engines are equipped with oxidation catalysts, a calculated control efficiency was applied to select HAPs to account for the emission reductions attributable to this emission control technology.<sup>4</sup> Control efficiencies (CE) were determined by comparing stack tested emission factors for VOC and formaldehyde at 50%, 75%, and 100% loading scenarios. The most conservative among three potential values was chosen and applied to relevant HAP emission factors affected by oxidation catalysts.

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<sup>4</sup> Control efficiencies were applied to select HAPs named in AP-42 Chapter 3.2, Table 3.2-2 (4 Stroke Lean Burn Natural Gas Engines) based on guidance provided by Korby Backen, P.E. on December 15th, 2023.

HAPs calculated using average brake specific fuel consumption per AP-42 Chapter 3.3 (Oct. 1996) to convert units for use with natural gas generators.

The following emission factors were used for the Caterpillar C18 diesel engines:

- ▶ PM emission factors obtained from the Caterpillar C18 engine emissions certification.
- ▶ NO<sub>x</sub>, CO, and VOC are based on the voluntarily accepted limit.
- ▶ SO<sub>2</sub> emission factor is based on AP-42, Table 3.4-1 (April 2025) for Ultra Low Sulfur Diesel (15 ppm sulfur or 0.0015%) for Large Uncontrolled Stationary Diesel Engines (>600 HP).
- ▶ HAP emission factors were referenced from AP-42 Section 3.4, HAP Emission Factors For Large Uncontrolled Stationary Diesel Engines (>600 HP) dated April 2025.

### 6.1.2 Equations Used for Emission Estimations

The following equations were used to estimate hourly and annual emissions from criteria pollutants, and GHGs:

$$\text{Hourly Emissions} \left( \frac{lb}{hr} \right) = \text{Engine Rating (kW)} \times \text{Emission Factor} \left( \frac{g}{kW-hr} \right) \times \left( \frac{1}{453.592} \right) \left( \frac{lb}{g} \right)$$

$$\text{Hourly Emissions} \left( \frac{lb}{hr} \right) = \text{Engine Rating (kW)} \times \text{Emission Factor} \left( \frac{lb}{kW-hr} \right)$$

$$\text{Annual Emissions (tpy)}$$

$$= \text{Engine Rating (kW)} \times \text{Emission Factor} \left( \frac{g}{kW-hr} \right) \times \text{Operation Hours} \left( \frac{hrs}{yr} \right) \times \left( \frac{1}{453.592} \right) \left( \frac{lb}{g} \right) \\ \times \frac{1}{2000} \left( \frac{tons}{lb} \right)$$

The following equations were used to estimate annual emissions from HAPs:

$$\text{Annual Emissions (tpy)} = \\ \text{Engine Rating (kW)} \times \text{Emission Factor} \left( \frac{lb}{MMBTU} \right) \times \text{Operation Hours} \left( \frac{hrs}{yr} \right) \times \left( \frac{1}{2000} \right) \left( \frac{tons}{lb} \right) \times 3.41 * \\ 10^{-3} \left( \frac{MMBTU}{kW-hr} \right) * (1 - CE^5)$$

## 6.2 Sources with Updated Moisture

South32 is also proposing to update the moisture content of the tailings to align with the latest MPO<sup>6</sup>. No changes are being proposed to the permitted calculation methodology. This change will affect the following sources:

- ▶ Moisture content
  - TSF and TSF2 Dozers (DOZER-TSF, DOZER1-TSF2, and DOZER2-TSF2)
  - Drop on TSF and TSF2 (DP-84 and DP-85)

<sup>5</sup> CE is applied to select HAPs for natural gas engines only, as discussed in Section 6.1.1

<sup>6</sup> Revised MPO date April 15, 2024

## 6.3 Emissions from Natural Gas Delivery trips on Roads

PM, PM<sub>10</sub>, PM<sub>2.5</sub>, and HAP emissions are generated from vehicles traveling on unpaved roads aboveground. Road emissions were calculated based on vehicle miles travelled (VMT), emission factors, and control efficiencies. The VMT from natural gas deliveries was calculated by multiplying number of trips and round-trip distance traveled by the vehicle. The number of trips was estimated based on natural gas usage on-site, truck capacities, and the estimated vehicle miles traveled at the project site.

### 6.3.1 Emission Factors

Uncontrolled PM, PM<sub>10</sub>, and PM<sub>2.5</sub> emission factors for vehicles traveling on unpaved roads aboveground and underground were calculated using the following equations from AP-42, Section 13.2.2 (November 2006):

$$E = (k) \left( \frac{s}{12} \right)^a \left( \frac{W}{3} \right)^b$$

$$E_{ext} = E \left[ \frac{(365 - P)}{365} \right]$$

Where:

E = size-specific hourly and daily emission factor (lb/VMT)

E<sub>ext</sub> = size-specific annual emission factor (lb/VMT)

k = particle size multiplier, per AP-42 Table 13.2.2-2 (November 2006)

s = surface material silt content (%), per South32 engineering judgement

W = mean vehicle weight (tons)

a, b = constants, per AP-42 Table 13.2.2-2 (November 2006)

P = days per year with at least 0.01 inch precipitation, per processed onsite meteorological data collected in 2019, 2020 and 2021. The most conservative year was used.

#### 6.3.1.1 Control Efficiency

Per the EPA document *Control of Open Fugitive Dust Sources*<sup>7</sup>, sufficient watering of unpaved roads can result in a control efficiency up to 95%. For emission estimations purposes, a conservative control efficiency of 90% has been used. In this case, sufficient watering is deemed as watering which meets applicable opacity limitations and other requirements such as to comply with A.A.C. R18-2-605 and R18-2-614.

#### 6.3.1.2 Control Efficiency

$$\text{Hourly Emissions} \left( \frac{\text{lbs}}{\text{hr}} \right) = EF \left( \frac{\text{lb}}{\text{VMT}} \right) \times \text{Total Miles Traveled} \left( \frac{\text{VMT}}{\text{hr}} \right) \times (1 - \text{Control Efficiency} (\%))$$

Annual Emissions (tpy)

$$= EF \left( \frac{\text{lb}}{\text{VMT}} \right) \times \text{Total Miles Traveled} \left( \frac{\text{VMT}}{\text{yr}} \right) \times (1 - \text{Control Efficiency} (\%)) \times \left( \frac{1}{2000} \right) \left( \frac{\text{ton}}{\text{lbs}} \right)$$

---

<sup>7</sup> EPA, Control of Open Fugitive Dust Sources, EPA-450/3-88/008, September 1988.

## **7. LIST OF INSIGNIFICANT AND TRIVIAL ACTIVITIES**

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Pursuant to A.A.C. R18-304.F.8, a complete application for a significant permit revision must identify activities which are insignificant pursuant to R18-2-101.68. Insignificant activities shall be listed in a permit application, but the application need not provide emissions data, except as requested by ADEQ following submittal of the application. Therefore, emissions from these equipment and activities are not considered in the PTE calculations in this application. Similarly, the Hermosa Mine has proposed activities which are considered “trivial” pursuant to A.A.C. R18-2-101.146. South32 is not proposing any modifications to the previously listed insignificant and trivial activities.

## 8. REGULATORY APPLICABILITY

The following sections provide an overview of federal and state regulations potentially applicable to the engines being modified as a part of this significant permit revision. The regulatory applicability analysis does not discuss other permitted emission sources not associated with this significant permit revision.

### 8.1 Permit Applicability Analysis

#### 8.1.1.1 Major NSR Applicability

The Hermosa Mine will be located in the area of Santa Cruz County classified in attainment with the National Ambient Air Quality Standards (NAAQS) or unclassified for all regulated pollutants. A section of Santa Cruz County is nonattainment for PM<sub>10</sub> in the Nogales planning area. However, Hermosa Mine operations will be outside the Nogales planning area and were previously determined not to impact the nonattainment area. Accordingly, all regulated NSR pollutants are evaluated for applicability under the PSD program.

Under PSD permitting rules, the major source threshold is 250 tpy unless the facility is listed as a categorical source in A.A.C. R18-2-101.23. The PSD major source threshold for the Hermosa Mine is 250 tpy for any individual regulated NSR pollutant (see A.A.C. R18-2-401.13.b). Note that because the Hermosa Mine is not a categorical source, only non-fugitive emissions are assessed against the 250 tpy major source threshold; fugitive emissions are excluded from the major source applicability determination. Also, the total facility wide post-project PTE has been compared to the major source threshold. As summarized in Table 1-1, all potential post-project site-wide non-fugitive emissions of regulated NSR pollutants will be less than 250 tpy. Therefore, neither this project nor the Hermosa Mine will be subject to PSD review.

#### 8.1.1.2 Minor NSR Applicability

Per A.A.C. R18-2-334.A, minor New Source Review (NSR) requirements shall apply when:

- ▶ *The project involves:*
  - *Construction of any new Class I or Class II source, including the construction of any source requiring a Class II permit under R18-2-302.01(C)(4); or*
  - *any minor NSR modification to a Class I or Class II source.*

The Hermosa Mine is an existing Class I source so it does not qualify as a “new Class I or Class II source”. The proposed changes at the Hermosa Mine meet the criteria for a “minor NSR modification” as defined in R18-2-301.14 because the PTE increase associated with the Project exceeds the mNSR thresholds as shown in Table 1-1 for PM<sub>10</sub> and PM<sub>2.5</sub>. As such, air dispersion modeling has been performed as a part of this significant permit revision.

### 8.2 Permit Revision Provisions

To assess whether the proposed changes could be processed as a minor permit revision, an evaluation was conducted in accordance with A.A.C. R18-2-319.A, which defines the conditions under which the minor permit revision procedures are applicable. One such condition Pursuant to A.A.C. R18-2-319.A.4 is noted below:

*Do not seek to establish or change a permit term or condition for which there is no corresponding underlying applicable requirement and that the source has assumed to avoid an applicable requirement to which the source would otherwise be subject.*

The proposed modification seeks to establish or change a permit condition for which there is no corresponding underlying applicable requirement and also constitutes a minor NSR change. As such, this change requires a significant permit revision pursuant to A.A.C. R18-2-319.A.4 and 8 and R18-2-320.A.

Accordingly, South32 is requesting that significant permit revision procedures be used in accordance with A.A.C R18-2-320.

### **8.3 Federal and State Applicability Analysis**

This section provides an applicability analysis of federal and state requirements for the Hermosa Mine, including the following:

- ▶ New Source Performance Standards (NSPS)
- ▶ National Emission Standards for Hazardous Air Pollutants (NESHAP)
- ▶ Compliance Assurance Monitoring
- ▶ Chemical Accident Prevention
- ▶ Arizona Administrative Code

#### **8.3.1 New Source Performance Standards**

New Source Performance Standards (NSPS) have been established under 40 CFR Part 60 to regulate emissions of air pollutants from new, modified, or reconstructed stationary sources in specific industrial sectors. The natural gas-fired stationary SI ICEs at the Hermosa Project will continue to be subject to NSPS Subpart A, *General Provisions* and NSPS Subpart JJJJ, *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*. All associated applicable requirements have already been identified in the existing permit 96653.

#### **8.3.2 National Emission Standards for Hazardous Air Pollutants**

National Emission Standards for Hazardous Air Pollutants (NESHAPs) have been established in 40 CFR Part 61 and Part 63 to regulate emissions of HAPs from stationary sources. The Hermosa Mine is currently classified as a major source of HAPs because it has potential HAP emissions greater than the major source thresholds. South32 is not proposing any changes to existing NESHAP applicability and South32 will demonstrate compliance with NESHAP Subpart A, NESHAP Subpart ZZZZ by complying with the applicable requirements in NSPS Subpart JJJJ, and all applicable NESHAP Subpart ZZZZ requirements. All associated applicable requirements have already been identified in the existing permit 96653.

#### **8.3.3 Compliance Assurance Monitoring**

The Compliance Assurance Monitoring (CAM) Rule under 40 CFR Part 64 applies to each pollutant-specific emission unit (PSEU) at a Title V source that satisfies all of the following criteria:

- ▶ Is subject to an emission limitation or standard for the applicable regulated air pollutant;
- ▶ Uses a control device to achieve compliance with any such emission limitation or standard;
- ▶ Has potential pre-control emissions of the applicable regulated air pollutant that are equal to or greater than the applicable Title V major source threshold; and
- ▶ Is not otherwise exempt.

Note that there are no new sources being authorized as a part of this SPR. As such, there are no new emission sources whose pre-control emissions individually exceed the major source threshold of 100 tpy. As such, the Hermosa Mine is not subject to CAM requirements.

#### **8.3.4 Arizona Administrative Code (A.A.C.)**

South32 will continue to comply with all applicable A.A.C. regulations in the current air permit. There are no new applicable requirements as a result of this Project.



## 9. PERMIT PROCESSING FEE

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In accordance with A.A.C R18-2-326, Fees Related to Individual Permits, and the ADEQ Permit Fee Schedule (effective November 1, 2025)<sup>8</sup>, no fee is being submitted with this Class I SPR application. However, South32 agrees to pay the \$208.00 per hour processing fee required based on the total actual time spent by ADEQ staff on processing this application.

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<sup>8</sup> [https://static.azdeq.gov/aqd/aqd\\_class\\_fees.pdf](https://static.azdeq.gov/aqd/aqd_class_fees.pdf)

## 10. COMPLIANCE PLAN AND CERTIFICATION

---

As required by A.A.C. R18-2-304(B)(8)(b) and ADEQ's Instructions in Section 2-4, Item 16 and 17 of ADEQ's Application Packet for a Class I Permit, South32 is committed to maintaining compliance as follows:

- ▶ Compliance certification.

The Hermosa Mine is in compliance with all applicable requirements noted as applicable to the Hermosa Mine in Permit No. 96653.

- ▶ For applicable requirements with which the source is in compliance at the time of permit issuance.

The Hermosa Mine source will continue to comply with applicable requirements.

- ▶ For applicable requirements that will become effective during the permit term.

The Hermosa Mine will meet in a timely manner applicable requirements that become effective during the permit term. South32 is not presently aware of any particular applicable requirements requiring a more specific future schedule. Furthermore, South32 shall submit a compliance certification semi-annually which describes the compliance status of the Hermosa Mine with respect to each permit condition.

- ▶ A schedule of compliance for sources that are not in compliance with all applicable requirements at the time of permit issuance. Such a schedule shall include a schedule of remedial measures, including an enforceable sequence of actions with milestones, leading to compliance with any applicable requirements for which the source will be in noncompliance at the time of permit issuance. This compliance schedule shall resemble and be at least as stringent as that contained in any judicial consent decree or administrative order to which the source is subject. Any such schedule of compliance shall be supplemental to, and shall not sanction noncompliance with, the applicable requirements on which it is based.

The Hermosa Mine is not out of compliance with any applicable requirements. Therefore, no compliance schedule is required.

- ▶ The Hermosa Mine includes two proposed Alternative Operating Scenarios.

The Hermosa Mine will meet all applicable requirements for each Alternate Operating Scenario upon implementation of the Alternate Operating Scenario. The time of change from one Alternate Operating Scenario to the other will be logged. If a proposed Alternate Operating Scenario would implicate an applicable requirement that will become effective during the permit term, the Hermosa Mine will comply with such requirements on a timely basis. South32 is not presently aware of any applicable requirements would become effective during the permit term.

- ▶ A schedule for the submission of certified progress reports no less frequently than every 6 months for sources required to have a schedule of compliance to remedy a violation.

The Hermosa Mine is not subject to a compliance schedule and therefore is not subject to a requirement to schedule certified progress reports.

## **APPENDIX A. CAT G3520 SPEC SHEET**

---

**G3520**

**2100 ekW/ 2625 kVA/ 60 Hz/ 1800 rpm/ 440-13800 V/ 0.8 Power Factor**

**Rating Type: STANDBY**

**Emissions: U.S. EPA S.I. Stationary**



**G3520**  
**2100 ekW/ 2625 kVA/ 60 Hz/ 1800 rpm/ 440-13800 V/ 0.8 Power Factor**

Image shown may not reflect actual configuration

**Metric**

**English**

**Generator Set Specifications**

|                                                             |                          |          |
|-------------------------------------------------------------|--------------------------|----------|
| Maximum Rating @ 0.80 pf                                    | 2625 kVA                 | 2100 ekW |
| Frequency                                                   | 60 Hz                    |          |
| Engine Speed (rpm)                                          | 1800 RPM                 |          |
| Fuel                                                        | NATURAL GAS              |          |
| Emission Standards                                          | U.S. EPA S.I. Stationary |          |
| Performance Number                                          | EM4299-04                |          |
| Altitude Capability at 25°C (77°F) ambient, above sea level | 2690 m                   | 8825 ft  |

**Engine Specifications**

|                         |             |                      |
|-------------------------|-------------|----------------------|
| Engine Model            | G3520       |                      |
| Compression Ratio       | 11.50       |                      |
| Aspiration              | TA          |                      |
| Governor Type           | ADEM4 W/ IM |                      |
| Bore                    | 170 mm      | 7 in                 |
| Displacement            | 98 L        | 5956 in <sup>3</sup> |
| Stroke                  | 215 mm      | 9 in                 |
| Aftercooler Temperature | 54 °C       | 130 °F               |
| Jacket Water Outlet     | 99 °C       | 210 °F               |

**Package Dimensions\***

|        |         |        |
|--------|---------|--------|
| Length | 8511 mm | 335 in |
| Width  | 3169 mm | 125 in |
| Height | 3822 mm | 150 in |

**G3520****2100 ekW/ 2625 kVA/ 60 Hz/ 1800 rpm/ 440-13800 V/ 0.8 Power Factor****Rating Type: STANDBY****Emissions: U.S. EPA S.I. Stationary****Package Fuel Consumption (ISO 3046/1)**

|                       |                 |                 |
|-----------------------|-----------------|-----------------|
| 100% Load without Fan | 9.16 MJ/ekw-hr  | 8685 Btu/ekw-hr |
| 75% Load without Fan  | 9.37 MJ/ekw-hr  | 8888 Btu/ekw-hr |
| 50% Load without Fan  | 10.00 MJ/ekw-hr | 9481 Btu/ekw-hr |

**Exhaust System**

|                                                            |                 |               |
|------------------------------------------------------------|-----------------|---------------|
| Combustion Air Flow (0° C, 101.3 kPa) / (77° F, 14.7 psia) | 4.32 Nm3/bkW-hr | 6112 ft3/min  |
| Exhaust temperature - engine outlet                        | 472.00 °C       | 881 °F        |
| Exhaust gas flow (@engine outlet temp, 14.5psia)           | 4.58 Nm3/bkW-hr | 16410 ft3/min |

**Heat Rejection**

|                                                   |         |               |
|---------------------------------------------------|---------|---------------|
| Jacket Water Circuit (JW + OC + 1AC)              | 1035 kW | 58850 Btu/min |
| Heat rejection to jacket water (JW)               | 602 kW  | 34215 Btu/min |
| Heat rejection to atmosphere (Includes Generator) | 270 kW  | 15368 Btu/min |
| Heat rejection to exhaust (LHV to 120°C / 248°F)  | 1392 kW | 79168 Btu/min |

**DEFINITIONS AND CONDITIONS**

1. For ambient and altitude capabilities consult your Cat dealer.
2. Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 77°F, 29.60 in Hg barometric pressure.) No overload permitted at rating shown.
3. Ratings are based on a natural gas fuel with a methane number with a LHV of 905 Btu/scf.
4. Gaseous emissions data measurements are consistent with those described in EPA 40 CFR PART 60 SUBPART JJJJ and ISO 8178 for measuring VOC, CO, and NOx.
5. Tolerance: Exhaust stack temperature +/- 8%, Inlet airflow rate +/- 5%, Exhaust flow +/- 6% Fuel rate +/- 5%, Heat rejection +/- 5%, Exhaust heat rejection +/- 10%

**APPLICABLE CODES AND STANDARDS:**

AS1359, CSA C22.2 No100-04, UL142,UL489, UL869, UL2200,  
NFPA37, NFPA70, NFPA99, NFPA110, IEC60034-1, ISO3046, ISO8528,  
NEMA MG1-22,NEMA MG1-33, 2006/95/EC, 2006/42/EC, 2004/108/EC.

Note: Codes may not be available in all model configurations. Please consult your local Cat Dealer representative for availability.

## **APPENDIX B. 2021 STACK TESTING REPORT**

---



AIR HYGIENE, INC.

*Testing Solutions for a Better World*

STACK EMISSIONS STUDY  
FOR THE  
CATERPILLAR, G3520 TALE  
PREPARED FOR  
CATALYTIC COMBUSTION CORPORATION  
AT THE  
STEWART & STEVENSON INTEGRATION CENTER  
HOUSTON, TEXAS  
JULY 29-30 AND SEPTEMBER 1, 2021

Report Date: September 22, 2021



**Corporate Headquarters**

1600 W Tacoma Street  
Broken Arrow, Oklahoma 74012



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Las Vegas, NV 89156  
Ft. Worth, TX 76028  
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Shreveport, LA 71115  
Miami, FL 33101  
Pittsburgh, PA 15205



**STACK EMISSIONS STUDY  
FOR THE  
CATERPILLAR, G3520 TALE  
PREPARED FOR  
CATALYTIC COMBUSTION CORPORATION  
AT THE  
STEWART & STEVENSON INTEGRATION CENTER  
HOUSTON, TEXAS  
JULY 29-30 AND SEPTEMBER 1, 2021**

Prepared and Reviewed by:



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Sr. Project Manager



Darin Grimes  
Sr. Testing Solutions Specialist



Thomas K. Graham, PE, QSTI  
Director of AHU



I, Patrick K. McGovern, Jr., QSTI  
Sr. Regional Manager-Shreveport, LA  
certify that this testing was conducted and  
this report was created in conformance  
with the requirements of ASTM D7036

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**Stack Emissions Study  
Caterpillar, G3520 TALE  
Catalytic Combustion Corporation  
Stewart & Stevenson Integration Center  
Houston, Texas  
July 29-30 and September 1, 2021**

## **1.0 INTRODUCTION**

Air Hygiene International, Inc. (Air Hygiene) has completed the Stack Emissions Study for nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), total hydrocarbons/volatile organic compounds (THC/VOC), ammonia (NH<sub>3</sub>), particulate matter (PM), acetaldehyde (C<sub>2</sub>H<sub>4</sub>O), formaldehyde (HCHO), methane (CH<sub>4</sub>), ethane (C<sub>2</sub>H<sub>6</sub>), nitrous oxide (N<sub>2</sub>O), and carbon dioxide (CO<sub>2</sub>) from the exhaust of the Caterpillar, G3520 TALE for Catalytic Combustion Corporation at the Stewart & Stevenson Integration Center in Houston, Texas. This report details the background, results, process description, and the sampling/analysis methodology of the stack sampling survey conducted on July 29-30 and September 1, 2021.

## **1.1 TEST PURPOSE AND OBJECTIVES**

The purpose of the test was to conduct an emission test to document levels of selected pollutants at three test loads (50, 75, and 100 percent). The information will be used to confirm the emissions controls meet certain emission levels. The specific objective was to determine the emission concentration of NO<sub>x</sub>, CO, THC/VOC, NH<sub>3</sub>, PM, C<sub>2</sub>H<sub>4</sub>O, HCHO, CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, N<sub>2</sub>O, and CO<sub>2</sub> from the exhaust of Catalytic Combustion Corporation's Caterpillar, G3520 TALE.

## **1.2 SUMMARY OF TEST PROGRAM**

The following list details pertinent information related to this specific project:

- 1.2.1 Participating Organizations
  - Catalytic Combustion Corporation
  - Air Hygiene
- 1.2.2 Industry
  - Catalyst Manufacturing
- 1.2.3 Plant Location
  - Stewart & Stevenson Integration Center in Houston, Texas
    - GPS Coordinates [Latitude 29.93248, Longitude -95.64816]
    - Physical Address: 10750 Telge Road, Houston, Texas
- 1.2.4 Equipment Tested
  - Caterpillar, G3520 TALE
- 1.2.5 Emission Points
  - Exhaust from the Caterpillar, G3520 TALE
  - For all gases, three sample points in the exhaust stack from the Caterpillar, G3520 TALE, at 16.7, 50.0, and 83.3 percent of the diameter
  - For all PM testing, 24 sampling points in the exhaust stack from the Caterpillar, G3520 TALE

#### 1.2.6 Emission Parameters Measured

- NO<sub>x</sub>
- CO
- THC/VOC
- NH<sub>3</sub>
- PM
- C<sub>2</sub>H<sub>4</sub>O
- HCHO
- CH<sub>4</sub>
- C<sub>2</sub>H<sub>6</sub>
- N<sub>2</sub>O
- Flow
- H<sub>2</sub>O
- CO<sub>2</sub>
- O<sub>2</sub>

#### 1.2.7 Dates of Emission Test

- July 29-30 and September 1, 2021

#### 1.2.8 Federal and State Certifications

- Stack Testing Accreditation Council AETB Certificate No. 3796.02
- International Standard ISO/IEC 17025:2005 Certificate No. 3796.01
- Texas NELAP Accreditation No. T104704523; Mobile Lab No. 1M104704523

### 1.3 KEY PERSONNEL

|                                   |                                                   |              |
|-----------------------------------|---------------------------------------------------|--------------|
| Catalytic Combustion Corporation: | Randy Sadler (rsadler@catalyticcombustion.com)    | 678-691-7214 |
| Catalytic Combustion Corporation: | Kati Sedlacek (ksedlacek@catalyticcombustion.com) | 678-691-7214 |
| Air Hygiene:                      | Pat McGovern, Jr. (pmcgovern@airhygiene.com)      | 918-307-8865 |
| Air Hygiene:                      | Matt McBride (mmcbride@airhygiene.com)            | 918-307-8865 |
| Air Hygiene:                      | Chandler King                                     | 918-307-8865 |
| Air Hygiene:                      | Pat McGovern, Sr.                                 | 918-307-8865 |
| Air Hygiene:                      | Wade Nesom                                        | 918-307-8865 |
| Air Hygiene:                      | Jeff Wollrab                                      | 918-307-8865 |

### 2.0 SUMMARY OF TEST RESULTS

Results from the sampling conducted on Catalytic Combustion Corporation's Caterpillar, G3520 TALE located at the Stewart & Stevenson Integration Center on July 29-30 and September 1, 2021 are summarized in the following table and relate only to the items tested.

All testing was performed without any real or apparent errors. All testing was conducted according to the approved testing protocol with the exception of a second mobilization to conduct the 100 percent load testing.

**TABLE 2.1**  
**SUMMARY OF CATERPILLAR, G3520 TALE RESULTS**

| Parameter                                                                                  | 50% Load | 75% Load | 100% Load |
|--------------------------------------------------------------------------------------------|----------|----------|-----------|
| Date (mm/dd/yy)                                                                            | 07/29/21 | 07/30/21 | 09/01/21  |
| Engine Fuel Flow (SCFH)                                                                    | 14,559   | 20,455   | 26,278    |
| Power Output (horsepower)                                                                  | 1,811.2  | 2,668.6  | 3,598.0   |
| NOx (as NO <sub>2</sub> ) (ppmvd)                                                          | 7.24     | 6.26     | 9.81      |
| NOx (as NO <sub>2</sub> ) (ppm@15%O <sub>2</sub> )                                         | 3.51     | 3.09     | 4.86      |
| NOx (as NO <sub>2</sub> ) (g/kW*hr)                                                        | 0.0627   | 0.0526   | 0.0787    |
| NO (ppmvd)                                                                                 | 7.24     | 6.23     | 8.87      |
| NO (ppm@15%O <sub>2</sub> )                                                                | 3.51     | 3.08     | 4.19      |
| NO (g/kW*hr)                                                                               | 0.0408   | 0.0341   | 0.0465    |
| NO (as NO <sub>2</sub> ) (g/kW*hr)                                                         | 0.0626   | 0.0523   | 0.0713    |
| NO <sub>2</sub> (ppmvd)                                                                    | 0.00     | 0.03     | 0.94      |
| NO <sub>2</sub> (ppm@15%O <sub>2</sub> )                                                   | 0.00     | 0.02     | 0.68      |
| NO <sub>2</sub> (g/kW*hr)                                                                  | 0.0000   | 0.0003   | 0.0075    |
| CO (ppmvd)                                                                                 | 6.14     | 3.68     | 2.71      |
| CO (ppm@15%O <sub>2</sub> )                                                                | 2.98     | 1.81     | 1.33      |
| CO (g/kW*hr)                                                                               | 0.0323   | 0.0188   | 0.0131    |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                            | 190.48   | 188.10   | 110.21    |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )                           | 79.07    | 80.06    | 47.36     |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                                          | 1.35     | 1.30     | 0.73      |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                            | 5.38     | 4.11     | 0.00      |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )                           | 2.23     | 1.75     | 0.00      |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                                          | 0.0381   | 0.0285   | 0.0000    |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                | 184.80   | 183.55   | 167.60    |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )               | 89.63    | 90.62    | 82.95     |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                              | 1.5320   | 1.4779   | 1.2884    |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                  | 0.31     | 0.43     | 0.24      |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> ) | 0.15     | 0.21     | 0.12      |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                | 0.0025   | 0.0035   | 0.0019    |
| Total PM (mg)                                                                              | 14.10    | 6.27     | 3.48      |
| Total PM (gr/dscf)                                                                         | 6.18E-03 | 1.91E-03 | 9.15E-04  |
| Total PM (lb/hr)                                                                           | 0.22     | 0.10     | 0.06      |
| Total PM (g/kW*hr)                                                                         | 0.0730   | 0.0221   | 0.0020    |
| N <sub>2</sub> O (ppmvd)                                                                   | 1.87     | 1.75     | 1.45      |
| N <sub>2</sub> O (ppm@15%O <sub>2</sub> )                                                  | 0.91     | 0.86     | 0.71      |
| N <sub>2</sub> O (g/kW*hr)                                                                 | 0.0155   | 0.0140   | 0.0110    |
| C <sub>2</sub> H <sub>4</sub> O (ppmvd)                                                    | 1.74     | 3.16     | 0.94      |
| C <sub>2</sub> H <sub>4</sub> O (ppm@15%O <sub>2</sub> )                                   | 0.85     | 1.56     | 0.46      |
| C <sub>2</sub> H <sub>4</sub> O (g/kW*hr)                                                  | 0.0145   | 0.0255   | 0.0071    |
| HCHO (ppmvd)                                                                               | 0.07     | 0.00     | 0.91      |
| HCHO (ppm@15%O <sub>2</sub> )                                                              | 0.04     | 0.00     | 0.45      |
| HCHO (g/kW*hr)                                                                             | 0.0004   | 0.0000   | 0.0047    |
| NH <sub>3</sub> (ppmvd)                                                                    | 0.47     | 16.79    | 5.56      |
| NH <sub>3</sub> (ppm@15%O <sub>2</sub> )                                                   | 0.23     | 8.29     | 2.80      |
| NH <sub>3</sub> (g/kW*hr)                                                                  | 0.0015   | 0.0522   | 0.0168    |
| CO <sub>2</sub> (%)                                                                        | 6.72     | 6.59     | 6.64      |
| CO <sub>2</sub> (g/kW*hr)                                                                  | 556      | 530      | 509       |

### 3.0 SOURCE OPERATION

#### 3.1 PROCESS DESCRIPTION

Catalytic Combustion Corporation is a provider of catalyst, air correction devices, and exhausts with products used to reduce the output of volatile organic compounds (VOCs). The interest of this test report is one caterpillar natural gas fired internal combustion engine located at the Stewart & Stevenson Integration Center in Houston, Texas.

#### 3.2 SAMPLING LOCATION

The engine exhausts to the atmosphere through an independent stack. A stack extension was fabricated on-site and added prior to the test, the extension and installed test ports met the required EPA Method 1 criteria of at least 0.5 duct diameters (dd) upstream and 2.0 dd downstream from the nearest disturbances. The sampling ports are approximately 27 feet above ground level. A fuel flow meter is located on the unit. Catalytic Combustion Corporation provided an aerial lift to access the stack ports.

### 4.0 SAMPLING AND ANALYTICAL PROCEDURES

#### 4.1 TEST METHODS

The emission test on the Caterpillar, G3520 TALE at the Stewart & Stevenson Integration Center was performed following United States Environmental Protection Agency (EPA) methods described by the Code of Federal Regulations (CFR). Table 4.1 outlines the specific methods performed on July 29-30 and September 1, 2021.

**TABLE 4.1  
SUMMARY OF SAMPLING METHODS**

| <b>Pollutant or Parameter</b> | <b>Sampling Method</b> | <b>Analysis Method</b>    |
|-------------------------------|------------------------|---------------------------|
| Sample Point Location         | EPA Method 1           | Equal Area Method         |
| Stack Flow Rate               | EPA Method 2           | S-Type Pitot Tube         |
| Oxygen                        | EPA Method 3A          | Paramagnetic Cell         |
| Stack Moisture Content        | EPA Method 4           | Gravimetric Analysis      |
| Particulate Matter            | EPA Method 5           | Front Half Filterables    |
| Stack Flow Rate               | EPA Method 19          | Dry Oxygen F Factor       |
| Total Hydrocarbons            | EPA Method 25A         | Flame Ionization Detector |
| Particulate Matter            | EPA Method 202         | Back Half Condensables    |



| Pollutant or Parameter                                                                                                              | Sampling Method | Analysis Method            |
|-------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------|
| Nitrogen Oxides, Carbon Monoxide, Ammonia, Acetaldehyde, Formaldehyde, Methane, Ethane, Nitrous Oxide, Carbon Dioxide, and Moisture | EPA Method 320  | Fourier Transform Infrared |

## 4.2 INSTRUMENT CONFIGURATION AND OPERATIONS FOR GAS ANALYSIS

The sampling and analysis procedures used during these tests conform with the methods outlined in the Code of Federal Regulations (CFR), Title 40, Part 60, Appendix A, Methods 1, 2, 3A, 4, 5, 19, 25A; 40 CFR 51, Appendix M, Method 202; and 40 CFR 63, Appendix A, Method 320.

Figure 4.1 depicts the sample system used for the real-time gas analyzer tests. The gas sample was continuously pulled through the probe and transported, via heat-traced Teflon® tubing, to a heated head pump and into the FTIR then to a stainless-steel minimum-contact condenser designed to dry the sample. Transportation of the sample, through Teflon® tubing, continued into the sample manifold within the mobile laboratory via a stainless steel/Teflon® diaphragm pump. From the manifold, the sample was partitioned to the real-time analyzers through rotameters that controlled the flow rate of the sample. Exhaust samples were routed to the wet based analyzer prior to gas conditioning.

Figure 4.1 shows that the sample system was also equipped with a separate path through which a calibration gas could be delivered to the probe and back through the entire sampling system. This allowed for convenient performance of system bias checks as required by the testing methods.

All instruments were housed in a climate controlled, trailer-mounted mobile laboratory. Gaseous calibration standards were provided in aluminum cylinders with the concentrations certified by the vendor. EPA Protocol No. 1 was used to determine the cylinder concentrations where applicable (i.e., C<sub>3</sub>H<sub>8</sub> calibration gases).

Table 4.2 provides a description of the analyzers used for the instrument portion of the tests. All data from the continuous monitoring instruments were recorded on a Logic Beach Portable Data Logging System which retrieves calibrated electronic data from each instrument every one second and reports an average of the collected data every 30 seconds. For target compounds measured with the Fourier transform infrared (FTIR) spectrometer, interferograms consisting of 30 co-added scans were recorded continuously during the test periods, and provided approximately 30-second average concentrations. Spectral data was analyzed by the MKS MG2000 software.

Figure 4.2 represents the sample system used for the PM tests. A heated stainless-steel probe with a glass liner and stainless-steel nozzle was inserted into the sample ports of the stack to extract gas measurements from the emission stream through a filter and glass impinger train. Flow rates are monitored with oil filled manometers and total sample volumes are measured with a dry gas meter. Glassware that is used to collect and analyze Method 202 condensable particulate samples is cleaned prior to the test with soap and water, and rinsed using tap water, deionized water, acetone, and finally, hexane. After cleaning, Air Hygiene incorporates a glassware bake at 300°C for six hours rather than the alternative of collecting a field train proof blank.

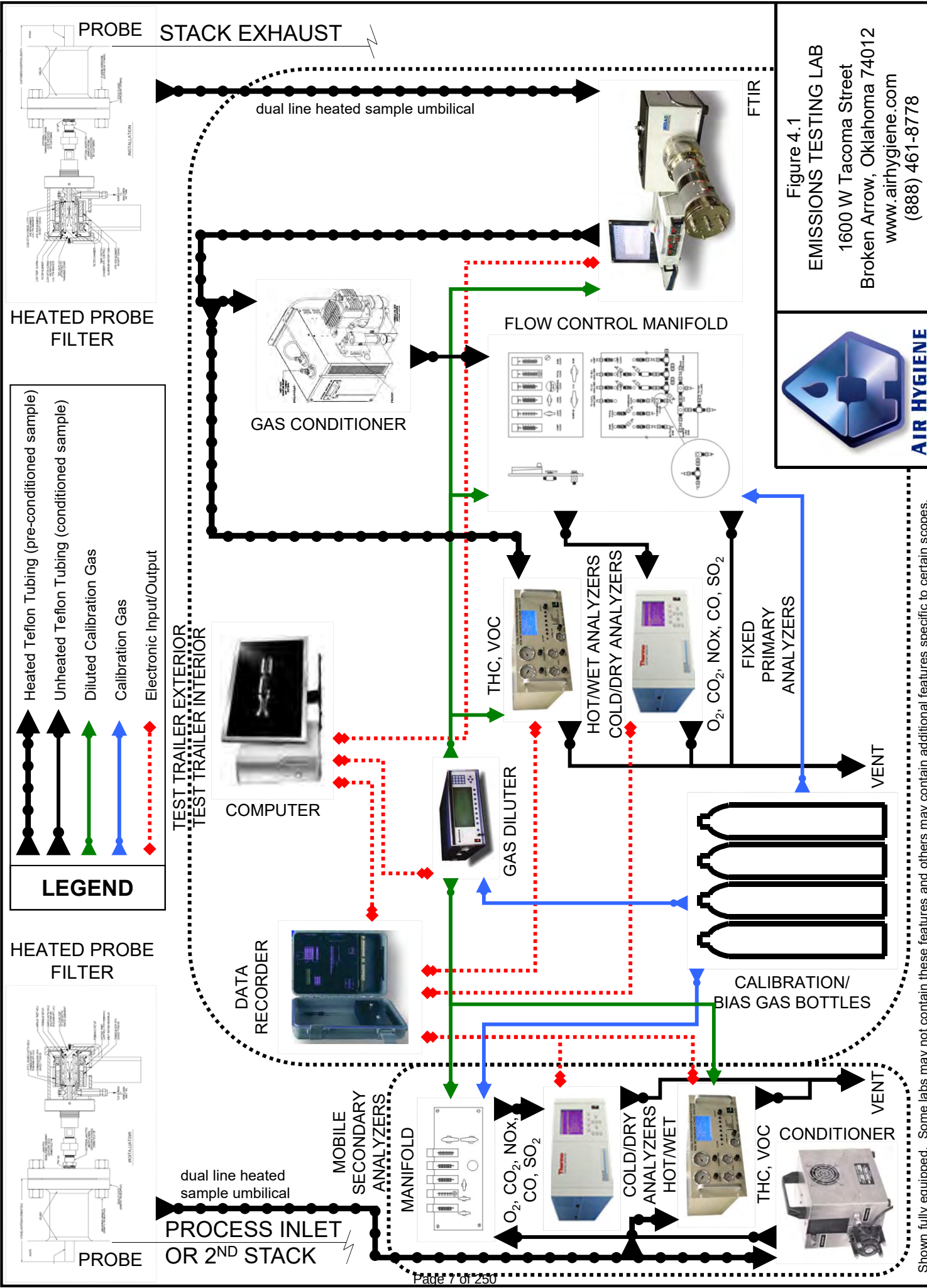
The stack gas analysis for O<sub>2</sub> concentrations was performed in accordance with procedures set forth in EPA Method 3A. The O<sub>2</sub> analyzer uses a paramagnetic cell detector.

THC emission concentrations were quantified in accordance with procedures set forth in EPA Method 25A. A continuous flame ionization (FID) analyzer was used for this purpose. VOC emission concentrations were quantified in conjunction with procedures outlined in EPA Method 320 for FTIR sampling and analysis of methane and ethane content. These results were then subtracted from the THC concentrations to determine VOC concentrations.

An MKS Instruments - MultiGas™ Fourier Transform Infrared (FTIR) spectrometer was used for NO<sub>x</sub>, CO, NH<sub>3</sub>, C<sub>2</sub>H<sub>4</sub>O, HCHO, CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, N<sub>2</sub>O, CO<sub>2</sub> and H<sub>2</sub>O analysis per EPA Method 320. The FTIR spectrometer spectral resolution was 0.5 cm<sup>-1</sup>. The system employed a silicon carbide infrared source at 1200°C, a helium neon reference laser, beam splitters, potassium bromide (KBr) cell window, front-surface optical transfer mirrors, and multi-pass absorption cells. MCT detectors were used and cooled with liquid nitrogen in order to maintain a constant temperature of 77 Kelvin. The approximately 5.11-meter multi-pass path cells incorporated aspheric, aberration-correcting mirrors to increase the optical throughput and the detection sensitivity. Transducers and thermocouples were connected directly to the insulated sample cells that provide the pressure and temperatures of the sample streams. During testing, the temperature of the absorption cells was set at 191°C. Elevated temperature prevented gas condensation within the cell and minimized compound adhesion to the cell walls and mirrors. The volume of the absorption cell was 0.5 liters, so at a sample gas flow rate of 4.0 liters per minute, the sample gas in the cell is refreshed approximately four times each minute. Interferograms consisting of 30 co-added scans were recorded continuously during the test periods, and provided approximately 30-second average concentrations.

**TABLE 4.2**  
**ANALYTICAL INSTRUMENTATION**

| Parameter                                                                                                                                                                             | Manufacturer and Model | Range                                | Sensitivity | Detection Principle                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------------------|-------------|---------------------------------------|
| NO <sub>x</sub> , CO, NH <sub>3</sub> , C <sub>2</sub> H <sub>4</sub> O, HCHO, CH <sub>4</sub> , C <sub>2</sub> H <sub>6</sub> , N <sub>2</sub> O, CO <sub>2</sub> , H <sub>2</sub> O | MKS 2030               | User may select from multiple ranges | 0.1 ppm     | Fourier Transform Infrared – FTIR     |
| THC                                                                                                                                                                                   | VIG 210                | User may select up to 10,000 ppm     | 0.1 ppm     | Flame Ionization Detector             |
| O <sub>2</sub>                                                                                                                                                                        | SERVOMEX 1440          | 0-25%                                | 0.1%        | Paramagnetic cell, inherently linear. |



Shown fully equipped. Some labs may not contain these features and others may contain additional features specific to certain scopes.

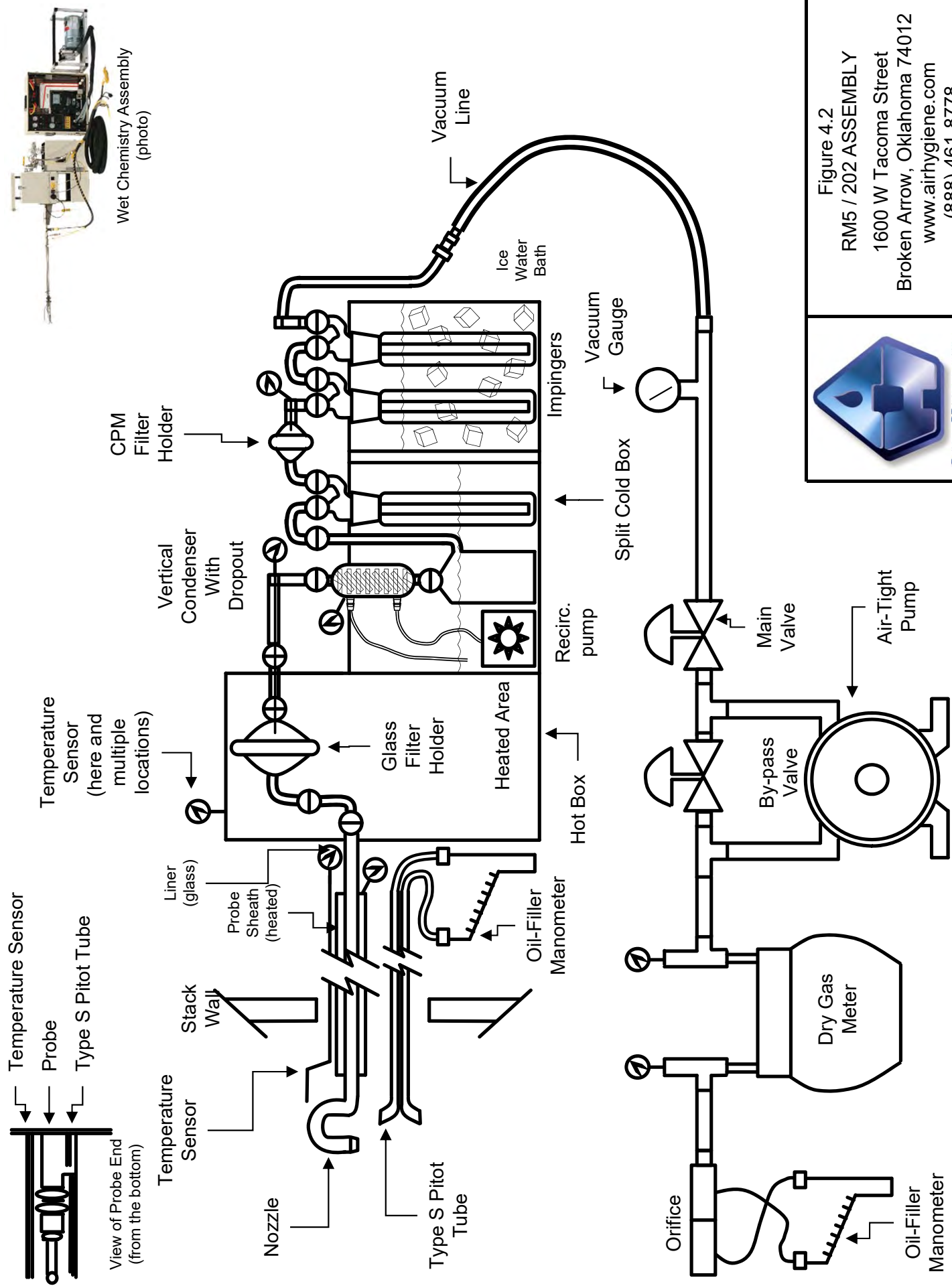


Figure 4.2  
RM5 / 202 ASSEMBLY  
1600 W Tacoma Street  
Broken Arrow, Oklahoma 74012  
www.airhygiene.com  
(888) 461-8778

**APPENDIX A**

**TEST RESULTS AND CALCULATIONS**

**TABLE A.1: EMISSIONS TESTING SCHEDULE**

| Unit       | Load | Component           | Run         | Date     | Start | Stop  | Time Sync | Duration |
|------------|------|---------------------|-------------|----------|-------|-------|-----------|----------|
| G3520 TALE | 50%  | Stratification Test | 1           | 07/29/21 | 11:00 | 12:10 | DAHS      | 01:10    |
|            |      |                     |             |          |       |       |           |          |
| G3520 TALE | 50%  | NOx, CO, THC, etc.  | 1-1         | 07/29/21 | 09:34 | 10:33 | DAHS      | 01:00    |
| G3520 TALE | 50%  | NOx, CO, THC, etc.  | 1-2         | 07/29/21 | 12:05 | 13:04 | DAHS      | 01:00    |
| G3520 TALE | 50%  | NOx, CO, THC, etc.  | 1-3         | 07/29/21 | 14:23 | 15:22 | DAHS      | 01:00    |
|            |      |                     |             |          |       |       | DAHS      |          |
| G3520 TALE | 50%  | Cyc. Flow Chk.      | R-1 50%-V1  | 07/28/21 | 08:46 | 08:59 | DAHS      | 00:13    |
| G3520 TALE | 50%  | PM                  | R-1 50%-1   | 07/29/21 | 09:34 | 11:24 | DAHS      | 01:50    |
| G3520 TALE | 50%  | PM                  | R-1 50%-2   | 07/29/21 | 12:05 | 13:59 | DAHS      | 01:54    |
| G3520 TALE | 50%  | PM                  | R-1 50%-3   | 07/29/21 | 14:23 | 15:58 | DAHS      | 01:35    |
|            |      |                     |             |          |       |       | DAHS      |          |
| G3520 TALE | 75%  | NOx, CO, THC, etc.  | 2-1         | 07/30/21 | 13:45 | 14:44 | DAHS      | 01:00    |
| G3520 TALE | 75%  | NOx, CO, THC, etc.  | 2-2         | 07/30/21 | 15:00 | 15:59 | DAHS      | 01:00    |
| G3520 TALE | 75%  | NOx, CO, THC, etc.  | 2-3         | 07/30/21 | 16:27 | 17:26 | DAHS      | 01:00    |
|            |      |                     |             |          |       |       | DAHS      |          |
| G3520 TALE | 75%  | PM                  | R-1 75%-1   | 07/30/21 | 08:08 | 09:42 | DAHS      | 01:34    |
| G3520 TALE | 75%  | PM                  | R-1 75%-2   | 07/30/21 | 13:17 | 14:56 | DAHS      | 01:39    |
| G3520 TALE | 75%  | PM                  | R-1 75%-3   | 07/30/21 | 15:25 | 17:01 | DAHS      | 01:36    |
|            |      |                     |             |          |       |       |           |          |
| G3520 TALE | 100% | NOx, CO, THC, etc.  | 3-1         | 09/01/21 | 09:23 | 10:25 | DAHS      | 01:02    |
| G3520 TALE | 100% | NOx, CO, THC, etc.  | 3-2         | 09/01/21 | 10:26 | 12:02 | DAHS      | 01:37    |
| G3520 TALE | 100% | NOx, CO, THC, etc.  | 3-3         | 09/02/21 | 12:03 | 13:06 | DAHS      | 01:03    |
|            |      |                     |             |          |       |       |           |          |
| G3520 TALE | 100% | Cyc. Flow Chk.      | R-1 100%-V1 | 08/31/21 | 07:14 | 07:38 | DAHS      | 00:24    |
| G3520 TALE | 100% | PM                  | R-1 100%-1  | 08/31/21 | 09:36 | 11:17 | DAHS      | 01:41    |
| G3520 TALE | 100% | PM                  | R-1 100%-2  | 08/31/21 | 12:05 | 13:44 | DAHS      | 01:39    |
| G3520 TALE | 100% | PM                  | R-1 100%-3  | 08/31/21 | 14:24 | 16:05 | DAHS      | 01:41    |
|            |      |                     |             |          |       |       |           |          |

## **TEST RESULTS AND CALCULATIONS**

**50% Load**

**NO<sub>x</sub>, CO, THC, N<sub>2</sub>O, C<sub>2</sub>H<sub>4</sub>O, NH<sub>3</sub>, HCHO, CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, and H<sub>2</sub>O Emissions Data**

**CATERPILLAR, G3520 TALE 50% LOAD DATA SUMMARY**

| Parameter                                                                                  | 50% Load,<br>Run - 1-1 | 50% Load,<br>Run - 1-2 | 50% Load,<br>Run - 1-3 | Average  |
|--------------------------------------------------------------------------------------------|------------------------|------------------------|------------------------|----------|
| Date (mm/dd/yy)                                                                            | 07/29/21               | 07/29/21               | 07/29/21               | 07/29/21 |
| Start Time (hh:mm:ss)                                                                      | 9:34:23                | 12:05:23               | 14:23:23               | 9:34:23  |
| End Time (hh:mm:ss)                                                                        | 10:33:53               | 13:04:53               | 15:22:53               | 15:22:53 |
| Run Duration (min / run)                                                                   | 60                     | 60                     | 60                     | 60       |
| Bar. Pressure (in. Hg)                                                                     | 29.90                  | 29.90                  | 29.84                  | 29.88    |
| Amb. Temp. (°F)                                                                            | 98                     | 99                     | 96                     | 98       |
| Rel. Humidity (%)                                                                          | 53                     | 49                     | 49                     | 50       |
| Spec. Humidity (lb water / lb air)                                                         | 0.020978               | 0.019455               | 0.018009               | 0.019481 |
| Engine Fuel Flow (SCFH)                                                                    | 14,625                 | 14,511                 | 14,541                 | 14,559   |
| Stack Flow (RM19) (SCFH)                                                                   | 215,406                | 215,084                | 216,383                | 215,625  |
| Stack Moisture (% Method 320)                                                              | 14.4                   | 14.4                   | 14.4                   | 14.4     |
| Power Output (horsepower)                                                                  | 1,810.4                | 1,813.0                | 1,810.4                | 1,811.2  |
| Engine Timing (BTDC)                                                                       | 23.0                   | 23.0                   | 23.0                   | 23.00    |
| Actual Power (kW)                                                                          | 1,350.0                | 1,352.0                | 1,350.0                | 1,350.67 |
| Amperes (A)                                                                                | 56.0                   | 57.0                   | 56.0                   | 56.33    |
| Air Manifold Temp. (F)                                                                     | 122.0                  | 122.0                  | 124.0                  | 122.67   |
| Engine Speed (rpm)                                                                         | 1,799.0                | 1,799.0                | 1,800.0                | 1,799.33 |
| NOx (as NO <sub>2</sub> ) (ppmvd)                                                          | 8.15                   | 6.92                   | 6.67                   | 7.24     |
| NOx (as NO <sub>2</sub> ) (ppm@15%O <sub>2</sub> )                                         | 3.93                   | 3.36                   | 3.25                   | 3.51     |
| NOx (as NO <sub>2</sub> ) (g/kW*hr)                                                        | 0.0704                 | 0.0596                 | 0.0579                 | 0.06     |
| NO (ppmvd)                                                                                 | 8.15                   | 6.91                   | 6.67                   | 7.24     |
| NO (ppm@15%O <sub>2</sub> )                                                                | 3.93                   | 3.35                   | 3.25                   | 3.51     |
| NO (g/kW*hr)                                                                               | 0.0459                 | 0.0388                 | 0.0378                 | 0.0408   |
| NO <sub>2</sub> (ppmvd)                                                                    | 0.00                   | 0.01                   | 0.00                   | 0.00     |
| NO <sub>2</sub> (ppm@15%O <sub>2</sub> )                                                   | 0.00                   | 0.00                   | 0.00                   | 0.00     |
| NO <sub>2</sub> (g/kW*hr)                                                                  | 0.0000                 | 0.0001                 | 0.0000                 | 0.0000   |
| CO (ppmvd)                                                                                 | 6.03                   | 5.97                   | 6.40                   | 6.14     |
| CO (ppm@15%O <sub>2</sub> )                                                                | 2.91                   | 2.90                   | 3.12                   | 2.98     |
| CO (g/kW*hr)                                                                               | 0.03                   | 0.03                   | 0.03                   | 0.03     |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                            | 183.85                 | 190.60                 | 197.00                 | 190.48   |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )                           | 75.89                  | 79.16                  | 82.17                  | 79.07    |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                                          | 1.30                   | 1.34                   | 1.40                   | 1.35     |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                            | 4.67                   | 4.59                   | 6.87                   | 5.38     |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )                           | 1.93                   | 1.91                   | 2.86                   | 2.23     |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                                          | 0.03                   | 0.03                   | 0.05                   | 0.04     |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                | 178.78                 | 185.57                 | 190.04                 | 184.80   |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )               | 86.22                  | 90.07                  | 92.60                  | 89.63    |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                              | 1.4813                 | 1.5330                 | 1.5817                 | 1.5320   |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                  | 0.40                   | 0.44                   | 0.09                   | 0.31     |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> ) | 0.19                   | 0.21                   | 0.04                   | 0.15     |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                | 0.0033                 | 0.0036                 | 0.0007                 | 0.0025   |
| N <sub>2</sub> O (ppmvd)                                                                   | 1.59                   | 1.97                   | 2.05                   | 1.87     |
| N <sub>2</sub> O (ppm@15%O <sub>2</sub> )                                                  | 0.77                   | 0.95                   | 1.00                   | 0.907    |
| N <sub>2</sub> O (g/kW*hr)                                                                 | 0.0132                 | 0.0162                 | 0.0170                 | 0.0155   |
| C <sub>2</sub> H <sub>4</sub> O (ppmvd)                                                    | 0.52                   | 0.68                   | 4.04                   | 1.74     |
| C <sub>2</sub> H <sub>4</sub> O (ppm@15%O <sub>2</sub> )                                   | 0.25                   | 0.33                   | 1.97                   | 0.848    |
| C <sub>2</sub> H <sub>4</sub> O (g/kW*hr)                                                  | 0.0043                 | 0.0056                 | 0.0336                 | 0.0145   |
| HCHO (ppmvd)                                                                               | 0.11                   | 0.07                   | 0.05                   | 7.48E-02 |
| HCHO (ppm@15%O <sub>2</sub> )                                                              | 0.05                   | 0.03                   | 0.02                   | 3.62E-02 |
| HCHO (g/kW*hr)                                                                             | 0.0006                 | 0.0004                 | 0.0003                 | 0.0004   |
| NH <sub>3</sub> (ppmvd)                                                                    | 0.54                   | 0.29                   | 0.57                   | 0.47     |
| NH <sub>3</sub> (ppm@15%O <sub>2</sub> )                                                   | 0.26                   | 0.14                   | 0.28                   | 0.23     |
| NH <sub>3</sub> (g/kW*hr)                                                                  | 0.0017                 | 0.0009                 | 0.0018                 | 0.0015   |
| CO <sub>2</sub> (%)                                                                        | 6.71                   | 6.69                   | 6.75                   | 6.72     |
| CO <sub>2</sub> (lb/hr)                                                                    | 1,651.80               | 1,643.88               | 1,669.41               | 1,655.03 |
| CO <sub>2</sub> (lb/kW*hr)                                                                 | 1,223.58               | 1,215.91               | 1,236.62               | 1,225.37 |
| CO <sub>2</sub> (ton/year) at 8760 hr/year                                                 | 7,234.89               | 7,200.20               | 7,312.00               | 7,249.03 |
| CO <sub>2</sub> (lb/MMBtu)                                                                 | 115.56                 | 115.56                 | 115.56                 | 115.56   |
| CO <sub>2</sub> (g/kW*hr)                                                                  | 555.01                 | 551.53                 | 560.92                 | 555.82   |
| O <sub>2</sub> (%)                                                                         | 8.67                   | 8.74                   | 8.79                   | 8.73     |



# Calculations, Formulas, and Constants

The following information supports the spreadsheets for this testing project.

## Given Data:

Ideal Gas Conversion Factor = 385.23 SCF/lb-mol at 68 deg F & 14.696 psia

Fuel Heating Value is based upon Air Hygiene's fuel gas calculation sheet. All calculations are based upon a correction to 68 deg F & 14.696 psia

High Heating Values (HHV) are used for the Fuel Heating Value, F-Factor, and Fuel Flow Data per EPA requirements.

### ASTM D 3588

|                                                    |       |
|----------------------------------------------------|-------|
| Molecular Weight of NOx (lb/lb-mole) =             | 46.01 |
| Molecular Weight of CO (lb/lb-mole) =              | 28.00 |
| Molecular Weight of N2O (lb/lb-mole) =             | 64.00 |
| Molecular Weight of THC (propane) (lb/lb-mole) =   | 44.00 |
| Molecular Weight of VOC (methane) (lb/lb-mole) =   | 16.00 |
| Molecular Weight of NH <sub>3</sub> (lb/lb-mole) = | 17.03 |
| Molecular Weight of HCHO (lb/lb-mole) =            | 30.03 |
| Molecular Weight of CO <sub>2</sub> (lb/lb-mole) = | 44.01 |

## Formulas:

1. Corrected Raw Average (C<sub>Gas</sub>), 40CFR60, App. A, RM 7E, Eq. 7E-5 (08/15/06)

$$C_{Gas} = (C_{Avg} - C_o) \times \left( \frac{C_M}{C_M - C_o} \right)$$

2. Correction to % O<sub>2</sub>, 40CFR60, App. A, RM 20, Eq. 20-5 (11/26/02)

$$C_{adj} = C_{Gas(T_{avg})} \times \left( \frac{20.9\% - AdjFactor}{20.9\% - C_{Gas(O_2)}} \right)$$

3. Correction to % O<sub>2</sub> and ISO Conditions

$$C_{ISO} = C_{Adj} \times \sqrt{\frac{P_r}{P_o}} \times e^{(19 \times (H_o - 0.00633))} \times \left( \frac{288}{T_a} \right)^{1.53}$$

4. Method 19 stack exhaust flow (scfh) [ref. EPA EMC FAQ Method 19]

$$Q_s = \left( \frac{FFactor \times Q_f \times HHV}{1,000,000} \right) \times \left( \frac{20.9\%}{20.9\% - C_{Gas(O_2)}} \right)$$

### 40CFR60, App. A, RM 19, Table 19-1

Conversion Constant for NOx = 0.0000001194351

Conversion Constant for CO = 0.0000000726839

Conversion Constant for N2O = 0.0000001661345

Conversion Constant for THC = 0.0000001142175

Conversion Constant for VOC (methane) = 0.0000000415336

Conversion Constant for NH<sub>3</sub> = 0.0000000442074

Conversion Constant for HCHO = 0.0000000779534

Conversion Constant for CO<sub>2</sub> = 0.0000001142434

NOTE: units are lb/ppm\*ft<sup>3</sup>

5. Emission Rate in lb/hr

$$E_{lb/hr} = \frac{C_{Gas}}{10^6} \times \frac{Q_s \times MW}{G}$$

6. Emission Rate in tons per year

$$E_{ton/yr} = \frac{E_{lb/hr} \times hr_{year}}{2000}$$

7. Emission Concentration in lb/MMBtu (O<sub>2</sub> based)

$$E_{lb/MMBtu} = \frac{C_{Gas} \times F_dFactor \times Conv_C \times 20.9\%}{20.9\% - C_{Gas(O_2)}}$$

8. Emission Concentration in g/hp\*hr

$$E_{g/hp-hr} = \frac{E_{lb/hr} \times 453.6}{mw \times 1341.022} \text{ or } \frac{E_{lb/hr} \times 453.6}{hp}$$

**RM 7E, (08-15-06), 12.1 Nomenclature. The terms used in the equations are defined as follows:**

ACE = Analyzer calibration error, percent of calibration span.  
B<sub>WS</sub> = Moisture content of sample gas as measured by Method 4 or other approved method, percent/100.  
C<sub>Adj</sub> = Average unadjusted gas concentration indicated by data recorder for the test run.  
C<sub>D</sub> = Pollutant concentration adjusted to dry conditions.  
C<sub>Dir</sub> = Measured concentration of a calibration gas (low, mid, or high) when introduced in direct calibration mode.  
C<sub>Gas</sub> = Average effluent gas concentration adjusted for bias.  
C<sub>M</sub> = Average of initial and final system calibration bias (or 2-point system calibration error) check responses for the upscale calibration gas.  
C<sub>MA</sub> = Actual concentration of the upscale calibration gas, ppmv.  
C<sub>O</sub> = Average of the initial and final system calibration bias (or 2-point system calibration error) check responses from the low-level (or zero) calibration gas.  
C<sub>S</sub> = Measured concentration of a calibration gas (low, mid, or high) when introduced in system calibration mode.  
C<sub>SS</sub> = Concentration of NOx measured in the spiked sample.  
C<sub>Spike</sub> = Concentration of NOx in the undiluted spike gas.  
C<sub>Calc</sub> = Calculated concentration of NOx in the spike gas diluted in the sample.  
C<sub>V</sub> = Manufacturer certified concentration of a calibration gas (low, mid, or high).  
C<sub>W</sub> = Pollutant concentration measured under moist sample conditions, wet basis.  
CS = Calibration span.  
D = Drift assessment, percent of calibration span.  
E<sub>p</sub> = The predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level response.  
Eff<sub>NO2</sub> = NO<sub>2</sub> to NO converter efficiency, percent.  
H = High calibration gas, designator.  
L = Low calibration gas, designator.  
M = Mid calibration gas, designator.  
NO<sub>Final</sub> = The average NO concentration observed with the analyzer in the NO mode during the converter efficiency test in Section 16.2.2.  
NO<sub>x</sub>Corr = The NO<sub>x</sub> concentration corrected for the converter efficiency.  
NO<sub>x</sub>Final = The final NO<sub>x</sub> concentration observed during the converter efficiency test in Section 16.2.2.  
NO<sub>x</sub>Peak = The highest NO<sub>x</sub> concentration observed during the converter efficiency test in Section 16.2.2.  
Q<sub>Spike</sub> = Flow rate of spike gas introduced in system calibration mode, L/min.  
Q<sub>Total</sub> = Total sample flow rate during the spike test, L/min.  
R = Spike recovery, percent.  
SB = System bias, percent of calibration span.  
SB<sub>i</sub> = Pre-run system bias, percent of calibration span.  
SB<sub>f</sub> = Post-run system bias, percent of calibration span.  
SB / D<sub>Alt</sub> = Alternative absolute difference criteria to pass bias and/or drift checks.  
SCE = System calibration error, percent of calibration span.  
SCE<sub>i</sub> = Pre-run system calibration error, percent of calibration span.  
SCE<sub>Final</sub> = Post-run system calibration error, percent of calibration span.  
Z = Zero calibration gas, designator.

**40CFR60.355(b)(1), (09-20-06), Nomenclature. The terms used in the equations are defined as follows:**

P<sub>r</sub> = reference combustor inlet absolute pressure at 101.3 kilopascals ambient pressure, mm Hg  
P<sub>o</sub> = observed combustor inlet absolute pressure at test, mm Hg  
H<sub>o</sub> = observed humidity of ambient air, g H<sub>2</sub>O/g air  
e = transcendental constant, 2.718  
T<sub>a</sub> = ambient temperature, K

**Small Engine and FTIR Nomenclature. The terms used in the equations are defined as follows:**

bhp = brake horsepower  
hp = horsepower  
Q<sub>sys</sub> = system flow (lpm)  
Q<sub>m</sub> = matrix spike flow (lpm)

**RM 19, (07-29-06), 12.1 Nomenclature. The terms used in the equations are defined as follows:**

AdjFactor = Percent oxygen or carbon dioxide adjustment applied to a target pollutant  
 $B_{wa}$  = Moisture fraction of ambient air, percent.  
 Btu = British thermal unit  
 $\%C$  = Concentration of carbon from an ultimate analysis of fuel, weight percent.  
 $\%CO_{2d}, \%CO_{2w}$  = Concentration of carbon dioxide on a dry and wet basis, respectively, percent.  
 CIP / CDP = Combustor inlet pressure / compressor discharge pressure (mm Hg); note, some manufactures reference as PCD.  
 E = Pollutant emission rate, ng/J (lb/million Btu).  
 $E_a$  = Average pollutant rate for the specified performance test period, ng/J (lb/million Btu).  
 $E_{aot}, E_{ai}$  = Average pollutant rate of the control device, outlet and inlet, respectively, for the performance test period, ng/J (lb/million Btu).  
 $E_{bi}$  = Pollutant rate from the steam generating unit, ng/J (lb/million Btu).  
 $E_{bo}$  = Pollutant emission rate from the steam generating unit, ng/J (lb/million Btu).  
 $E_{ci}$  = Pollutant rate in combined effluent, ng/J (lb/million Btu).  
 $E_{co}$  = Pollutant emission rate in combined effluent, ng/J (lb/million Btu).  
 $E_d$  = Average pollutant rate for each sampling period (e.g., 24-hr Method 6B sample or 24-hr fuel sample) or for each fuel lot (e.g., amount of fuel bunkered), ng/J (lb/million Btu).  
 $E_{di}$  = Average inlet SO<sub>2</sub> rate for each sampling period d, ng/J (lb/million Btu).  
 $E_g$  = Pollutant rate from gas turbine, ng/J (lb/million Btu).  
 $E_{ga}$  = Daily geometric average pollutant rate, ng/J (lbs/million Btu) or ppm corrected to 7 percent O<sub>2</sub>.  
 $E_{j,e}$  = Matched pair hourly arithmetic average pollutant rate, outlet and inlet, respectively, ng/J (lb/million Btu) or ppm corrected to 7 percent O<sub>2</sub>.  
 $E_{hj}$  = Hourly average pollutant, ng/J (lb/million Btu).  
 $E_{hj}$  = Hourly arithmetic average pollutant rate for hour "j," ng/J (lb/million Btu) or ppm corrected to 7 percent O<sub>2</sub>.  
 EXP = Natural logarithmic base (2.718) raised to the value enclosed by brackets.  
 Fc = Ratio of the volume of carbon dioxide produced to the gross calorific value of the fuel from Method 19  
 $F_d, F_w, F_c$  = Volumes of combustion components per unit of heat content, scm/J (scf/million Btu).  
 ft<sup>3</sup> = cubic feet  
 G = ideal gas conversion factor  
 (385.23 SCF/lb-mol at 68 deg F & 14.696 psia)  
 GCM = gross Btu per SCF (constant, compound based)  
 GCV = Gross calorific value of the fuel consistent with the ultimate analysis, kJ/kg (Btu/lb).  
 $GCV_p, GCV_r$  = Gross calorific value for the product and raw fuel lots, respectively, dry basis, kJ/kg (Btu/lb).  
 $\%H$  = Concentration of hydrogen from an ultimate analysis of fuel, weight percent.  
 $H_b$  = Heat input rate to the steam generating unit from fuels fired in the steam generating unit, J/hr (million Btu/hr).  
 $H_g$  = Heat input rate to gas turbine from all fuels fired in the gas turbine, J/hr (million Btu/hr).  
 $\%H_2O$  = Concentration of water from an ultimate analysis of fuel, weight percent.  
 $H_t$  = Total numbers of hours in the performance test period (e.g., 720 hours for 30-day performance test period).  
 K = volume of combustion component per pound of component (constant)  
 $K = \text{Conversion factor, } 10^{-5} \text{ (kJ/J)/(}\% \text{)} [10^6 \text{ Btu/million Btu}]$   
 $K_c = (9.57 \text{ scm/kg})/\% [(1.53 \text{ scf/lb})/\%]$   
 $K_{cc} = (2.0 \text{ scm/kg})/\% [(0.321 \text{ scf/lb})/\%]$   
 $K_{hd} = (22.7 \text{ scm/kg})/\% [(3.64 \text{ scf/lb})/\%]$   
 $K_{hw} = (34.74 \text{ scm/kg})/\% [(5.57 \text{ scf/lb})/\%]$   
 $K_n = (0.86 \text{ scm/kg})/\% [(0.14 \text{ scf/lb})/\%]$   
 $K_o = (2.85 \text{ scm/kg})/\% [(0.46 \text{ scf/lb})/\%]$   
 $K_s = (3.54 \text{ scm/kg})/\% [(0.57 \text{ scf/lb})/\%]$   
 $K_{sulfur} = 2 \times 10^4 \text{ Btu/wt}\% \text{-MMBtu}$   
 $K_w = (1.30 \text{ scm/kg})/\% [(0.21 \text{ scf/lb})/\%]$   
 lb = pound  
 ln = Natural log of indicated value.  
 $L_p, L_r$  = Weight of the product and raw fuel lots, respectively, metric ton (ton).  
 $\%N$  = Concentration of nitrogen from an ultimate analysis of fuel, weight percent.  
 $M_{\%}$  = mole percent  
 mol = mole  
 MW = molecular weight (lb/lb-mol)  
 $MW_{AIR} = \text{molecular weight of air ( } 28.9625 \text{ lb/lb-mole)}^1$   
 NCM = net Btu per SCF (constant based on compound)  
 $\%O$  = Concentration of oxygen from an ultimate analysis of fuel, weight percent.  
 $\%O_{2d}, \%O_{2w}$  = Concentration of oxygen on a dry and wet basis, respectively, percent.  
 $P_B$  = barometric pressure, in Hg  
 $P_s$  = Potential SO<sub>2</sub> emissions, percent.  
 $\%S$  = Sulfur content of as-fired fuel lot, dry basis, weight percent.  
 $S_e$  = Standard deviation of the hourly average pollutant rates for each performance test period, ng/J (lb/million Btu).  
 $\%S_r$  = Concentration of sulfur from an ultimate analysis of fuel, weight percent.  
 $S(\text{wt}\%)$  = weight percent of sulfur, per lab analysis by appropriate ASTM standard  
 $S_t$  = Standard deviation of the hourly average inlet pollutant rates for each performance test period, ng/J (lb/million Btu).  
 $S_o$  = Standard deviation of the hourly average emission rates for each performance test period, ng/J (lb/million Btu).  
 $\%S_p, \%S_r$  = Sulfur content of the product and raw fuel lots respectively, dry basis, weight percent.  
 SCF = standard cubic feet  
 SH = specific humidity, pounds of water per pound of air  
 $t_{0.95}$  = Values shown in Table 19-3 for the indicated number of data points n.  
 $T_{amb}$  = ambient temperature, °F  
 $W/D \text{ Factor} = 1.0236 = \text{conv. at } 14.696 \text{ psia and } 68 \text{ deg F (ref. Civil Eng. Ref. Manual, 7th Ed.)}$   
 $X_{CO_2}$  = CO<sub>2</sub> Correction factor, percent.  
 $X_k$  = Fraction of total heat input from each type of fuel k.

## EXAMPLE CALCULATIONS (FFACTOR)

RM 19, (02-27-14),  
2.0 Summary of Method,  
2.1 Emission Rates. Oxygen (O<sub>2</sub>) or carbon dioxide (CO<sub>2</sub>) concentrations and appropriate F factors (ratios of combustion gas volumes to heat inputs) are used to calculate pollutant emission rates from pollutant concentrations.

RM 19, (02-27-14),  
12.2 Emission Rates of PM, SO<sub>2</sub>, and NO<sub>x</sub>. Select from the following sections the applicable procedure to compute the PM, SO<sub>2</sub>, or NO<sub>x</sub> emission rate (E) in lb/MMBtu. The pollutant concentration must be in lb/scf and the F factor must be in scf/MMBtu. If the pollutant concentration (C) is not in the appropriate units, use Table 19-1 in Section 17.0 to make the proper conversion. An F factor is the ratio of the gas volume of the products of combustion to the heat content of the fuel. The dry F factor (F<sub>d</sub>) includes all components of combustion less water, the wet F factor (F<sub>w</sub>) includes all components of combustion, and the carbon F factor (F<sub>c</sub>) includes only carbon dioxide.

Mark's Std Hdbk, 10th ed., pg 4-26

**High Heat Value Dry** (HHV<sub>dry</sub>), calc for Methane (single component for the fuel gas)

$$HHV_{dry} (Btu / SCF) = \left[ \left( \frac{M_{\%}}{100} \right) \times GCM \right] \quad HHV_{dry} = \frac{98.35 \%}{100.00} \times \frac{994.85 \text{ Btu}}{SCF} = \frac{978.48 \text{ Btu}}{SCF}$$

Mark's Std Hdbk, 10th ed., pg 4-26

**Low Heat Value Dry** (LHV<sub>dry</sub>), calc for Methane (single component for the fuel gas)

$$LHV_{dry} (Btu / SCF) = \left[ \left( \frac{M_{\%}}{100} \right) \times NCM \right] \quad LHV_{dry} = \frac{98.35 \%}{100.00} \times \frac{895.75 \text{ Btu}}{SCF} = \frac{881.02 \text{ Btu}}{SCF}$$

Civil Eng. Ref. Man., 7th Ed., pg 14-9/GPA Ref. Bulletin 181-86, App. C

**High Heat Value Wet** (HHV<sub>wet</sub>), calc for entire sample (all components of the fuel gas)

$$HHV_{wet} (Btu / SCF) = \frac{HHV_{dry}}{W / D. factor} \quad HHV_{wet} = \frac{998.79 \text{ Btu/SCF}}{1.0236} = 975.76 \text{ Btu/SCF}$$

Civil Eng. Ref. Man., 7th Ed., pg 14-9/GPA Ref. Bulletin 181-86, App. C

**Low Heat Value Wet** (LHV<sub>wet</sub>), calc for entire sample (all components of the fuel gas)

$$LHV_{wet} (Btu / SCF) = \frac{LHV_{dry}}{W / D. factor} \quad LHV_{wet} = \frac{899.60 \text{ Btu/SCF}}{1.0236} = 878.86 \text{ Btu/SCF}$$

**Lbs Component per Lb-Mol of Gas** (CM), calc for Methane (single component for the fuel gas)

$$CM (lb / lb - mol) = \left[ \left( \frac{M_{\%}}{100} \right) \times MW \right] \quad CM = \frac{98.35 \%}{100.00} \times \frac{16.04 \text{ lb}}{lb - mol} = 15.78 \text{ lb/lb-mol}$$

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**Fuel Molecular Weight** (MW<sub>Fuel</sub>)

$$MW_{Fuel} (lb / lb \cdot mol) = \sum (CM) \quad MW_{Fuel} = 15.78 \text{ lb/lb-mol} + 0.34 \text{ lb/lb-mol} + \text{etc.} = 16.307 \text{ lb/lb-mol}$$

**Btu per Lb of Gas Gross (GCV)**

$$GCV (Btu / lb) = \left[ \frac{HHV_{dry} \times G}{MW_{Fuel}} \right] \quad GCV = \frac{998.79 \text{ Btu/SCF} \times 385.23 \text{ ft}^3/\text{lbmol}}{16.307 \text{ lb/lb-mol}} = 23,595.43 \text{ Btu/lb}$$

ASTM D 3588 (SG)

**Specific Gravity**

$$SG = \left[ \frac{MW_{Fuel}}{MW_{AIR}} \right] \quad SG = \frac{16.31 \text{ lb/lb-mol}}{28.96 \text{ lb/lb-mol}} = 0.5630$$

**Btu per Lb of Gas Net (NCV)**

$$NCV (Btu / lb) = \left[ \frac{LHV_{dry} \times G}{MW_{Fuel}} \right] \quad NCV = \frac{899.60 \text{ Btu/SCF} \times 385.23 \text{ ft}^3/\text{lbmol}}{16.307 \text{ lb/lb-mol}} = 21,252.13 \text{ Btu/lb}$$

**Weight Percent of Component (C<sub>%</sub>), methane**

$$C_{\%} (\%) = \left[ \left( \frac{CM}{MW_{Fuel}} \right) \times 100 \right] \quad C_{\%} = \frac{15.78 \text{ lb/lb-mol}}{16.31 \text{ lb/lb-mol}} \times 100 = 96.76 \%$$

**Weight Percent of Volatile Organic Compounds (VOC<sub>%</sub>)**

$$VOC_{\%} (\%) = \left[ \sum_{C_3H_8}^{C_8H_{18}} Wt_{\%} \right] \quad VOC_{\%} = 0.05 \% + 0.00 \% + 0.00 \% + \text{etc.} = 0.06 \%$$

RM 19, (02-27-14), 12.3.2 Determined **F Factors**. If the fuel burned is not listed in Table 19-2 or if the owner or operator chooses to determine an F factor rather than use the values in Table 19-2, use the procedure below: 12.3.2.1 Equations. Use the eq

RM 19, (02-27-14),

12.1 Nomenclature

**K (scf/lb)/%**

H 3.64  
C 1.53  
S 0.57  
N<sub>2</sub> 0.14  
O<sub>2</sub> 0.46

$$F_d = \frac{K(K_{hd} \%H + K_c \%C + K_s \%S + K_n \%N - K_o \%O)}{GCV} \quad \text{Eq. 19-13}$$

$$F_d = \frac{10^6 \text{ Btu}}{\text{MMBtu}} \times \left[ \frac{3.64 \text{ SCF}}{\text{lb} \cdot \%} \times 24.75 \% + \frac{1.53 \text{ SCF}}{\text{lb} \cdot \%} \times 74.35 \% + \frac{0.57 \text{ SCF}}{\text{lb} \cdot \%} \times 0.00 \% + \frac{0.14 \text{ SCF}}{\text{lb} \cdot \%} \times 0.38 \% - \frac{0.46 \text{ SCF}}{\text{lb} \cdot \%} \times 0.51 \% \right] \times \frac{\text{lb}}{23,595.43 \text{ Btu}} = \frac{8,631.70 \text{ SCF}}{\text{MMBtu}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

**EXAMPLE CALCULATIONS (Methane and Ethane subtraction from THC to determine VOC)****VOC (as propane)**

Using a THC analyzer calibrated with propane and an FTIR, GC, or other type of analyzer that reads methane and ethane on a methane and ethane basis, respectively; first convert the wet based methane to a wet based propane equivalent by dividing the number by three, if FTIR is the analysis method, a 1.1 multiplier is applied as the correction factor; then convert the wet based ethane to a wet based propane equivalent by multiplying the number by two and then dividing by three. Once all concentrations are in wet based equivalent units, subtract the methane (as propane) and ethane (as propane) from the THC concentration. If the calculation results in a negative number, which is fairly common when subtracting fairly large numbers, the result will be assumed as zero.

$$VOC(ppm) = C_{THC (propane)} - \left( \frac{C_{CH_4 (methane)}}{3} \right) \times 1.1 - \left( \frac{C_{C_2H_6 (ethane)} \times 2}{3} \right)_{(propane)}$$

$$VOC (ppm) = 157.35 \text{ ppm} - \frac{417.32 \text{ ppm}}{3} \times 1.1 - \frac{0.52 \text{ ppm} \times 2}{3} = 3.99 \text{ ppm}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

**EXAMPLE CALCULATIONS (INFORMATION)****Specific Humidity (RH<sub>sp</sub>)**

Note: RH<sub>sp</sub> (gr/lb) calculated using temperature, relative humidity, and barometric pressure with psychrometric chart, psychrometric calculator, or built in psychrometric algorithm.

$$RH_{sp} (lb / lb) = \left[ \left( \frac{gr}{lb} \right) \times \frac{lb}{7000 gr} \right]$$

$$RH_{sp} = \frac{146.84 \text{ gr}}{lb} \times \frac{1 lb}{7000 \text{ gr}} = 0.020978 \frac{lb H_2O}{lb Air}$$

**EXAMPLE CALCULATIONS (CALIBRATION)****Calibration Error and Estimated Point, RM 25A, THC/VOC Analyzer**

RM 25A, (02-27-14), 8.4 Calibration Error Test. Immediately prior to the test series (within 2 hours of the start of the test), introduce zero gas and high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Calculate the predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level response. Then introduce low-level and mid-level calibration gases successively to the measurement system. ... These differences must be less than 5 percent of the respective calibration gas value. (calc for THC/VOC analyzer mid gas, if applicable)

$$E_p = \frac{C_{Dir(H)} - C_{Dir(Z)}}{C_{V(H)} - C_{V(Z)}} \times C_{Dir(M)} + C_{Dir(Z)}$$

Eq. of a line  
y=mx+b

$$E_p = \frac{808.45 \text{ ppm} - 1.42 \text{ ppm}}{802.00 \text{ ppm} - 0.00 \text{ ppm}} \times 456.00 \text{ ppm} + 1.42 = 460.28 \text{ ppm}$$

$$ACE = \left( \frac{C_{Dir} - C_V}{CS} \right) \times 100 \quad \text{Eq. 7E-1}$$

$$ACE_{THC} = \frac{461.70 \text{ ppm} - 460.28 \text{ ppm}}{456.00 \text{ ppm}} \times 100 = 0.31 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

## EXAMPLE CALCULATIONS (RUNS)

### Stack Exhaust Flow (Q<sub>S</sub>) - RM19

$$Q_S = \left( \frac{FFactor \times Q_f \times HHV}{1,000,000} \right) \times \left( \frac{20.9\%}{20.9\% - C_{Gas(O_2)}} \right)$$

Note: Equation presented in EPA Emission Measurement Center (EMC), Frequently Asked Questions (FAQ) for Method 19

$$Q_S = \frac{8,631.70 \text{ SCF}}{\text{MMBtu}} \times \frac{14,625.00 \text{ SCF}}{\text{hr}} \times \frac{998.79 \text{ Btu}}{\text{SCF}} \times \frac{\text{MMBtu}}{10^6 \text{ Btu}} \times \left( \frac{20.90\%}{20.9\% - 8.7\%} \right) = 215,406.45 \text{ SCFH}$$

### Moisture Correction

RM 7E, (02-27-14), 12.10 Moisture Correction. Use Equation 7E-10 if your measurements need to be corrected to a dry basis. (calc for NOx analyzer, Run 1, if applicable) Note: Calculations may not match as Run 1 results are typically also bias adjusted

$$C_D = \frac{C_W}{1 - B_{WS}} \quad \text{Eq. 7E-10} \quad C_D = \frac{6.97 \text{ ppmvw}}{1 - 0.14} = 8.15 \text{ ppmvd} \quad \text{or inversely,} \quad C_W = 8.15 \text{ ppmvd} \times \left( 1 - 0.14 \right) = 6.97 \text{ ppmvw}$$

### Diluent-Corrected Pollutant Concentration, O<sub>2</sub> Based

RM 20, (11-26-02), 7.3.1 Correction of Pollutant Concentration Using O<sub>2</sub> Concentration. Calculate the O<sub>2</sub> corrected pollutant concentration, as follows: (calc for NOx gas, Run 1, if applicable) [now contained in applicable Subpart]

$$C_{adj} = C_{Gas(Targ,et)} \times \left( \frac{20.9\% - AdjFactor}{20.9\% - C_{Gas(O_2)}} \right) \quad \text{Eq. 20-4} \quad C_{adj} = 8.15 \text{ ppm} \times \left( \frac{20.9\% - 15.00\%}{20.9\% - 8.67\%} \right) = 3.93 \text{ ppm@15\%O}_2$$

### Emissions Rate (lb/hr)

Calculation for pound per hour emission rate. Calculate, as follows: (calc for NOx gas Run 1, if applicable)

$$E_{lb/hr} = \frac{C_{Gas} \times Q_S \times MW}{10^6 \times G} \quad E_{lb/hr} = \frac{8.15 \text{ ppmvd}}{10^6 \text{ ppm/part}} \times \frac{215,406 \text{ DSCFH} \times 46.01 \text{ lb/lb-mol}}{385.23 \text{ SCF/lb-mol}} = \frac{0.21 \text{ lb}}{\text{hr}}$$

### Emissions Rate (g/kW-hr)

Calculation for grams per horsepower-hour. Calculate, as follows: (calc for NOx gas Run 1, if applicable)

$$E_{g/hp-hr} = \frac{E_{lb/hr} \times 453.6}{mw \times 1341.022} \text{ or } \frac{E_{lb/hr} \times 453.6}{hp} \quad E_{g/hp-hr} = \frac{0.21 \text{ lb}}{\text{hr}} \times \frac{453.6 \text{ g}}{\text{lb}} \times \frac{1}{1,810 \text{ hp}} \times \frac{\text{hp}}{0.7456 \text{ kW}} = \frac{0.0704 \text{ g}}{\text{kW*hr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

**Method 320 Equation 3, Dilution Factor (DF)***(example calculation for Trial #1, where applicable)*

$$DF = \frac{SF_6(\text{spk})}{SF_6(\text{dir})} = \frac{(SF_6(\text{spk}+\text{native}) - SF_6(\text{native}))}{SF_6(\text{dir})} \text{ OR } \frac{(CO_2(\text{native}) - CO_2(\text{spk}+\text{native}))}{CO_2(\text{native})}$$

$$DF (SF_6) = \frac{0.4082 \text{ ppmvw} - (-0.0034 \text{ ppmvw})}{5.61 \text{ ppmvw}} = 0.0734$$

**Test Method 320, Section 9.0 Quality Control**

Where,

$SF_6(\text{dir})$  =  $SF_6$  (or tracer gas) concentration measured directly in undiluted spike gas

$SF_6(\text{spk})$  = Diluted  $SF_6$  (or tracer gas) concentration measured in a spiked sample

$$SF_6(\text{spk}) = SF_6(\text{spk}+\text{native}) - SF_6(\text{native})$$

$SF_6(\text{spk}+\text{native})$  = Diluted  $SF_6$  (or tracer gas) concentration measured in a spiked sample in stack gas

$SF_6(\text{native})$  =  $SF_6$  (or tracer gas) concentration measured in a native stack gas sample

**Dilution Factor Ratio***(example calculation for Trial #1, where applicable)*

$$DF \text{ Ratio} = \frac{SF_6(\text{dir})}{SF_6(\text{spk})} = \frac{SF_6(\text{dir})}{(SF_6(\text{spk}+\text{native}) - SF_6(\text{native}))} \text{ OR } \frac{CO_2(\text{native})}{CO_2(\text{native}) - CO_2(\text{spk}+\text{native})} \geq 10$$

$$DF \text{ Ratio} = \frac{5.61 \text{ ppmvw}}{0.4082 \text{ ppmvw} - (-0.0034 \text{ ppmvw})} =$$

$$\text{Spike Ratio} = 13.6 : 1 \geq 10$$

Unspike = Native concentration of analytes in unspiked samples

Spike<sub>dir</sub> = Concentration of the analyte in the spike standard measured by filling the FTIR cell directly

**Method 320 Equation 4 [Method 321 Equation 2], Excepted Concentration of the Spiked Samples****Ideal Spike Yield***(example calculation for Trial #1 ( $SF_6$ ), where applicable)*

$$CS = DF \times \text{Spike}_{\text{dir}} + \text{Unspike} (1 - DF)$$

$$CS = 0.0734 \times 5.6103 \text{ ppmvw} + (-0.0034 \text{ ppmvw}) \times (1 - 0.0734) = 0.4085 \text{ ppmvw}$$

**Method 320 Spiked vs Expected**

$$\text{Spiked vs Expected} = \frac{\text{Actual Spike Yield}}{\text{Ideal Spike Yield}} \times 100 \quad \text{(example calculation for Trial \#1 (} SF_6 \text{), where applicable)}$$

$$\% \text{ Recovery} = \frac{0.4082 \text{ ppmvw}}{0.4085 \text{ ppmvw}} \times 100 = 99.940 \%$$

**Method 320 Equation 4 [Method 321 Equation 2], Excepted Concentration of the Spiked Samples****Ideal Spike Yield***(example calculation for Trial #1 ( $C_2H_4O$ ), where applicable)*

$$CS = DF \times \text{Spike}_{\text{dir}} + \text{Unspike} (1 - DF)$$

$$CS = 0.0734 \times 47.1138 \text{ ppmvw} + 0.4382 \text{ ppmvw} \times (1 - 0.0734) = 3.8626 \text{ ppmvw}$$

**Method 320 Spiked vs Expected**

$$\text{Spiked vs Expected} = \frac{\text{Actual Spike Yield}}{\text{Ideal Spike Yield}} \times 100 \quad \text{(example calculation for Trial \#1 (} C_2H_4O \text{), where applicable)}$$

$$\% \text{ Recovery} = \frac{3.6232 \text{ ppmvw}}{3.8626 \text{ ppmvw}} \times 100 = 93.802 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

**Method 320 Equation 3, Dilution Factor (DF)***(example calculation for Trial #2, where applicable)*

$$DF = \frac{SF_6(\text{spk})}{SF_6(\text{dir})} = \frac{(SF_6(\text{spk}+\text{native}) - SF_6(\text{native}))}{SF_6(\text{dir})} \text{ OR } \frac{(CO_2(\text{native}) - CO_2(\text{spk}+\text{native}))}{CO_2(\text{native})}$$

$$DF (SF_6) = \frac{0.4291 \text{ ppmvw} - (-0.0011 \text{ ppmvw})}{5.61 \text{ ppmvw}} = 0.0767$$

**Test Method 320, Section 9.0 Quality Control**

Where,

$SF_6(\text{dir})$  =  $SF_6$  (or tracer gas) concentration measured directly in undiluted spike gas

$SF_6(\text{spk})$  = Diluted  $SF_6$  (or tracer gas) concentration measured in a spiked sample

$$SF_6(\text{spk}) = SF_6(\text{spk}+\text{native}) - SF_6(\text{native})$$

$SF_6(\text{spk}+\text{native})$  = Diluted  $SF_6$  (or tracer gas) concentration measured in a spiked sample in stack gas

$SF_6(\text{native})$  =  $SF_6$  (or tracer gas) concentration measured in a native stack gas sample

**Dilution Factor Ratio***(example calculation for Trial #2, where applicable)*

$$DF \text{ Ratio} = \frac{SF_6(\text{dir})}{SF_6(\text{spk})} = \frac{SF_6(\text{dir})}{(SF_6(\text{spk}+\text{native}) - SF_6(\text{native}))} \text{ OR } \frac{CO_2(\text{native})}{CO_2(\text{native}) - CO_2(\text{spk}+\text{native})} \geq 10$$

$$DF \text{ Ratio} = \frac{5.61 \text{ ppmvw}}{0.4291 \text{ ppmvw} - (-0.0011 \text{ ppmvw})} =$$

$$\text{Spike Ratio} = 13.0 : 1 \geq 10$$

Unspike = Native concentration of analytes in unspiked samples

$Spike_{\text{dir}}$  = Concentration of the analyte in the spike standard measured by filling the FTIR cell directly

**Method 320 Equation 4 [Method 321 Equation 2], Excepted Concentration of the Spiked Samples****Ideal Spike Yield***(example calculation for Trial #2 ( $SF_6$ ), where applicable)*

$$CS = DF \times Spike_{\text{dir}} + \text{Unspike} (1 - DF)$$

$$CS = 0.0767 \times 5.6103 \text{ ppmvw} + (-0.0011 \text{ ppmvw}) \times (1 - 0.0767) = 0.4292 \text{ ppmvw}$$

**Method 320 Spiked vs Expected**

$$\text{Spiked vs Expected} = \frac{\text{Actual Spike Yield}}{\text{Ideal Spike Yield}} \times 100 \quad \text{(example calculation for Trial \#2 (} SF_6 \text{), where applicable)}$$

$$\% \text{ Recovery} = \frac{0.4291 \text{ ppmvw}}{0.4292 \text{ ppmvw}} \times 100 = 99.981 \%$$

**Method 320 Equation 4 [Method 321 Equation 2], Excepted Concentration of the Spiked Samples****Ideal Spike Yield***(example calculation for Trial #2 ( $C_2H_4O$ ), where applicable)*

$$CS = DF \times Spike_{\text{dir}} + \text{Unspike} (1 - DF)$$

$$CS = 0.0767 \times 47.1138 \text{ ppmvw} + 0.4477 \text{ ppmvw} \times (1 - 0.0767) = 4.0257 \text{ ppmvw}$$

**Method 320 Spiked vs Expected**

$$\text{Spiked vs Expected} = \frac{\text{Actual Spike Yield}}{\text{Ideal Spike Yield}} \times 100 \quad \text{(example calculation for Trial \#2 (} C_2H_4O \text{), where applicable)}$$

$$\% \text{ Recovery} = \frac{4.1004 \text{ ppmvw}}{4.0257 \text{ ppmvw}} \times 100 = 101.856 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.



**Method 320 Equation 3, Dilution Factor (DF)***(example calculation for Trial #3, where applicable)*

$$DF = \frac{SF_6(\text{spk})}{SF_6(\text{dir})} = \frac{(SF_6(\text{spk}+\text{native}) - SF_6(\text{native}))}{SF_6(\text{dir})} \text{ OR } \frac{(CO_2(\text{native}) - CO_2(\text{spk}+\text{native}))}{CO_2(\text{native})}$$

$$DF (SF_6) = \frac{0.4383 \text{ ppmvw} - 0.0018 \text{ ppmvw}}{5.61 \text{ ppmvw}} = 0.0778$$

**Test Method 320, Section 9.0 Quality Control**

Where,

$SF_6(\text{dir})$  =  $SF_6$  (or tracer gas) concentration measured directly in undiluted spike gas

$SF_6(\text{spk})$  = Diluted  $SF_6$  (or tracer gas) concentration measured in a spiked sample

$$SF_6(\text{spk}) = SF_6(\text{spk}+\text{native}) - SF_6(\text{native})$$

$SF_6(\text{spk}+\text{native})$  = Diluted  $SF_6$  (or tracer gas) concentration measured in a spiked sample in stack gas

$SF_6(\text{native})$  =  $SF_6$  (or tracer gas) concentration measured in a native stack gas sample

**Dilution Factor Ratio***(example calculation for Trial #3, where applicable)*

$$DF \text{ Ratio} = \frac{SF_6(\text{dir})}{SF_6(\text{spk})} = \frac{SF_6(\text{dir})}{(SF_6(\text{spk}+\text{native}) - SF_6(\text{native}))} \text{ OR } \frac{CO_2(\text{native})}{CO_2(\text{native}) - CO_2(\text{spk}+\text{native})} \geq 10$$

$$DF \text{ Ratio} = \frac{5.61 \text{ ppmvw}}{0.4383 \text{ ppmvw} - 0.0018 \text{ ppmvw}} =$$

$$\text{Spike Ratio} = 12.9 : 1 \geq 10$$

Unspike = Native concentration of analytes in unspiked samples

$Spike_{\text{dir}}$  = Concentration of the analyte in the spike standard measured by filling the FTIR cell directly

**Method 320 Equation 4 [Method 321 Equation 2], Excepted Concentration of the Spiked Samples****Ideal Spike Yield***(example calculation for Trial #3 ( $SF_6$ ), where applicable)*

$$CS = DF \times Spike_{\text{dir}} + \text{Unspike} (1 - DF)$$

$$CS = 0.0778 \times 5.6103 \text{ ppmvw} + 0.0018 \text{ ppmvw} \times (1 - 0.0778) = 0.4382 \text{ ppmvw}$$

**Method 320 Spiked vs Expected**

$$\text{Spiked vs Expected} = \frac{\text{Actual Spike Yield}}{\text{Ideal Spike Yield}} \times 100 \quad \text{(example calculation for Trial \#3 (} SF_6 \text{), where applicable)}$$

$$\% \text{ Recovery} = \frac{0.4383 \text{ ppmvw}}{0.4382 \text{ ppmvw}} \times 100 = 100.031 \%$$

**Method 320 Equation 4 [Method 321 Equation 2], Excepted Concentration of the Spiked Samples****Ideal Spike Yield***(example calculation for Trial #3 ( $C_2H_4O$ ), where applicable)*

$$CS = DF \times Spike_{\text{dir}} + \text{Unspike} (1 - DF)$$

$$CS = 0.0778 \times 47.1138 \text{ ppmvw} + 0.3622 \text{ ppmvw} \times (1 - 0.0778) = 4.0003 \text{ ppmvw}$$

**Method 320 Spiked vs Expected**

$$\text{Spiked vs Expected} = \frac{\text{Actual Spike Yield}}{\text{Ideal Spike Yield}} \times 100 \quad \text{(example calculation for Trial \#3 (} C_2H_4O \text{), where applicable)}$$

$$\% \text{ Recovery} = \frac{4.3142 \text{ ppmvw}}{4.0003 \text{ ppmvw}} \times 100 = 107.849 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

## **TEST RESULTS AND CALCULATIONS**

### **75% Load**

**NO<sub>x</sub>, CO, THC, N<sub>2</sub>O, C<sub>2</sub>H<sub>4</sub>O, NH<sub>3</sub>, HCHO, CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, and H<sub>2</sub>O Emissions Data**

**CATERPILLAR, G3520 TALE 75% LOAD DATA SUMMARY**

| Parameter                                                                                  | 75% Load,<br>Run - 2-1 | 75% Load,<br>Run - 2-2 | 75% Load,<br>Run - 2-3 | Average   |
|--------------------------------------------------------------------------------------------|------------------------|------------------------|------------------------|-----------|
| Date (mm/dd/yy)                                                                            | 07/30/21               | 07/30/21               | 07/30/21               | 07/30/21  |
| Start Time (hh:mm:ss)                                                                      | 13:45:23               | 15:00:23               | 16:27:23               | 13:45:23  |
| End Time (hh:mm:ss)                                                                        | 14:44:53               | 15:59:53               | 17:26:53               | 17:26:53  |
| Run Duration (min / run)                                                                   | 60                     | 60                     | 60                     | 60        |
| Bar. Pressure (in. Hg)                                                                     | 29.89                  | 29.87                  | 29.85                  | 29.87     |
| Amb. Temp. (°F)                                                                            | 94                     | 97                     | 97                     | 96        |
| Rel. Humidity (%)                                                                          | 53                     | 47                     | 42                     | 47        |
| Spec. Humidity (lb water / lb air)                                                         | 0.018296               | 0.017841               | 0.015856               | 0.017331  |
| Engine Fuel Flow (SCFH)                                                                    | 20,603                 | 20,591                 | 20,172                 | 20,455    |
| Stack Flow (RM19) (SCFH)                                                                   | 310,849                | 310,873                | 303,928                | 308,550   |
| Stack Moisture (% Method 320)                                                              | 13.9                   | 13.9                   | 13.6                   | 13.8      |
| Power Output (horsepower)                                                                  | 2,691.4                | 2,698.1                | 2,616.3                | 2,668.6   |
| Engine Timing (BTDC)                                                                       | 23.0                   | 23.0                   | 23.0                   | 23.00     |
| Actual Power (kW)                                                                          | 2,007.0                | 2,012.0                | 1,951.0                | 1,990.00  |
| Amperes (A)                                                                                | 89.0                   | 90.0                   | 97.0                   | 92.00     |
| Air Manifold Temp. (F)                                                                     | 131.0                  | 131.0                  | 129.0                  | 130.33    |
| Engine Speed (rpm)                                                                         | 1,800.0                | 1,800.0                | 1,800.0                | 1,800.00  |
| NOx (as NO <sub>2</sub> ) (ppmvd)                                                          | 6.49                   | 6.25                   | 6.05                   | 6.26      |
| NOx (as NO <sub>2</sub> ) (ppm@15%O <sub>2</sub> )                                         | 3.20                   | 3.09                   | 2.98                   | 3.09      |
| NOx (as NO <sub>2</sub> ) (g/kW*hr)                                                        | 0.0544                 | 0.0523                 | 0.0511                 | 0.05      |
| NO (ppmvd)                                                                                 | 6.49                   | 6.24                   | 5.96                   | 6.23      |
| NO (ppm@15%O <sub>2</sub> )                                                                | 3.20                   | 3.08                   | 2.94                   | 3.08      |
| NO (g/kW*hr)                                                                               | 0.0355                 | 0.0341                 | 0.0328                 | 0.0341    |
| NO <sub>2</sub> (ppmvd)                                                                    | 0.00                   | 0.01                   | 0.09                   | 0.03      |
| NO <sub>2</sub> (ppm@15%O <sub>2</sub> )                                                   | 0.00                   | 0.00                   | 0.04                   | 0.02      |
| NO <sub>2</sub> (g/kW*hr)                                                                  | 0.0000                 | 0.0000                 | 0.0008                 | 0.0003    |
| CO (ppmvd)                                                                                 | 3.23                   | 4.20                   | 3.59                   | 3.68      |
| CO (ppm@15%O <sub>2</sub> )                                                                | 1.60                   | 2.08                   | 1.77                   | 1.81      |
| CO (g/kW*hr)                                                                               | 0.02                   | 0.02                   | 0.02                   | 0.02      |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                            | 176.40                 | 197.01                 | 190.89                 | 188.10    |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )                           | 74.99                  | 83.86                  | 81.34                  | 80.06     |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                                          | 1.22                   | 1.36                   | 1.33                   | 1.30      |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                            | 0.83                   | 4.90                   | 6.61                   | 4.11      |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )                           | 0.35                   | 2.09                   | 2.82                   | 1.75      |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                                          | 0.01                   | 0.03                   | 0.05                   | 0.03      |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                | 174.98                 | 191.69                 | 183.99                 | 183.55    |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )               | 86.41                  | 94.72                  | 90.73                  | 90.62     |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                              | 1.4073                 | 1.5380                 | 1.4883                 | 1.4779    |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                  | 0.59                   | 0.42                   | 0.30                   | 0.43      |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> ) | 0.29                   | 0.21                   | 0.15                   | 0.21      |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                | 0.0047                 | 0.0033                 | 0.0024                 | 0.0035    |
| N <sub>2</sub> O (ppmvd)                                                                   | 1.68                   | 1.86                   | 1.70                   | 1.75      |
| N <sub>2</sub> O (ppm@15%O <sub>2</sub> )                                                  | 0.83                   | 0.92                   | 0.84                   | 0.86      |
| N <sub>2</sub> O (g/kW*hr)                                                                 | 0.0135                 | 0.0149                 | 0.0137                 | 0.0140    |
| C <sub>2</sub> H <sub>4</sub> O (ppmvd)                                                    | 1.12                   | 3.50                   | 4.87                   | 3.16      |
| C <sub>2</sub> H <sub>4</sub> O (ppm@15%O <sub>2</sub> )                                   | 0.55                   | 1.73                   | 2.40                   | 1.56      |
| C <sub>2</sub> H <sub>4</sub> O (g/kW*hr)                                                  | 0.0090                 | 0.0280                 | 0.0393                 | 0.0255    |
| HCHO (ppmvd)                                                                               | 0.00                   | 0.00                   | 0.00                   | 0.00      |
| HCHO (ppm@15%O <sub>2</sub> )                                                              | 0.00                   | 0.00                   | 0.00                   | 0.00      |
| HCHO (g/kW*hr)                                                                             | 0.0000                 | 0.0000                 | 0.0000                 | 0.0000    |
| NH <sub>3</sub> (ppmvd)                                                                    | 18.17                  | 16.63                  | 15.56                  | 16.79     |
| NH <sub>3</sub> (ppm@15%O <sub>2</sub> )                                                   | 8.97                   | 8.22                   | 7.67                   | 8.29      |
| NH <sub>3</sub> (g/kW*hr)                                                                  | 0.0564                 | 0.0515                 | 0.0486                 | 0.0522    |
| CO <sub>2</sub> (%)                                                                        | 6.57                   | 6.55                   | 6.66                   | 6.59      |
| CO <sub>2</sub> (lb/hr)                                                                    | 2,333.03               | 2,325.95               | 2,312.44               | 2,323.80  |
| CO <sub>2</sub> (lb/kW*hr)                                                                 | 1,162.47               | 1,156.06               | 1,185.28               | 1,167.93  |
| CO <sub>2</sub> (ton/year) at 8760 hr/year                                                 | 10,218.67              | 10,187.65              | 10,128.47              | 10,178.26 |
| CO <sub>2</sub> (lb/MMBtu)                                                                 | 115.63                 | 115.63                 | 115.63                 | 115.63    |
| CO <sub>2</sub> (g/kW*hr)                                                                  | 527.29                 | 524.38                 | 537.63                 | 529.77    |
| O <sub>2</sub> (%)                                                                         | 8.95                   | 8.96                   | 8.94                   | 8.95      |

## **TEST RESULTS AND CALCULATIONS**

**100% Load**

**NO<sub>x</sub>, CO, THC, N<sub>2</sub>O, C<sub>2</sub>H<sub>4</sub>O, NH<sub>3</sub>, HCHO, CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, and H<sub>2</sub>O Emissions Data**

**CATERPILLAR, G3520 TALE 100% LOAD DATA SUMMARY**

| Parameter                                                                                  | 100% Load,<br>Run - 3-1 | 100% Load,<br>Run - 3-2 | 100% Load,<br>Run - 3-3 | Average   |
|--------------------------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------|-----------|
| Date (mm/dd/yy)                                                                            | 09/01/21                | 09/01/21                | 09/02/21                | 09/01/21  |
| Start Time (hh:mm:ss)                                                                      | 9:23:57                 | 10:26:27                | 12:03:27                | 9:23:57   |
| End Time (hh:mm:ss)                                                                        | 10:25:57                | 12:02:57                | 13:06:27                | 13:06:27  |
| Run Duration (min / run)                                                                   | 62                      | 97                      | 64                      | 74        |
| Bar. Pressure (in. Hg)                                                                     | 29.73                   | 29.73                   | 29.74                   | 29.73     |
| Amb. Temp. (°F)                                                                            | 88                      | 93                      | 95                      | 92        |
| Rel. Humidity (%)                                                                          | 70                      | 57                      | 46                      | 58        |
| Spec. Humidity (lb water / lb air)                                                         | 0.020202                | 0.019207                | 0.016410                | 0.018606  |
| Engine Fuel Flow (SCFH)                                                                    | 26,278                  | 26,278                  | 26,278                  | 26,278    |
| Stack Flow (RM19) (SCFH)                                                                   | 386,201                 | 399,898                 | 406,400                 | 397,500   |
| Stack Moisture (% Method 320)                                                              | 13.6                    | 12.9                    | 13.0                    | 13.2      |
| Power Output (horsepower)                                                                  | 3,598.0                 | 3,598.0                 | 3,598.0                 | 3,598.0   |
| Engine Timing (BTDC)                                                                       | 22.0                    | 22.0                    | 22.0                    | 22.00     |
| Actual Power (kW)                                                                          | 2,613.0                 | 2,613.0                 | 2,613.0                 | 2,613.00  |
| Amperes (A)                                                                                | 109.0                   | 109.0                   | 109.0                   | 109.00    |
| Air Manifold Temp. (F)                                                                     | 136.0                   | 136.0                   | 136.0                   | 136.00    |
| Engine Speed (rpm)                                                                         | 1,800.0                 | 1,800.0                 | 1,800.0                 | 1,800.00  |
| NOx (as NO <sub>2</sub> ) (ppmvd)                                                          | 10.21                   | 9.38                    | 9.85                    | 9.81      |
| NOx (as NO <sub>2</sub> ) (ppm@15%O <sub>2</sub> )                                         | 4.92                    | 4.67                    | 4.99                    | 4.86      |
| NOx (as NO <sub>2</sub> ) (g/kW*hr)                                                        | 0.080                   | 0.076                   | 0.081                   | 0.08      |
| NO (ppmvd)                                                                                 | 8.60                    | 8.67                    | 9.35                    | 8.87      |
| NO (ppm@15%O <sub>2</sub> )                                                                | 4.14                    | 4.32                    | 4.12                    | 4.19      |
| NO (g/kW*hr)                                                                               | 0.044                   | 0.046                   | 0.050                   | 0.05      |
| NO <sub>2</sub> (ppmvd)                                                                    | 1.61                    | 0.71                    | 0.50                    | 0.94      |
| NO <sub>2</sub> (ppm@15%O <sub>2</sub> )                                                   | 0.78                    | 0.35                    | 0.90                    | 0.68      |
| NO <sub>2</sub> (g/kW*hr)                                                                  | 0.013                   | 0.006                   | 0.004                   | 0.01      |
| CO (ppmvd)                                                                                 | 4.36                    | 2.18                    | 1.58                    | 2.71      |
| CO (ppm@15%O <sub>2</sub> )                                                                | 2.10                    | 1.09                    | 0.80                    | 1.33      |
| CO (g/kW*hr)                                                                               | 0.021                   | 0.011                   | 0.008                   | 0.01      |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                            | 114.77                  | 107.19                  | 108.68                  | 110.21    |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )                           | 47.70                   | 46.52                   | 47.86                   | 47.36     |
| THC (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                                          | 0.739                   | 0.721                   | 0.742                   | 0.73      |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                            | 0.00                    | 0.00                    | 0.00                    | 0.00      |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )                           | 0.00                    | 0.00                    | 0.00                    | 0.00      |
| VOC (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                                          | 0.000                   | 0.000                   | 0.000                   | 0.00      |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                                | 176.10                  | 165.42                  | 161.29                  | 167.60    |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> )               | 84.74                   | 82.43                   | 81.68                   | 82.95     |
| CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                              | 1.316                   | 1.280                   | 1.269                   | 1.29      |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppmvd)                  | 0.00                    | 0.28                    | 0.45                    | 0.24      |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (ppm@15%O <sub>2</sub> ) | 0.00                    | 0.14                    | 0.23                    | 0.12      |
| C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) (g/kW*hr)                | 0.000                   | 0.002                   | 0.004                   | 0.00      |
| N <sub>2</sub> O (ppmvd)                                                                   | 2.40                    | 1.16                    | 0.80                    | 1.45      |
| N <sub>2</sub> O (ppm@15%O <sub>2</sub> )                                                  | 1.16                    | 0.58                    | 0.40                    | 0.713     |
| N <sub>2</sub> O (g/kW*hr)                                                                 | 0.018                   | 0.009                   | 0.006                   | 0.01      |
| C <sub>2</sub> H <sub>4</sub> O (ppmvd)                                                    | 0.91                    | 0.96                    | 0.94                    | 0.94      |
| C <sub>2</sub> H <sub>4</sub> O (ppm@15%O <sub>2</sub> )                                   | 0.44                    | 0.48                    | 0.48                    | 0.464     |
| C <sub>2</sub> H <sub>4</sub> O (g/kW*hr)                                                  | 0.007                   | 0.007                   | 0.007                   | 0.0072    |
| HCHO (ppmvd)                                                                               | 1.29                    | 0.82                    | 0.61                    | 9.07E-01  |
| HCHO (ppm@15%O <sub>2</sub> )                                                              | 0.62                    | 0.41                    | 0.31                    | 4.46E-01  |
| HCHO (g/kW*hr)                                                                             | 0.007                   | 0.004                   | 0.003                   | 0.005     |
| NH <sub>3</sub> (ppmvd)                                                                    | 0.68                    | 2.65                    | 13.33                   | 5.56      |
| NH <sub>3</sub> (ppm@15%O <sub>2</sub> )                                                   | 0.33                    | 1.32                    | 6.75                    | 2.80      |
| NH <sub>3</sub> (g/kW*hr)                                                                  | 0.002                   | 0.008                   | 0.041                   | 0.02      |
| CO <sub>2</sub> (%)                                                                        | 6.81                    | 6.58                    | 6.53                    | 6.64      |
| CO <sub>2</sub> (lb/hr)                                                                    | 3,004.47                | 3,005.35                | 3,030.75                | 3,013.53  |
| CO <sub>2</sub> (lb/kW*hr)                                                                 | 1,119.81                | 1,120.14                | 1,129.60                | 1,123.18  |
| CO <sub>2</sub> (ton/year) at 8760 hr/year                                                 | 13,159.59               | 13,163.45               | 13,274.70               | 13,199.25 |
| CO <sub>2</sub> (lb/MMBtu)                                                                 | 115.57                  | 115.57                  | 115.57                  | 115.57    |
| CO <sub>2</sub> (g/kW*hr)                                                                  | 507.94                  | 508.08                  | 512.38                  | 509.47    |
| O <sub>2</sub> (%)                                                                         | 8.64                    | 9.06                    | 9.25                    | 8.98      |

## **TEST RESULTS AND CALCULATIONS**

### **50% Load PM Emissions Data**

# METHOD 5 (FRONT) AND 202 (BACK) - RESULTS

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| Historical Data                 | R-1 50%-1 | R-1 50%-2 | R-1 50%-3 | Average | Units                  |
|---------------------------------|-----------|-----------|-----------|---------|------------------------|
| Run Start Time                  | 09:34     | 12:05     | 14:23     |         | hh:mm                  |
| Run Stop Time                   | 11:24     | 13:59     | 15:58     |         | hh:mm                  |
| Test Date                       | 07/29/21  | 07/29/21  | 07/29/21  |         | mm/dd/yy               |
| Load                            | 50%       | 50%       | 50%       |         | % or w/DB              |
| Meter Calibration Factor        | 0.986     | 0.986     | 0.986     |         |                        |
| Pitot Tube Coefficient          | 0.8215    | 0.8230    | 0.8215    |         |                        |
| Average Nozzle Diameter         | 0.311     | 0.311     | 0.311     |         | in                     |
| Stack Test Data                 | R-1 50%-1 | R-1 50%-2 | R-1 50%-3 | Average | Units                  |
| Initial Meter Volume            | 59.000    | 96.035    | 133.977   |         | ft <sup>3</sup>        |
| Final Meter Volume              | 95.989    | 133.682   | 171.362   |         | ft <sup>3</sup>        |
| Total Meter Volume              | 36.989    | 37.647    | 37.385    | 37.340  | ft <sup>3</sup>        |
| Total Sampling Time             | 90.00     | 90.00     | 90.00     | 90.00   | min                    |
| Average Meter Temperature       | 87.00     | 94.63     | 93.96     | 91.86   | °F                     |
| Average Stack Temperature       | 906.00    | 904.83    | 922.71    | 911.18  | °F                     |
| Barometric Pressure             | 29.87     | 29.90     | 29.85     | 29.87   | in Hg                  |
| Stack Static Pressure           | 0.07      | 0.07      | 0.07      | 0.07    | in H <sub>2</sub> O    |
| Absolute Stack Pressure         | 29.88     | 29.91     | 29.86     | 29.88   | in Hg                  |
| Average Orifice Pressure Drop   | 0.52      | 0.53      | 0.53      | 0.53    | in H <sub>2</sub> O    |
| Absolute Meter Pressure         | 30.00     | 30.03     | 29.98     | 30.01   | in Hg                  |
| Avg Square Root Pitot Pressure  | 0.41      | 0.42      | 0.41      | 0.41    | √(in H <sub>2</sub> O) |
| Moisture Content Data           | R-1 50%-1 | R-1 50%-2 | R-1 50%-3 | Average | Units                  |
| Impinger Water Weight Gain      | 117.70    | 117.80    | 115.30    | 116.93  | g                      |
| Silica Gel Weight Gain          | 8.40      | 6.90      | 7.00      | 7.43    | g                      |
| Total Water Volume Collected    | 126.33    | 124.92    | 122.52    | 124.59  | ml                     |
| Standard Water Vapor Volume     | 5.95      | 5.88      | 5.77      | 5.86    | scf                    |
| Standard Meter Volume           | 35.2      | 35.4      | 35.1      | 35.2    | dscf                   |
| Standard Metric Meter Volume    | 1.0       | 1.0       | 1.0       | 1.0     | dscm                   |
| Calculated Stack Moisture       | 14.45     | 14.26     | 14.11     | 14.27   | %                      |
| Saturated Stack Moisture        | 100.00    | 100.00    | 100.00    | 100.00  | %                      |
| Reported Stack Moisture Content | 14.45     | 14.26     | 14.11     | 14.27   | %                      |
| Gas Analysis Data               | R-1 50%-1 | R-1 50%-2 | R-1 50%-3 | Average | Units                  |
| Carbon Dioxide Content          | 6.7       | 6.7       | 6.8       | 6.7     | %                      |
| Oxygen Content                  | 8.7       | 8.7       | 8.8       | 8.7     | %                      |
| Carbon Monoxide Content         | 6.0       | 6.0       | 6.4       | 6.1     | ppm                    |
| Nitrogen Content                | 84.6      | 84.6      | 84.5      | 84.5    | %                      |
| Stack Dry Molecular Weight      | 29.42     | 29.42     | 29.43     | 29.42   | lb/lb-mole             |
| Stack Wet Molecular Weight      | 27.77     | 27.79     | 27.82     | 27.79   | lb/lb-mole             |
| Calculated Fuel Factor          | 1.822     | 1.817     | 1.793     | 1.811   |                        |
| Fuel F-Factor                   | 8631.70   | 8631.70   | 8631.70   | 8631.70 | dscf/MMBtu             |
| Percent Excess Air              | 63.4      | 64.4      | 65.1      | 64.3    | %                      |

# METHOD 5 (FRONT) AND 202 (BACK) - RESULTS

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| <b>Volumetric Flow Rate Data</b> | <b>R-1 50%-1</b> | <b>R-1 50%-2</b> | <b>R-1 50%-3</b> | <b>Average</b> | <b>Units</b> |
|----------------------------------|------------------|------------------|------------------|----------------|--------------|
| Average Stack Gas Velocity       | 37.36            | 37.43            | 37.48            | 37.42          | ft/sec       |
| Stack Cross-Sectional Area       | 5.54             | 5.54             | 5.54             | 5.54           | ft²          |
| Actual Stack Flow Rate           | 12,421           | 12,445           | 12,462           | 12,443         | acfm         |
| Wet Standard Stack Flow Rate     | 288              | 289              | 285              | 287            | wkscfh       |
| Dry Standard Stack Flow Rate     | 246,059          | 247,565          | 244,695          | 246,106        | dscfh        |
| Percent of Isokinetic Rate       | 100.2            | 99.9             | 100.3            | 100.1          | %            |
| <b>Gravimetric Analysis</b>      | <b>R-1 50%-1</b> | <b>R-1 50%-2</b> | <b>R-1 50%-3</b> | <b>Average</b> | <b>Units</b> |
| NH <sub>4</sub> OH Correction    | 0.0000           | 0.0000           | 0.0000           | 0.0000         | ml           |
| NH <sub>4</sub> OH Correction    | 0.0000           | 0.0000           | 0.0000           | 0.0000         | mg           |
| <b>Emission Rate Data</b>        | <b>R-1 50%-1</b> | <b>R-1 50%-2</b> | <b>R-1 50%-3</b> | <b>Average</b> | <b>Units</b> |
| Total PM Mass                    | 18.09            | 14.54            | 9.68             | 14.10          | mg           |
| Total PM Concentration           | 5.14E-04         | 4.11E-04         | 2.76E-04         | 4.00E-04       | g/dscf       |
|                                  | 7.93E-03         | 6.34E-03         | 4.26E-03         | 6.18E-03       | gr/dscf      |
| Total PM Emission Rate           | 0.13             | 0.10             | 0.07             | 0.10           | kg/hr        |
|                                  | 0.28             | 0.22             | 0.15             | 0.22           | lb/hr        |
|                                  | 1.22             | 0.98             | 0.65             | 0.95           | tpy          |
|                                  | 0.0167           | 0.0134           | 0.0091           | 0.0131         | lb/MMBtu     |
| Filterable PM Mass               | 11.69            | 10.89            | 7.98             | 10.19          | mg           |
| Filterable PM Concentration      | 3.32E-04         | 3.08E-04         | 2.27E-04         | 2.89E-04       | g/dscf       |
|                                  | 5.13E-03         | 4.75E-03         | 3.51E-03         | 4.46E-03       | gr/dscf      |
| Filterable PM Emission Rate      | 0.08             | 0.08             | 0.06             | 0.07           | kg/hr        |
|                                  | 0.18             | 0.17             | 0.12             | 0.16           | lb/hr        |
|                                  | 0.79             | 0.74             | 0.54             | 0.69           | tpy          |
|                                  | 0.0108           | 0.0101           | 0.0075           | 0.0094         | lb/MMBtu     |
| Condensable PM Mass              | 6.40             | 3.65             | 1.70             | 3.92           | mg           |
| Condensable PM Concentration     | 1.82E-04         | 1.03E-04         | 4.84E-05         | 1.11E-04       | g/dscf       |
|                                  | 2.81E-03         | 1.59E-03         | 7.47E-04         | 1.72E-03       | gr/dscf      |
| Condensable PM Emission Rate     | 0.04             | 0.03             | 0.01             | 0.03           | kg/hr        |
|                                  | 0.10             | 0.06             | 0.03             | 0.06           | lb/hr        |
|                                  | 0.43             | 0.25             | 0.11             | 0.26           | tpy          |
|                                  | 0.0059           | 0.0034           | 0.0016           | 0.0036         | lb/MMBtu     |



## Nomenclature

- %CO = carbon monoxide concentration (%)
- %CO<sub>2</sub> = carbon dioxide concentration (%)
- %N<sub>2</sub> = nitrogen concentration (%)
- %O<sub>2</sub> = oxygen concentration (%)
- %O<sub>2,wet</sub> = Oxygen content of gas stream, % by volume of wet gas. (Note: The oxygen percentage used in Method 201A, Equation 3 is on a wet gas basis. That means that since oxygen is typically measured on a dry gas basis, the measured percent O<sub>2</sub> must be multiplied by the quantity (1 - B<sub>ws</sub>) to convert to the actual volume fraction. Therefore, %O<sub>2,wet</sub> = (1 - B<sub>ws</sub>) \* %O<sub>2, dry</sub>)
- (%EA)<sub>avg</sub> = average excess air (%)
- (F<sub>o</sub>)<sub>avg</sub> = average calculated fuel factor
- [(Δp)<sup>0.5</sup>]<sub>avg</sub> = Average of square roots of the velocity pressures measured during the preliminary traverse, inches W.C.
- μ = Gas viscosity, micropoise
- 12.0 = Constant calculated as 60 percent of 20.5 square inch cross-sectional area of combined cyclone head, square inches
- 17.03 = mg/milliequivalents for ammonium ion
- 22.4 = liters of ideal gas per lb-mol of substance at 0°C and 1 atm (ref. Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg)
- 24.04 = liters of ideal gas per lb-mol of substance at 20°C and 1 atm (ref. Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg)
- 5.02 x 10<sup>4</sup> = constant derived from the molecular weight and correcting standard temperature and pressure (ref. Bay Area Air Quality Management District, Source Test Procedure ST-1B, Ammonia Integrated Sampling, Adopted January 20, 1982, Regulation 7-303)
- A = distance upstream (in.)
- A<sub>D</sub> = stack diameters upstream (dia.)
- A<sub>n</sub> = Area of nozzle, square feet
- A<sub>s</sub> = area of stack (ft<sup>2</sup>)
- B = distance downstream (in.)
- B<sub>D</sub> = stack diameters downstream (dia.)
- b<sub>f</sub> = Average blockage factor calculated in Equation 26, dimensionless
- B<sub>wm</sub> = meter moisture content (%)
- B<sub>ws</sub> = stack moisture content (%)
- C = Cunningham correction factor for particle diameter, D<sub>p</sub>, and calculated using the actual stack gas temperature, dimensionless
- C<sub>1</sub> = -150.3162 (micropoise)
- C<sub>2</sub> = 18.0614 (micropoise/K<sup>0.5</sup>) = 13.4622 (micropoise/R<sup>0.5</sup>)
- C<sub>3</sub> = 1.19183 × 10<sup>6</sup> (micropoise/K<sup>2</sup>) = 3.86153 × 10<sup>6</sup> (micropoise/R<sup>2</sup>)
- C<sub>4</sub> = 0.591123 (micropoise)
- C<sub>5</sub> = 91.9723 (micropoise)
- C<sub>6</sub> = 4.91705 × 10<sup>-5</sup> (micropoise/K<sup>2</sup>) = 1.51761 × 10<sup>-5</sup> (micropoise/R<sup>2</sup>)
- C<sub>a</sub> = Acetone blank concentration, mg/mg
- C<sub>b</sub> = Concentration of NH<sub>3</sub> ion in the back half of train (breakthrough)
- C<sub>f</sub> = Concentration of NH<sub>3</sub> ion in the front half of train (main catch)
- C<sub>fPM10</sub> = Conc. of filterable PM<sub>10</sub>, gr/dscf
- C<sub>fPM2.5</sub> = Conc. of filterable PM<sub>2.5</sub>, gr/dscf
- C<sub>k</sub> = K Factor Constant, 849.8

## Nomenclature

- $C_n$  = nozzle diameter constant, 0.03575
- $C_p'$  = Coefficient for the pitot used in the preliminary traverse, dimensionless
- $C_p$  = Pitot coefficient for the combined cyclone pitot, dimensionless
- $C_{cpm}$  = Concentration of the condensable PM in the stack gas, dry basis, corrected to standard conditions, milligrams/dry standard cubic foot.
- $C_r$  = Re-estimated Cunningham correction factor for particle diameter equivalent to the actual cut size diameter and calculated using the actual stack gas temperature, dimensionless
- $D_{50}$  = Particle cut diameter, micrometers
- $D_{50(N+1)}$  =  $D_{50}$  value for cyclone IV calculated during the N+1 iterative step, micrometers
- $D_{50-1}$  = Re-calculated particle cut diameters based on re-estimated  $C_r$ , micrometers
- $D_{50LL}$  = Cut diameter for cyclone I corresponding to the 2.25 micrometer cut diameter for cyclone IV, micrometer
- $D_{50N}$  =  $D_{50}$  value for cyclone IV calculated during the Nth iterative step, micrometers
- $D_{50T}$  = Cyclone I cut diameter corresponding to the middle of the overlap zone shown in Method 201A, Figure 10 of Section 17, micrometers
- $D_e$  = equivalent stack diameter (in.)
- $\Delta H@$  =  $\Delta H$  @ 0.75 scfm (in. H<sub>2</sub>O)
- $\Delta H_{avg}$  = average orifice pressure (in. H<sub>2</sub>O)
- $D_n$  = Inner diameter of sampling nozzle mounted on Cyclone I, inches
- $D_{na}$  = actual nozzle diameter (in.)
- $D_p$  = Physical particle size, micrometers
- $\Delta p$  = velocity head (in. H<sub>2</sub>O)
- $\Delta p_1$  = velocity head at first current traverse point (in. H<sub>2</sub>O)
- $\Delta p'_1$  = velocity head at first preliminary traverse point (in. H<sub>2</sub>O)
- $\Delta p_{avg}$  = average pitot tube differential pressure (in. H<sub>2</sub>O)
- $\Delta p_n$  = velocity head at subsequent current traverse point (in. H<sub>2</sub>O)
- $\Delta p_{RM2}$  = method 2 velocity head (in. H<sub>2</sub>O)
- $D_s$  = diameter of stack (in.)
- $F_d$  = fuel f-factor (dscf/MMBtu)
- $f_{O_2}$  = stack gas fraction of O<sub>2</sub>, by volume, dry basis
- $I$  = Percent isokinetic sampling, dimensionless
- $K_1$  = standard volume correction, 17.65°R/in. Hg
- $K_4$  = isokinetic conversion constant, 0.0945min•in.Hg/sec•°R
- $K_5$  = water mass to std water vapor, 0.04715 ft<sup>3</sup>/g
- $K_p$  = 85.49, ((ft/sec)/(pounds/mole -°R))
- $L$  = length of stack (in.)
- $L_{fw}$  = distance to far wall of stack (in.)
- $L_{nw}$  = distance to near wall of stack (in.) [reference]
- $m_{\#x}$  = weight measurements (g)
- $M_1$  = Milligrams of PM collected on the filter, less than or equal to 2.5 micrometers
- $M_2$  = Milligrams of PM recovered from Container #2 (acetone blank corrected), greater than 10 micrometers
- $M_3$  = Milligrams of PM recovered from Container #3 (acetone blank corrected), less than or equal to 10 and greater than 2.5 micrometers
- $M_4$  = Milligrams of PM recovered from Container #4 (acetone blank corrected), less than or equal to 2.5 micrometers

## Nomenclature

- $m_a$  = Mass of residue of acetone after evaporation, mg
- $m_c$  = Mass of the  $NH_4^+$  added to sample to form ammonium sulfate, mg
- $m_{cpm}$  = Mass of the total condensable PM, mg
- $M_d$  = Molecular weight of dry gas, pounds/pound mole
- $m_{fb}$  = Mass of total CPM in field train recovery blank, mg
- $m_{fx}$  = final weight, avg of last two measurements (g)
- mg = Milligram
- mg/L = Milligram per liter
- $m_i$  = Mass of inorganic CPM, mg
- $m_{ib}$  = Mass of inorganic CPM in field train recovery blank, mg
- $M_n$  = total particulates (mg)
- $m_o$  = Mass of organic CPM, mg
- $m_{ob}$  = Mass of organic CPM in field train blank, mg
- $m_r$  = Mass of dried sample from inorganic fraction, mg
- $m_{tx}$  = tare weight (g)
- MW = molecular weight (lb/lb-mole)
- $M_w$  = Molecular weight of wet gas, pounds/pound mole
- N = Normality of ammonium hydroxide titrant
- $N_a$  = null angle (deg.)
- $N_{re}$  = Reynolds number, dimensionless
- $N_{tp}$  = Number of iterative steps or total traverse points
- $P_b = P_{bar}$  = barometric pressure (in. Hg)
- $P_{bar}$  = barometric pressure (in. Hg)
- ppmCO = carbon monoxide concentration (ppm)
- ppmv = Parts per million by volume
- ppmw = Parts per million by weight
- $P_s$  = absolute stack pressure (in. Hg)
- $P_{static}$  = static pressure (in.  $H_2O$ )
- $P_{std}$  = standard pressure, 29.92 in. Hg
- $\Theta$  = total sampling time (min)
- $Q_{aw}$  = average stack wet flow rate (ascf/min)
- $Q_l$  = Sampling rate for cyclone I to achieve specified  $D_{50}$
- $Q_m$  = estimated orifice flow rate, 0.750 acfm, else  $V_m/Q$  from previous run
- $Q_s$  = Sampling rate for cyclone I to achieve specified  $D_{50}$
- $Q_{s(std)}$  = total cyclone flow rate at standard conditions (dscf/min)
- $Q_{sd}$  = dry standard stack flow rate (dscfm)
- $Q_{sST}$  = Dry gas sampling rate through the sampling assembly, dscfm
- $Q_{sw}$  = wet standard stack flow rate (ascfm)
- $R_{max}$  = Nozzle/stack velocity ratio parameter, dimensionless
- $R_{min}$  = Nozzle/stack velocity ratio parameter, dimensionless
- $t_1$  = Sampling time at point 1, min
- $t_m$  = average gas meter temperature ( $^{\circ}F$ )
- $t_m$  = average meter temperature ( $^{\circ}F$ )
- $T_m$  = Meter box and orifice gas temperature,  $^{\circ}R$
- $t_n$  = Sampling time at point n, min

## Nomenclature

- $t_r$  = Total projected run time, min
- $T_s$  = Absolute stack gas temperature, °R
- $T_{std}$  = standard temperature, 68°F, 528°R
- $T_u$  = absolute temperature offset, 460°R
- $V_a$  = Volume of acetone blank, ml
- $V_{aw}$  = Volume of acetone used in sample recovery wash, ml
- $V_b$  = Volume of aliquot taken for IC analysis, ml
- $V_c$  = Quantity of water captured in impingers and silica gel, ml
- $V_f$  = final impinger volume (ml)
- $V_i$  = initial impinger volume (ml)
- $V_{ic}$  = Volume of impinger contents sample, ml
- $V_m$  = Dry gas meter volume sampled, acf
- $V_{m(std)}$  = standard meter volume (dscf)
- $v_{max}$  = Maximum gas velocity calculated from Equations 18 or 19, ft/sec
- $v_{max}$  = maximum nozzle velocity (ft/sec)
- $V_{mf}$  = final dry gas meter reading (dcf)
- $V_{mi}$  = initial dry gas meter reading (dcf)
- $v_{min}$  = Minimum gas velocity calculated from Method 201A, Equations 16 or 17, ft/sec
- $V_{ms}$  = Dry gas meter volume sampled, corrected to standard conditions, dscf
- $v_n$  = Sample gas velocity in the nozzle, ft/sec
- $v_{org}$  = organics wash volume (ml)
- $V_p$  = Volume of water added during train purge
- $v_s$  = average stack gas velocity (ft/sec)
- $v_{sl}$  = local velocity (ft/sec)
- $V_t$  = total impinger volume (ml) =  $;(V_f - V_i)$
- $V_t$  = Volume of NH<sub>4</sub>OH titrant, ml
- $V_{w(std)}$  = volume of water vapor in gas sample at standard conditions (scf)
- $v_x$  = blank volume (ml)
- $W$  = width of stack (in.)
- $W_{2,3,4}$  = Weight of PM recovered from Containers #2, #3, and #4, mg
- $W_a$  = Weight of blank residue in acetone used to recover samples, mg
- $W_f$  = final impinger weight (g)
- $W_i$  = initial impinger weight (g)
- $W_t$  = total impinger weight (g) =  $;(W_f - W_i)$
- $w_x$  = blank weight of solids (g)
- $Y$  = meter calibration factor (a.k.a gamma)
- $Z$  = Ratio between estimated cyclone IV D<sub>50</sub> values, dimensionless
- $\gamma$  = Dry gas meter gamma value, dimensionless
- $\Delta H$  = Meter box orifice pressure drop, inches W.C.
- $\Delta H@$  = Pressure drop across orifice at flow rate of 0.75 scfm at standard conditions, inches W.C.  
(Note: Specific to each orifice and meter box.)
- $\Delta p_1$  = Velocity pressure measured at point 1, inches W.C.
- $\Delta p_{avg}$  = Average velocity pressure, inches W.C.
- $\Delta p_m$  = Observed velocity pressure using S-type pitot tube in preliminary traverse, inches W.C.
- $\Delta p_{max}$  = Maximum velocity pressure, inches W.C.

## Nomenclature

- $\Delta p_{\min}$  = Minimum velocity pressure, inches W.C.
- $\Delta p_n$  = Velocity pressure measured at point n during the test run, inches W.C.
- $\Delta p_s$  = Velocity pressure calculated in Method 201a, Equation 25, inches W.C.
- $\Delta p_{s1}$  = Velocity pressure adjusted for combined cyclone pitot tube, inches W.C.
- $\Delta p_{s2}$  = Velocity pressure corrected for blockage, inches W.C.
- $\theta$  = Total run time, min
- $\rho_a$  = Density of acetone, mg/ml (see label on bottle)
- $\Sigma_n$  = total number of sampling points

### EXAMPLE CALCULATIONS (Reference Method 1 - Circular Stack)

#### Diameter of Stack (in.)

$$D(in.) = L_{fv} - L_{mv}$$

$$D(in.) = 32.00 \text{ in.} - 0.13 \text{ in.} = 31.88 \text{ in.}$$

#### Stack Diameters Downstream

$$B_D(dia.) = \frac{B}{D}$$

$$B_D(dia.) = \frac{64.00 \text{ in.}}{31.88 \text{ in.}} = 2.01 \text{ diameters}$$

#### Area of Stack (ft<sup>2</sup>)

$$A_s(ft^2) = \pi \times \left( \frac{D}{2 \times 12} \right)^2$$

$$A_s(ft^2) = 3.14 \times \left( \frac{31.88 \text{ in.}}{2 \times 12 \text{ in./ft}} \right)^2 = 5.54 \text{ ft}^2$$

#### Stack Diameters Upstream

$$A_D(dia.) = \frac{A}{D}$$

$$A_D(dia.) = \frac{16.00 \text{ in.}}{31.88 \text{ in.}} = 0.50 \text{ diameters}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

**EXAMPLE CALCULATIONS (Reference Method 3a) [Values from Run 1 test]****Carbon Monoxide Concentration (%)**

$$\%CO = \frac{ppmCO}{10,000}$$

$$\%CO (\%) = \frac{6.03 \text{ ppm}}{10,000 \text{ ppm/\%}} = 0.0006 \%$$

**Nitrogen Concentration (%)**

$$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$$

$$\%N_2 (\%) = 100 - 6.71 \% - 8.67 \% - 6.03 / 10,000 \% = 84.62 \%$$

**Stack Dry Molecular Weight (lb/lb-mole)**

$$M_d (\text{lb} / \text{lb} - \text{mol}) = \sum \left( \frac{MW_{comp}}{100} \times \%component \right)$$

$$M_d (\text{lb/lb-mol}) = \left( \frac{44 \text{ lb/lb-mol}}{100} \times 6.71 \% \right) +$$

$$\left( \frac{32 \text{ lb/lb-mol}}{100} \times 8.67 \% \right) + \left( \frac{28 \text{ lb/lb-mol}}{100} \times \left[ \frac{6.03}{10,000} + 84.62 \right] \right) = \frac{29.42 \text{ lb}}{\text{lb-mol}}$$

**Stack Wet Molecular Weight (lb/lb-mole)**

$$M_s (\text{lb} / \text{lb} - \text{mol}) = \left[ M_d \times \left( 1 - \frac{B_{ws}}{100} \right) \right] + \left[ MW_{H_2O} \times \frac{B_{ws}}{100} \right]$$

$$M_s (\text{lb/lb-mol}) = \left\{ \frac{29.42 \text{ lb}}{\text{lb-mol}} \times \left( 1 - \frac{14.45 \%}{100} \right) \right\} + \left\{ \frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{14.45 \%}{100} \right\} = \frac{27.77 \text{ lb}}{\text{lb-mol}}$$

**Average Calculated Fuel Factor (F<sub>o</sub>)**

$$F_{o(avg)} = \frac{[20.9 - (\%O_2)_{avg} - (0.5 \times (\%CO)_{avg})]}{(\%CO_2)_{avg} + (\%CO)_{avg}}$$

$$F_{o(avg)} = \frac{20.9\% - 8.67 \% - (0.5 \times 0.001 \%)}{6.71 \% + 0.001 \%} = 1.822$$

**Average Excess Air (%)**

$$\%EA_{avg} (\%) = \frac{100 \times [(\%O_2)_{avg} - (0.5 \times (\%CO)_{avg})]}{(0.264 \times (N_2)_{avg}) - [(\%O_2)_{avg} - (0.5 \times (\%CO)_{avg})]}$$

$$(\%EA)_{AVG} = \frac{100 \times \{ 8.67 \% - (0.5 \times 0.001 \%) \}}{(0.264 \times 84.62 \%) - \{ 8.67 \% - (0.5 \times 0.001 \%) \}} = 63.38 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

# **EXAMPLE CALCULATIONS (Reference Method 2) [Values from Run 1 test]**

## **Absolute Stack Pressure (in. Hg)**

$$P_s (\text{in. Hg}) = P_b + \frac{P_{\text{static}}}{13.6}$$

$$P_s (\text{in. Hg}) = 29.87 \text{ in. Hg} + \frac{0.07 \text{ in. H}_2\text{O}}{13.6 \text{ in. H}_2\text{O/in. Hg}} = 29.88 \text{ in. Hg}$$

## **Average Stack Gas Velocity (ft/sec)**

$$v_s (\text{ft / sec}) = K_p \times C_p \times (\sqrt{\Delta p})_{\text{avg}} \times \sqrt{\frac{(t_s)_{\text{avg}} + T_u}{P_s \times M_s}}$$

$v_{sl} (\text{ft/sec}) =$

$$\left( \frac{85.49 \text{ ft (lb/lb-mol)(in. Hg)}}{\text{sec (}^\circ\text{R)(in. H}_2\text{O)}} \right)^{1/2} \times 0.82 \times 0.41 \text{ in. H}_2\text{O}^{1/2} \times \sqrt{\frac{906.00 + 460^\circ\text{R}}{29.88 \text{ in. Hg} \times 27.77 \text{ lb/lb-mol}}} = \frac{37.3 \text{ ft}}{\text{sec}}$$

## **Average Stack Dry Standard Flow Rate (dscfh)**

$$Q_{sd} (\text{dscfh}) = \frac{60 \times 60 \times \left( 1 - \frac{B_{H_2O}}{100} \right) \times v_s \times A_s \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sd} (\text{dscf/hr}) = \frac{3600 \text{ sec}}{\text{hr}} \times \left( 1 - \frac{14.45 \%}{100} \right) \times \frac{37.36 \text{ ft}}{\text{sec}} \times 5.54 \text{ ft}^2 \times \frac{68.00 + 460^\circ\text{R}}{906.00 + 460^\circ\text{R}} \times \frac{29.88 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{246,058.86 \text{ dscf}}{\text{hr}}$$

## **Average Stack Wet Flow Rate (acfm)**

$$Q_{aw} (\text{acfm}) = 60 \times v_s \times A_s$$

$$Q_{aw} (\text{acf/min}) = \frac{60 \text{ sec}}{\text{min}} \times \frac{37.36 \text{ ft}}{\text{sec}} \times 5.54 \text{ ft}^2 = \frac{12,420.94 \text{ acf}}{\text{min}}$$

## **Average Stack Wet Standard Flow Rate (ascfh)**

$$Q_{sw} (\text{ascfh}) = \frac{60 \times Q_{aw} \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sw} (\text{ascf/hr}) = \frac{60 \text{ min}}{\text{hr}} \times \frac{12,420.94 \text{ acf}}{\text{min}} \times \frac{68.00 + 460^\circ\text{R}}{906.00 + 460^\circ\text{R}} \times \frac{29.88 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{287,632.16 \text{ ascf}}{\text{hr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.



**EXAMPLE CALCULATIONS (Reference Method 4) [Values from Run 1 test]****Water Volume Weighed (scf)**

$$V_{wsg (std)} (scf) = W_t \times K_s$$

$$V_{wsa(std)} = 126.10 \text{ g} \times 0.04715 \text{ ft}^3/\text{g} = 5.946 \text{ scf}$$

**Standard Meter Volume (dscf)**

$$V_{m(std)} (dscf) = \frac{K_1 \times Y \times V_m \times \left( P_b + \frac{\Delta H_{avg}}{13.6} \right)}{(t_m)_{avg} + T_u}$$

$$V_{m(std)} = \frac{17.65 \text{ }^{\circ}\text{R}}{\text{in. Hg}} \times 0.99 \times 36.99 \text{ dcf} \times \left( 29.87 \text{ in. Hg} + \frac{0.52 \text{ in. H}_2\text{O}}{13.6 \text{ in. H}_2\text{O} / \text{in. Hg}} \right) = 35.19 \text{ dscf}$$

$$87.00 \text{ }^{\circ}\text{F} + 460 \text{ }^{\circ}\text{R}$$

**Calculated Moisture Content (%)**

$$B_{ws(calc)} (\%) = 100 \times \frac{V_{wsg (std)}}{V_{wsg (std)} + V_{m (std)}}$$

$$B_{ws(calc)} = 100 \times \frac{5.95 \text{ dscf}}{5.95 \text{ dscf} + 35.19 \text{ dscf}} = 14.45 \%$$

**Saturated Moisture Content (%)**

$$B_{ws(svp)} (\%) = 100 \times \frac{10^{\frac{6.691 - \frac{3144}{t_{s(avg)} + 390.86}}{P_b + \frac{P_{static}}{13.6}}}}{\leq 100}$$

$$B_{ws(svp)} = 100 \times \frac{10^{\left( 6.691 - \frac{3144}{906.00 \text{ }^{\circ}\text{F} + 390.86} \right)}}{29.87 \text{ in. Hg} + \frac{0.07 \text{ in. H}_2\text{O}}{13.6 \text{ in. H}_2\text{O} / \text{in. Hg}}} \leq 100 = 100.00 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

# EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

**Desired Orifice (in. H<sub>2</sub>O)** (first point)

$$\Delta H_d (\text{in. H}_2\text{O}) = K \times \Delta p$$

$$\Delta H_d (\text{in. H}_2\text{O}) = 3.05 \times$$

$$0.15 \text{ in. H}_2\text{O} = 0.46 \text{ in. H}_2\text{O}$$

**Absolute Meter Pressure (in. Hg)**

$$P_m (\text{in. Hg}) = P_b + \frac{\Delta H @}{13.6}$$

$$P_m (\text{in. Hg}) = 29.87 \text{ in. Hg} + \frac{1.83 \text{ in. H}_2\text{O}}{13.6 \text{ in. H}_2\text{O/in. Hg}} = 30.00 \text{ in. Hg}$$

**Recommended Nozzle Diameter (in.)**

$$D_m (\text{in.}) = \sqrt{\frac{C_u \times Q_m \times P_m}{(t_m + T_u) \times C_p} \times \left( \frac{1 - \frac{B_{wm}}{100}}{1 - \frac{B_{ws}}{100}} \right) \times \left( t_s + T_u \right) \times \left[ \frac{M_d \times \left( 1 - \frac{B_{ws}}{100} \right) + \left( 18 \times \frac{B_{ws}}{100} \right)}{P_s \times \Delta p_{avg}} \right]}$$

$$D_{ni} (\text{in.}) = \frac{0.03575 (\text{lb-mole} \cdot ^\circ\text{R} \cdot \text{in. H}_2\text{O})^{1/2} \cdot \text{min} \cdot \text{in.}^2}{\text{acf} \cdot \text{in. Hg}^{3/4} \cdot \text{lb}^{1/2}} \times 0.75 \text{ acf} \times 30.00 \text{ in. Hg} \times \left( \frac{1 - \frac{0.00}{100}}{1 - \frac{14.45}{100}} \right) \times \left( \frac{87.00}{906.00} \frac{^\circ\text{F} + 460^\circ\text{R}}{^\circ\text{F} + 460^\circ\text{R}} \right) \times \left( \frac{29.42 \text{ lb}}{\text{lb-mole}} \times \left( 1 - \frac{14.45}{100} \right) + \left( \frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{14.45}{100} \right) \right) \times \left( \frac{1}{29.88 \text{ in. Hg} \times 0.41 \text{ in. H}_2\text{O}} \right) = 0.315 \text{ in.}$$

**ΔP to ΔH Isokinetic Factor**

$$K = C_k \times C_p^2 \times \Delta H @ \times D_{na}^4 \times \left[ \frac{M_d \times \left( 1 - \frac{B_{wm}}{100} \right) + \left( 18 \times \frac{B_{wm}}{100} \right)}{M_d \times \left( 1 - \frac{B_{ws}}{100} \right) + \left( 18 \times \frac{B_{ws}}{100} \right)} \right] \times \left( \frac{1 - \frac{B_{ws}}{100}}{1 - \frac{B_{wm}}{100}} \right) \times \left( \frac{t_m + T_u}{t_s + T_u} \right) \times \frac{P_s}{P_m}$$

$$K = \frac{849.8}{\text{in. H}_2\text{O} \cdot \text{in.}^4} \times 0.82^2 \times 1.83 \text{ in. H}_2\text{O} \times 0.31^4 \times \left( \frac{1 - \frac{14.45}{100}}{1 - \frac{0.00}{100}} \right)^2 \times \left( \frac{87.00}{906.00} \frac{^\circ\text{F} + 460^\circ\text{R}}{^\circ\text{F} + 460^\circ\text{R}} \right) \times \left( \frac{29.42 \text{ lb}}{\text{lb-mole}} \times \left( 1 - \frac{0.00}{100} \right) + \left( \frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.00}{100} \right) \right) \times \left( \frac{29.42 \text{ lb}}{\text{lb-mole}} \times \left( 1 - \frac{14.45}{100} \right) + \left( \frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{14.45}{100} \right) \right) \times \frac{29.88 \text{ in. Hg}}{30.00 \text{ in. Hg}} = 3.05$$

**Percent Isokinetic (%)** (first point)

$$I(\%) = \frac{K_4 \times ((t_s)_{avg} + T_u) \times V_m (\text{std})}{\left( \Theta \times (v_{s(I)})_{avg} \times P_s \times \pi \times \left( \frac{D_{na}}{2} \times \frac{1}{12} \right)^2 \right) \times \left( 1 - \frac{B_{ws}}{100} \right)}$$

$$I(\%) = \frac{0.0945 \text{ min} \cdot \text{in. Hg}}{\text{sec} \cdot ^\circ\text{R}} \times (900.00 \text{ } ^\circ\text{F} + 460 \text{ } ^\circ\text{R}) \times 1.32 \text{ dscf} \times \frac{3.75 \text{ min} \times \frac{34.83 \text{ ft}}{\text{sec}} \times 29.88 \text{ in. Hg} \times 3.14 \times \left( \frac{0.31 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}} \right)^2 \times \left( 1 - \frac{14.45}{100} \right)} = 95.97 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

## EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

### Cumulative Percent Isokinetic (%) (weighted average of all points)

Using Method 5, Eq 5-8 to determine intermediate isokinetics at each point, weighted averaging of the cumulative isokinetics is necessary since all points are not equal, and determined by using the dry standard meter volume collected at each point to weight the cumulative average. Intermediate isokinetics and dry standard meter volumes are found at each point. At each point the cumulative sum is found of each value and the quotient of the two used to determine the cumulative isokinetics for each residual point (n).

$$I(\%) = \sum_{1-n} \frac{I(\%) \times V_{m(std)}_{1-n}}{V_{m(std)}_{1-n}}$$

| Pt   | In (%) | x | Vm(std)n | = | I (%)n | Σ(I (%)n) | / | Σ(Vm(std)n) | = | I (%) | Pt      | In (%) | x | Vm(std)n | = | I (%)n | Σ(I (%)n) | / | Σ(Vm(std)n) | = | I (%) |
|------|--------|---|----------|---|--------|-----------|---|-------------|---|-------|---------|--------|---|----------|---|--------|-----------|---|-------------|---|-------|
| A-1  | 95.97  | x | 1.318    | = | 126.45 | 126.45    | / | 1.32        | = | 96.0  | B-9     | 97.00  | x | 1.417    | = | 137.41 | 3040.43   | / | 30.63       | = | 99.3  |
| A-2  | 98.04  | x | 1.472    | = | 144.30 | 270.76    | / | 2.79        | = | 97.1  | B-10    | 107.27 | x | 1.565    | = | 167.87 | 3208.29   | / | 32.20       | = | 99.6  |
| A-3  | 97.62  | x | 1.424    | = | 138.97 | 409.72    | / | 4.21        | = | 97.3  | B-11    | 98.32  | x | 1.393    | = | 136.93 | 3345.22   | / | 33.59       | = | 99.6  |
| A-4  | 98.77  | x | 1.354    | = | 133.70 | 543.42    | / | 5.57        | = | 97.6  | B-12    | 112.75 | x | 1.599    | = | 180.25 | 3525.47   | / | 35.19       | = | 100.2 |
| A-5  | 99.56  | x | 1.450    | = | 144.34 | 687.76    | / | 7.02        | = | 98.0  | Last Pt |        |   |          |   |        |           |   |             |   |       |
| A-6  | 101.42 | x | 1.601    | = | 162.36 | 850.12    | / | 8.62        | = | 98.7  |         |        |   |          |   |        |           |   |             |   |       |
| A-7  | 97.68  | x | 1.505    | = | 146.99 | 997.11    | / | 10.12       | = | 98.5  |         |        |   |          |   |        |           |   |             |   |       |
| A-8  | 99.63  | x | 1.492    | = | 148.69 | 1145.80   | / | 11.61       | = | 98.7  |         |        |   |          |   |        |           |   |             |   |       |
| A-9  | 99.91  | x | 1.538    | = | 153.61 | 1299.41   | / | 13.15       | = | 98.8  |         |        |   |          |   |        |           |   |             |   |       |
| A-10 | 100.38 | x | 1.544    | = | 155.01 | 1454.42   | / | 14.70       | = | 99.0  |         |        |   |          |   |        |           |   |             |   |       |
| A-11 | 102.86 | x | 1.541    | = | 158.54 | 1612.95   | / | 16.24       | = | 99.3  |         |        |   |          |   |        |           |   |             |   |       |
| A-12 | 95.96  | x | 1.398    | = | 134.20 | 1747.16   | / | 17.64       | = | 99.1  |         |        |   |          |   |        |           |   |             |   |       |
| B-1  | 100.45 | x | 1.384    | = | 139.00 | 1886.16   | / | 19.02       | = | 99.2  |         |        |   |          |   |        |           |   |             |   |       |
| B-2  | 97.66  | x | 1.384    | = | 135.15 | 2021.30   | / | 20.40       | = | 99.1  |         |        |   |          |   |        |           |   |             |   |       |
| B-3  | 99.15  | x | 1.403    | = | 139.08 | 2160.39   | / | 21.81       | = | 99.1  |         |        |   |          |   |        |           |   |             |   |       |
| B-4  | 101.47 | x | 1.479    | = | 150.04 | 2310.43   | / | 23.29       | = | 99.2  |         |        |   |          |   |        |           |   |             |   |       |
| B-5  | 92.93  | x | 1.393    | = | 129.49 | 2439.92   | / | 24.68       | = | 98.9  |         |        |   |          |   |        |           |   |             |   |       |
| B-6  | 109.72 | x | 1.646    | = | 180.64 | 2620.56   | / | 26.33       | = | 99.5  |         |        |   |          |   |        |           |   |             |   |       |
| B-7  | 98.33  | x | 1.473    | = | 144.88 | 2765.45   | / | 27.80       | = | 99.5  |         |        |   |          |   |        |           |   |             |   |       |
| B-8  | 97.10  | x | 1.417    | = | 137.57 | 2903.01   | / | 29.22       | = | 99.4  |         |        |   |          |   |        |           |   |             |   |       |

### Percent Isokinetic (%) (intermediate equation, all points)

[equivalent to taking an average of point-by-point isokinetics without weighting the average (e.g. all points equal)]

$$I(\%) = \frac{K_4 \times ((t_s)_{avg} + T_u) \times V_{m(std)}}{\left( \Theta \times (v_{s(l)})_{avg} \times P_s \times \pi \times \left( \frac{D_{na}}{2} \times \frac{1}{12} \right)^2 \right) \times \left( 1 - \frac{B_{ws}}{100} \right)}$$

$$I(\%) = \frac{0.0945 \text{ min} \cdot \text{in. Hg}}{\text{sec} \cdot ^\circ \text{R}} \times (906.00 \text{ } ^\circ \text{F} + 460 \text{ } ^\circ \text{R}) \times \frac{35.19 \text{ dscf}}{\text{sec}}$$

$$90.00 \text{ min} \times \frac{37.36 \text{ ft}}{\text{sec}} \times 29.88 \text{ in. Hg} \times 3.14 \times \left( \frac{0.31 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}} \right)^2 \times \left( 1 - \frac{14.45 \%}{100} \right) = 100.00 \%$$

### Raw Data Percent Isokinetic (%)

[utilizes the raw data equation for isokinetics from Method 5]

$$I(\%) = \frac{100 \left( (t_s)_{avg} + T_u \right) \left[ K_4 V_{1c} + \frac{V_m Y}{(t_m)_{avg} + T_u} \left( P_{bar} + \frac{\Delta H}{13.6} \right) \right]}{60 \left( \Theta \times (v_{s(l)})_{avg} \times P_s \times \pi \times \left( \frac{D_{na}}{2} \times \frac{1}{12} \right)^2 \right)}$$

$$I(\%) =$$

$$100 \times (906.00 \text{ } ^\circ \text{F} + 460 \text{ } ^\circ \text{R}) \times \left[ \frac{0.002669 \text{ ft}^3 \cdot \text{in. Hg}}{\text{ml} \cdot ^\circ \text{R}} \times 126.3 \text{ ml} + \frac{36.99 \text{ dcf} \times 0.986}{87.00 \text{ } ^\circ \text{F} + 460 \text{ } ^\circ \text{R}} \left( 29.87 \text{ in Hg} + \frac{0.415}{13.6} \right) \right]$$

$$60 \times 90.00 \text{ min} \times \frac{37.36 \text{ ft}}{\text{sec}} \times 29.88 \text{ in. Hg} \times 3.14 \times \left( \frac{0.31 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}} \right)^2 = 99.93 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

**EXAMPLE CALCULATIONS (Gravimetric Analysis) [Values from Run 1 test]****Blank Concentration [Acetone Blank Weight of Solids] (mg/ml)**

$$C_x (mg / ml) = \frac{1000 \times w_x}{v_x}$$

$$C_x (mg/ml) = \frac{1000 \text{ mg}}{\text{g}} \times \frac{0.0004 \text{ g}}{137.00 \text{ ml}} = \frac{0.0026 \text{ mg}}{\text{ml}} = \frac{\text{mg}}{\text{ml}}$$

**Blank Adjustment [Acetone Blank Weight of Solids and Probe Wash] (mg)**

$$W_x (mg) = v_x \times C_x$$

$$W_x (mg) = 200.00 \text{ ml} \times 0.0026 \text{ mg/ml} = 0.51 \text{ mg} < \text{Sample Gain}$$

**Sample Gain [Probe Wash] (mg)**

$$m_x (mg) = (m_{fx} - m_{tx}) \times 1000$$

$$m_x (mg) = \frac{1000 \text{ mg}}{\text{g}} \times (126.00 \text{ g} - 125.99 \text{ g}) = 9.50 \text{ mg}$$

**Adjusted Sample Gain [Probe Wash] (mg)**

$$m_{xadj} (mg) = m_x - W_x$$

$$m_{xadj} (mg) = 9.50 \text{ mg} - 0.51 \text{ mg} = 8.99 \text{ mg}$$

**0.1N NH<sub>4</sub>OH Correction (mg)**

$$m_c (mg) = 17.03 \times V_t \times N$$

$$m_c (mg) = 17.03 \times 0.00 \text{ ml} \times 0.1 \text{ N} = 0.00 \text{ mg}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

**EXAMPLE CALCULATIONS (Analysis) [Values from Run 1 test - Total PM Mass]****Stack Total Concentration (g/dscf)**

$$c_s (g / dscf) = 0.001 \times \frac{M_n}{V_{m(std)}}$$

$$c_s (g/dscf) = \frac{g}{1000 \text{ mg}} \times \frac{18.09 \text{ mg}}{35.19 \text{ dscf}} = \frac{5.14\text{E-}04 \text{ g}}{\text{dscf}}$$

**Stack Total Concentration (gr/dscf)**

$$c'_s (gr / dscf) = 0.001 \times \frac{M_n}{V_{m(std)}} \times \frac{7000}{453.592}$$

$$c'_s (gr/dscf) = \frac{g}{1000 \text{ mg}} \times \frac{18.09 \text{ mg}}{35.19 \text{ dscf}} \times \frac{7000 \text{ gr}}{\text{lb}} \times \frac{\text{lb}}{453.592 \text{ g}} = \frac{7.93\text{E-}03 \text{ gr}}{\text{dscf}}$$

**Total Emissions Rate (kg/hr)**

$$E (kg / hr) = c_s \times Q_{sd} \times \frac{kg}{1000 \text{ g}}$$

$$E (kg/hr) = \frac{kg}{1000 \text{ g}} \times \frac{5.14\text{E-}04 \text{ g}}{\text{dscf}} \times \frac{246,059 \text{ dscf}}{\text{hr}} = \frac{0.13 \text{ kg}}{\text{hr}}$$

**Total Emissions Rate (lb/hr)**

$$E' (lb / hr) = \frac{M_n \times Q_{sd}}{V_{m(std)}} \times \frac{lb \times g}{453.592 \text{ g} \times 1000 \text{ mg}}$$

$$E' (lb/hr) = \frac{g}{1000 \text{ mg}} \times \frac{\text{lb}}{453.592 \text{ g}} \times \frac{18.09 \text{ mg}}{35.19 \text{ dscf}} \times \frac{246,059 \text{ dscf}}{\text{hr}} = \frac{0.28 \text{ lb}}{\text{hr}}$$

**Total Emissions Rate (tpy)**

$$E'' (ton / yr) = E' \times \frac{8760}{2000}$$

$$E'' (tpy) = \frac{\text{ton}}{2000 \text{ lb}} \times \frac{8,760 \text{ hr}}{\text{yr}} \times \frac{0.28 \text{ lb}}{\text{hr}} = \frac{1.22 \text{ ton}}{\text{yr}}$$

**Total Emissions Rate (lb/MMBtu)**

Oxygen Based:

$$E''' (lb/MMBtu) = \frac{M_n \times F_d}{V_{m(std)} \times 1000 \times 453.592} \times \left( \frac{20.9}{20.9 - \%O_2} \right)$$

$$E''' (lb/MMBtu) = \frac{g}{1000 \text{ mg}} \times \frac{\text{lb}}{453.592 \text{ g}} \times \frac{18.09 \text{ mg}}{35.19 \text{ dscf}} \times \frac{8,631.70 \text{ dscf}}{\text{MMBtu}} \times \left( \frac{20.9}{20.9 - 8.7 \%} \right) = \frac{0.0167 \text{ lb}}{\text{MMBtu}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

## **TEST RESULTS AND CALCULATIONS**

### **75% Load PM Emissions Data**

# METHOD 5 (FRONT) AND 202 (BACK) - RESULTS

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| Historical Data                 | R-1 75%-1 | R-1 75%-2 | R-1 75%-3 | Average | Units                  |
|---------------------------------|-----------|-----------|-----------|---------|------------------------|
| Run Start Time                  | 08:08     | 13:17     | 15:25     |         | hh:mm                  |
| Run Stop Time                   | 09:42     | 14:56     | 17:01     |         | hh:mm                  |
| Test Date                       | 07/30/21  | 07/30/21  | 07/30/21  |         | mm/dd/yy               |
| Load                            | 75%       | 75%       | 75%       |         | % or w/DB              |
| Meter Calibration Factor        | 0.986     | 0.986     | 0.986     |         |                        |
| Pitot Tube Coefficient          | 0.8230    | 0.8230    | 0.8230    |         |                        |
| Average Nozzle Diameter         | 0.311     | 0.311     | 0.311     |         | in                     |
| Stack Test Data                 | R-1 75%-1 | R-1 75%-2 | R-1 75%-3 | Average | Units                  |
| Initial Meter Volume            | 171.591   | 224.575   | 278.408   |         | ft <sup>3</sup>        |
| Final Meter Volume              | 224.305   | 278.151   | 332.354   |         | ft <sup>3</sup>        |
| Total Meter Volume              | 52.714    | 53.576    | 53.946    | 53.412  | ft <sup>3</sup>        |
| Total Sampling Time             | 90.00     | 90.00     | 90.00     | 90.00   | min                    |
| Average Meter Temperature       | 82.33     | 92.13     | 94.79     | 89.75   | °F                     |
| Average Stack Temperature       | 911.54    | 908.79    | 910.17    | 910.17  | °F                     |
| Barometric Pressure             | 29.89     | 29.90     | 29.86     | 29.88   | in Hg                  |
| Stack Static Pressure           | 0.21      | 0.21      | 0.21      | 0.21    | in H <sub>2</sub> O    |
| Absolute Stack Pressure         | 29.91     | 29.92     | 29.88     | 29.90   | in Hg                  |
| Average Orifice Pressure Drop   | 1.14      | 1.09      | 1.12      | 1.11    | in H <sub>2</sub> O    |
| Absolute Meter Pressure         | 30.02     | 30.03     | 29.99     | 30.02   | in Hg                  |
| Avg Square Root Pitot Pressure  | 0.60      | 0.59      | 0.60      | 0.60    | √(in H <sub>2</sub> O) |
| Moisture Content Data           | R-1 75%-1 | R-1 75%-2 | R-1 75%-3 | Average | Units                  |
| Impinger Water Weight Gain      | 168.90    | 161.90    | 157.20    | 162.67  | g                      |
| Silica Gel Weight Gain          | 9.20      | 9.70      | 11.10     | 10.00   | g                      |
| Total Water Volume Collected    | 178.42    | 171.91    | 168.60    | 172.98  | ml                     |
| Standard Water Vapor Volume     | 8.40      | 8.09      | 7.94      | 8.14    | scf                    |
| Standard Meter Volume           | 50.7      | 50.6      | 50.7      | 50.7    | dscf                   |
| Standard Metric Meter Volume    | 1.4       | 1.4       | 1.4       | 1.4     | dscm                   |
| Calculated Stack Moisture       | 14.21     | 13.78     | 13.54     | 13.85   | %                      |
| Saturated Stack Moisture        | 100.00    | 100.00    | 100.00    | 100.00  | %                      |
| Reported Stack Moisture Content | 14.21     | 13.78     | 13.54     | 13.85   | %                      |
| Gas Analysis Data               | R-1 75%-1 | R-1 75%-2 | R-1 75%-3 | Average | Units                  |
| Carbon Dioxide Content          | 6.6       | 6.5       | 6.7       | 6.6     | %                      |
| Oxygen Content                  | 9.0       | 9.0       | 8.9       | 8.9     | %                      |
| Carbon Monoxide Content         | 3.2       | 4.2       | 3.6       | 3.7     | ppm                    |
| Nitrogen Content                | 84.5      | 84.5      | 84.4      | 84.5    | %                      |
| Stack Dry Molecular Weight      | 29.41     | 29.41     | 29.42     | 29.41   | lb/lb-mole             |
| Stack Wet Molecular Weight      | 27.79     | 27.83     | 27.88     | 27.83   | lb/lb-mole             |
| Calculated Fuel Factor          | 1.819     | 1.823     | 1.796     | 1.813   |                        |
| Fuel F-Factor                   | 8632.09   | 8632.09   | 8632.09   | 8632.09 | dscf/MMBtu             |
| Percent Excess Air              | 67.1      | 67.1      | 67.0      | 67.1    | %                      |

# METHOD 5 (FRONT) AND 202 (BACK) - RESULTS

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| <b>Volumetric Flow Rate Data</b> | <b>R-1 75%-1</b> | <b>R-1 75%-2</b> | <b>R-1 75%-3</b> | <b>Average</b> | <b>Units</b> |
|----------------------------------|------------------|------------------|------------------|----------------|--------------|
| Average Stack Gas Velocity       | 53.86            | 53.62            | 53.76            | 53.75          | ft/sec       |
| Stack Cross-Sectional Area       | 5.54             | 5.54             | 5.54             | 5.54           | ft²          |
| Actual Stack Flow Rate           | 17,907           | 17,828           | 17,876           | 17,870         | acfm         |
| Wet Standard Stack Flow Rate     | 413              | 413              | 413              | 413            | wkscfh       |
| Dry Standard Stack Flow Rate     | 354,670          | 355,692          | 356,802          | 355,721        | dscfh        |
| Percent of Isokinetic Rate       | 100.0            | 99.5             | 99.4             | 99.6           | %            |
| <b>Gravimetric Analysis</b>      | <b>R-1 75%-1</b> | <b>R-1 75%-2</b> | <b>R-1 75%-3</b> | <b>Average</b> | <b>Units</b> |
| NH <sub>4</sub> OH Correction    | 0.0000           | 0.0000           | 0.0000           | 0.0000         | ml           |
| NH <sub>4</sub> OH Correction    | 0.0000           | 0.0000           | 0.0000           | 0.0000         | mg           |
| <b>Emission Rate Data</b>        | <b>R-1 75%-1</b> | <b>R-1 75%-2</b> | <b>R-1 75%-3</b> | <b>Average</b> | <b>Units</b> |
| Total PM Mass                    | 6.11             | 7.36             | 5.34             | 6.27           | mg           |
| Total PM Concentration           | 1.20E-04         | 1.45E-04         | 1.05E-04         | 1.24E-04       | g/dscf       |
|                                  | 1.86E-03         | 2.24E-03         | 1.63E-03         | 1.91E-03       | gr/dscf      |
| Total PM Emission Rate           | 0.04             | 0.05             | 0.04             | 0.04           | kg/hr        |
|                                  | 0.09             | 0.11             | 0.08             | 0.10           | lb/hr        |
|                                  | 0.41             | 0.50             | 0.36             | 0.43           | tpy          |
|                                  | 0.0040           | 0.0048           | 0.0035           | 0.0041         | lb/MMBtu     |
| Filterable PM Mass               | 4.31             | 5.91             | 3.89             | 4.70           | mg           |
| Filterable PM Concentration      | 8.50E-05         | 1.17E-04         | 7.68E-05         | 9.29E-05       | g/dscf       |
|                                  | 1.31E-03         | 1.80E-03         | 1.19E-03         | 1.43E-03       | gr/dscf      |
| Filterable PM Emission Rate      | 0.03             | 0.04             | 0.03             | 0.03           | kg/hr        |
|                                  | 0.07             | 0.09             | 0.06             | 0.07           | lb/hr        |
|                                  | 0.29             | 0.40             | 0.26             | 0.32           | tpy          |
|                                  | 0.0028           | 0.0039           | 0.0026           | 0.0031         | lb/MMBtu     |
| Condensable PM Mass              | 1.80             | 1.45             | 1.45             | 1.57           | mg           |
| Condensable PM Concentration     | 3.55E-05         | 2.86E-05         | 2.86E-05         | 3.09E-05       | g/dscf       |
|                                  | 5.48E-04         | 4.42E-04         | 4.42E-04         | 4.77E-04       | gr/dscf      |
| Condensable PM Emission Rate     | 0.01             | 0.01             | 0.01             | 0.01           | kg/hr        |
|                                  | 0.03             | 0.02             | 0.02             | 0.02           | lb/hr        |
|                                  | 0.12             | 0.10             | 0.10             | 0.11           | tpy          |
|                                  | 0.0012           | 0.0010           | 0.0010           | 0.0010         | lb/MMBtu     |



## **TEST RESULTS AND CALCULATIONS**

### **100% Load PM Emissions Data**

# METHOD 5 (FRONT) AND 202 (BACK) - RESULTS

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| Historical Data                 | R-1 100%-1 | R-1 100%-2 | R-1 100%-3 | Average | Units                  |
|---------------------------------|------------|------------|------------|---------|------------------------|
| Run Start Time                  | 09:36      | 12:05      | 14:24      |         | hh:mm                  |
| Run Stop Time                   | 11:17      | 13:44      | 16:05      |         | hh:mm                  |
| Test Date                       | 08/31/21   | 08/31/21   | 08/31/21   |         | mm/dd/yy               |
| Load                            | 100%       | 100%       | 100%       |         | % or w/DB              |
| Meter Calibration Factor        | 0.970      | 0.970      | 0.970      |         |                        |
| Pitot Tube Coefficient          | 0.8230     | 0.8230     | 0.8230     |         |                        |
| Average Nozzle Diameter         | 0.293      | 0.293      | 0.293      |         | in                     |
| Stack Test Data                 | R-1 100%-1 | R-1 100%-2 | R-1 100%-3 | Average | Units                  |
| Initial Meter Volume            | 921.610    | 984.410    | 48.125     |         | ft <sup>3</sup>        |
| Final Meter Volume              | 984.105    | 1046.875   | 110.390    |         | ft <sup>3</sup>        |
| Total Meter Volume              | 62.495     | 62.465     | 62.265     | 62.408  | ft <sup>3</sup>        |
| Total Sampling Time             | 90.00      | 90.00      | 90.00      | 90.00   | min                    |
| Average Meter Temperature       | 83.54      | 91.46      | 76.50      | 83.83   | °F                     |
| Average Stack Temperature       | 877.75     | 878.08     | 876.67     | 877.50  | °F                     |
| Barometric Pressure             | 29.72      | 29.71      | 29.66      | 29.70   | in Hg                  |
| Stack Static Pressure           | -0.36      | -0.36      | -0.36      | -0.36   | in H <sub>2</sub> O    |
| Absolute Stack Pressure         | 29.69      | 29.68      | 29.63      | 29.67   | in Hg                  |
| Average Orifice Pressure Drop   | 1.41       | 1.43       | 1.47       | 1.43    | in H <sub>2</sub> O    |
| Absolute Meter Pressure         | 29.85      | 29.84      | 29.79      | 29.83   | in Hg                  |
| Avg Square Root Pitot Pressure  | 0.76       | 0.76       | 0.76       | 0.76    | √(in H <sub>2</sub> O) |
| Moisture Content Data           | R-1 100%-1 | R-1 100%-2 | R-1 100%-3 | Average | Units                  |
| Impinger Water Weight Gain      | 189.10     | 184.70     | 233.10     | 202.30  | g                      |
| Silica Gel Weight Gain          | 15.10      | 15.60      | 15.30      | 15.33   | g                      |
| Total Water Volume Collected    | 204.57     | 200.66     | 248.85     | 218.03  | ml                     |
| Standard Water Vapor Volume     | 9.63       | 9.44       | 11.71      | 10.26   | scf                    |
| Standard Meter Volume           | 58.7       | 57.8       | 59.1       | 58.5    | dscf                   |
| Standard Metric Meter Volume    | 1.7        | 1.6        | 1.7        | 1.7     | dscm                   |
| Calculated Stack Moisture       | 14.09      | 14.04      | 16.53      | 14.89   | %                      |
| Saturated Stack Moisture        | 100.00     | 100.00     | 100.00     | 100.00  | %                      |
| Reported Stack Moisture Content | 14.09      | 14.04      | 16.53      | 14.89   | %                      |
| Gas Analysis Data               | R-1 100%-1 | R-1 100%-2 | R-1 100%-3 | Average | Units                  |
| Carbon Dioxide Content          | 6.8        | 6.6        | 6.6        | 6.7     | %                      |
| Oxygen Content                  | 8.6        | 9.1        | 9.1        | 8.9     | %                      |
| Carbon Monoxide Content         | 4.4        | 2.2        | 2.2        | 2.9     | ppm                    |
| Nitrogen Content                | 84.6       | 84.4       | 84.4       | 84.4    | %                      |
| Stack Dry Molecular Weight      | 29.44      | 29.41      | 29.41      | 29.42   | lb/lb-mole             |
| Stack Wet Molecular Weight      | 27.82      | 27.81      | 27.53      | 27.72   | lb/lb-mole             |
| Calculated Fuel Factor          | 1.800      | 1.800      | 1.800      | 1.800   |                        |
| Fuel F-Factor                   | 8631.42    | 8631.42    | 8631.42    | 8631.42 | dscf/MMBtu             |
| Percent Excess Air              | 63.2       | 68.6       | 68.6       | 66.8    | %                      |

# METHOD 5 (FRONT) AND 202 (BACK) - RESULTS

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| <b>Volumetric Flow Rate Data</b> | <b>R-1 100%-1</b> | <b>R-1 100%-2</b> | <b>R-1 100%-3</b> | <b>Average</b> | <b>Units</b> |
|----------------------------------|-------------------|-------------------|-------------------|----------------|--------------|
| Average Stack Gas Velocity       | 68.00             | 68.19             | 68.64             | 68.28          | ft/sec       |
| Stack Cross-Sectional Area       | 5.54              | 5.54              | 5.54              | 5.54           | ft²          |
| Actual Stack Flow Rate           | 22,611            | 22,673            | 22,821            | 22,702         | acfm         |
| Wet Standard Stack Flow Rate     | 531               | 533               | 536               | 533            | wkscfh       |
| Dry Standard Stack Flow Rate     | 456,526           | 457,773           | 447,146           | 453,815        | dscfh        |
| Percent of Isokinetic Rate       | 102.0             | 99.9              | 104.6             | 102.2          | %            |
| <b>Gravimetric Analysis</b>      | <b>R-1 100%-1</b> | <b>R-1 100%-2</b> | <b>R-1 100%-3</b> | <b>Average</b> | <b>Units</b> |
| NH <sub>4</sub> OH Correction    | 0.0000            | 0.0000            | 0.0000            | 0.0000         | ml           |
| NH <sub>4</sub> OH Correction    | 0.0000            | 0.0000            | 0.0000            | 0.0000         | mg           |
| <b>Emission Rate Data</b>        | <b>R-1 100%-1</b> | <b>R-1 100%-2</b> | <b>R-1 100%-3</b> | <b>Average</b> | <b>Units</b> |
| Total PM Mass                    | 6.05              | 1.64              | 2.75              | 3.48           | mg           |
| Total PM Concentration           | 1.03E-04          | 2.84E-05          | 4.65E-05          | 5.93E-05       | g/dscf       |
|                                  | 1.59E-03          | 4.38E-04          | 7.18E-04          | 9.15E-04       | gr/dscf      |
| Total PM Emission Rate           | 0.05              | 0.01              | 0.02              | 0.03           | kg/hr        |
|                                  | 0.10              | 0.03              | 0.05              | 0.06           | lb/hr        |
|                                  | 0.45              | 0.13              | 0.20              | 0.26           | tpy          |
|                                  | 0.0033            | 0.0010            | 0.0016            | 0.0020         | lb/MMBtu     |
| Filterable PM Mass               | 3.60              | 1.05              | 0.00              | 1.55           | mg           |
| Filterable PM Concentration      | 6.13E-05          | 1.82E-05          | 0.00E+00          | 2.65E-05       | g/dscf       |
|                                  | 9.46E-04          | 2.80E-04          | 0.00E+00          | 4.09E-04       | gr/dscf      |
| Filterable PM Emission Rate      | 0.03              | 0.01              | 0.00              | 0.01           | kg/hr        |
|                                  | 0.06              | 0.02              | 0.00              | 0.03           | lb/hr        |
|                                  | 0.27              | 0.08              | 0.00              | 0.12           | tpy          |
|                                  | 0.0020            | 0.0006            | 0.0000            | 0.0009         | lb/MMBtu     |
| Condensable PM Mass              | 2.45              | 0.59              | 2.75              | 1.93           | mg           |
| Condensable PM Concentration     | 4.17E-05          | 1.02E-05          | 4.65E-05          | 3.28E-05       | g/dscf       |
|                                  | 6.44E-04          | 1.58E-04          | 7.18E-04          | 5.06E-04       | gr/dscf      |
| Condensable PM Emission Rate     | 0.02              | 0.00              | 0.02              | 0.01           | kg/hr        |
|                                  | 0.04              | 0.01              | 0.05              | 0.03           | lb/hr        |
|                                  | 0.18              | 0.05              | 0.20              | 0.14           | tpy          |
|                                  | 0.0014            | 0.0003            | 0.0016            | 0.0011         | lb/MMBtu     |

**APPENDIX B**

**EMISSION DATA RECORDS**

## **EMISSION DATA RECORDS**

**Operating Data**  
**(provided by Catalytic Combustion Corporation)**

# Catalytic Combustion Corporation

|                                      |                                         |
|--------------------------------------|-----------------------------------------|
| <b>Plant Name or Location:</b>       | Stewart & Stevenson Integration Center  |
| <b>Project Number:</b>               | catc-21-houston.tx-start#1              |
| <b>Manufacturer &amp; Equipment:</b> | Caterpillar                             |
| <b>Model:</b>                        | G3520 TALE                              |
| <b>Test Load:</b>                    | multiple                                |
| <b>Tester(s) / Test Unit(s):</b>     | C. King / P. McGovern / J. Wolrab / 217 |

|                            |                   | RUN      |          |          |          |          |          |          |          |          |
|----------------------------|-------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|                            | UNITS             | 1-1      | 1-2      | 1-3      | 2-1      | 2-2      | 2-3      | 3-1      | 3-2      | 3-3      |
| <b>Start Time</b>          | hh:mm:ss          | 09:34:23 | 12:05:23 | 14:23:23 | 13:45:23 | 15:00:23 | 16:27:23 | 09:23:57 | 10:26:27 | 12:03:27 |
| <b>End Time</b>            | hh:mm:ss          | 10:33:53 | 13:04:53 | 15:22:53 | 14:44:53 | 15:59:53 | 17:26:53 | 10:25:57 | 12:02:57 | 13:06:27 |
| <b>Bar. Pressure</b>       | in. Hg            | 29.90    | 29.90    | 29.84    | 29.89    | 29.87    | 29.85    | 29.73    | 29.73    | 29.74    |
| <b>Amb. Temp.</b>          | °F                | 98       | 99       | 96       | 94       | 97       | 97       | 88       | 93       | 95       |
| <b>Rel. Humidity</b>       | %                 | 53       | 49       | 49       | 53       | 47       | 42       | 70       | 57       | 46       |
| <b>Spec. Humidity</b>      | lb water / lb air | 0.020978 | 0.019455 | 0.018009 | 0.018296 | 0.017841 | 0.015856 | 0.020202 | 0.019207 | 0.016410 |
| <b>Date</b>                | mm/dd/yy          | 07/29/21 | 07/29/21 | 07/29/21 | 07/30/21 | 07/30/21 | 07/30/21 | 09/01/21 | 09/01/21 | 09/02/21 |
| <b>Load Designator</b>     |                   | 50%      | 50%      | 50%      | 75%      | 75%      | 75%      | 100%     | 100%     | 100%     |
| <b>Engine Fuel Flow</b>    | SCFH              | 14,625   | 14,511   | 14,541   | 20,603   | 20,591   | 20,172   | 26,278   | 26,278   | 26,278   |
| <b>Stack Moisture</b>      | % Method 320      | 14.41    | 14.43    | 14.39    | 13.91    | 13.86    | 13.59    | 13.64    | 12.89    | 13.03    |
| <b>Power Output</b>        | horsepower        | 1,810.4  | 1,813.0  | 1,810.4  | 2,691.4  | 2,698.1  | 2,616.3  | 3,598.0  | 3,598.0  | 3,598.0  |
| <b>Air Manifold Press.</b> | psia              | 25.20    | 25.40    | 25.30    | 36.80    | 36.70    | 35.60    | 473.00   | 473.00   | 473.00   |
| <b>Air Manifold Temp.</b>  | F                 | 122.00   | 122.00   | 124.00   | 131.00   | 131.00   | 129.00   | 136.00   | 136.00   | 136.00   |
| <b>Engine Speed</b>        | rpm               | 1,799.00 | 1,799.00 | 1,800.00 | 1,800.00 | 1,800.00 | 1,800.00 | 1,800.00 | 1,800.00 | 1,800.00 |
| <b>Actual Power</b>        | kW                | 1,350.00 | 1,352.00 | 1,350.00 | 2,007.00 | 2,012.00 | 1,951.00 | 2,613.00 | 2,613.00 | 2,613.00 |
| <b>Amperes</b>             | A                 | 56.00    | 57.00    | 56.00    | 89.00    | 90.00    | 97.00    | 109.00   | 109.00   | 109.00   |
| <b>Engine Timing</b>       | BTDC              | 23.00    | 23.00    | 23.00    | 23.00    | 23.00    | 23.00    | 22.00    | 22.00    | 22.00    |

-Brake horsepower available from engine panel and/or site personnel.

Created with Comp&RATA&Eng-AHI v20210331

## **EMISSION DATA RECORDS**

**50% Load**

**NO<sub>x</sub>, CO, THC, N<sub>2</sub>O, C<sub>2</sub>H<sub>4</sub>O, NH<sub>3</sub>, HCHO, CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, and H<sub>2</sub>O**  
**Reference Method Data**

Catalytic Combustion Corporation  
July 29, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

Fuel Data

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 14.625 | SCFH          |

Weather Data

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.90    | in. Hg                       |
| Relative Humidity   | 53       | %                            |
| Ambient Temperature | 98       | °F                           |
| Specific Humidity   | 0.020978 | lb H <sub>2</sub> O / lb air |

Unit Data

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 1,810.4 | horsepower |
| Meas. Stack Moisture     | 14.4    | %          |
| Stack Exhaust Flow (M19) | 215,406 | SCFH       |

50% Load, Run - 1-1

| Date/Time<br>(mm/dd/yyyy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vvd) | NOx<br>(ppmw) | CO<br>(ppmw) | THC (as C <sub>2</sub> H <sub>6</sub> )<br>(ppmw) | CO <sub>2</sub><br>(%vvd) | N <sub>2</sub> O<br>(ppmw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmw) | NO<br>(ppmw) | NO <sub>2</sub><br>(ppmw) | NH <sub>3</sub><br>(ppmw) | HCHO<br>(ppmw) | CH <sub>4</sub><br>(ppmw) | C <sub>2</sub> H <sub>6</sub><br>(ppmw) | H <sub>2</sub> O<br>(%) |
|------------------------------------|---------------------------|--------------------------|---------------|--------------|---------------------------------------------------|---------------------------|----------------------------|-------------------------------------------|--------------|---------------------------|---------------------------|----------------|---------------------------|-----------------------------------------|-------------------------|
| 07/29/21 09:34:23                  | 64260                     | 8.64                     | 7.86          | 5.26         | 154.78                                            | 5.81                      | 1.26                       | 0.25                                      | 7.86         | 0.00                      | 0.62                      | 0.06           | 412.89                    | 0.43                                    | 13.81                   |
| 07/29/21 09:34:53                  | 64290                     | 8.65                     | 7.74          | 5.30         | 155.11                                            | 5.79                      | 1.21                       | 0.44                                      | 7.74         | 0.00                      | 0.64                      | 0.10           | 411.55                    | 0.56                                    | 14.08                   |
| 07/29/21 09:35:23                  | 64320                     | 8.65                     | 7.58          | 5.22         | 154.88                                            | 5.75                      | 1.29                       | 0.43                                      | 7.58         | 0.00                      | 0.63                      | 0.09           | 410.71                    | 0.57                                    | 14.48                   |
| 07/29/21 09:35:53                  | 64350                     | 8.64                     | 7.82          | 5.31         | 155.59                                            | 5.81                      | 1.28                       | 0.48                                      | 7.82         | 0.00                      | 0.60                      | 0.09           | 411.45                    | 0.58                                    | 13.77                   |
| 07/29/21 09:36:23                  | 64380                     | 8.66                     | 7.59          | 5.21         | 156.36                                            | 5.80                      | 1.29                       | 0.17                                      | 7.59         | 0.00                      | 0.62                      | 0.02           | 413.14                    | 0.39                                    | 13.89                   |
| 07/29/21 09:36:53                  | 64410                     | 8.67                     | 7.66          | 5.22         | 154.14                                            | 5.72                      | 1.23                       | 0.58                                      | 7.66         | 0.00                      | 0.59                      | 0.16           | 407.82                    | 0.41                                    | 14.77                   |
| 07/29/21 09:37:23                  | 64440                     | 8.67                     | 7.60          | 5.33         | 155.38                                            | 5.80                      | 1.28                       | 0.69                                      | 7.60         | 0.00                      | 0.59                      | 0.10           | 413.59                    | 0.41                                    | 13.93                   |
| 07/29/21 09:37:53                  | 64470                     | 8.68                     | 7.65          | 5.30         | 158.32                                            | 5.85                      | 1.29                       | 0.25                                      | 7.65         | 0.00                      | 0.57                      | 0.03           | 418.84                    | 0.54                                    | 13.40                   |
| 07/29/21 09:38:23                  | 64500                     | 8.66                     | 8.33          | 5.33         | 157.36                                            | 5.91                      | 1.29                       | 0.53                                      | 8.32         | 0.01                      | 0.58                      | 0.00           | 418.45                    | 0.50                                    | 12.81                   |
| 07/29/21 09:38:53                  | 64530                     | 8.67                     | 7.37          | 5.20         | 155.95                                            | 5.74                      | 1.27                       | 0.66                                      | 7.37         | 0.00                      | 0.60                      | 0.09           | 413.16                    | 0.60                                    | 14.45                   |
| 07/29/21 09:39:23                  | 64560                     | 8.67                     | 7.57          | 5.27         | 157.13                                            | 5.84                      | 1.32                       | 0.51                                      | 7.57         | 0.00                      | 0.57                      | 0.03           | 417.11                    | 0.56                                    | 13.50                   |
| 07/29/21 09:39:53                  | 64590                     | 8.66                     | 7.52          | 5.27         | 156.37                                            | 5.82                      | 1.32                       | 0.08                                      | 7.52         | 0.00                      | 0.54                      | 0.06           | 414.39                    | 0.44                                    | 13.72                   |
| 07/29/21 09:40:23                  | 64620                     | 8.66                     | 7.53          | 5.28         | 157.35                                            | 5.85                      | 1.32                       | -0.02                                     | 7.53         | 0.00                      | 0.56                      | 0.15           | 417.90                    | 0.47                                    | 13.41                   |
| 07/29/21 09:40:53                  | 64650                     | 8.65                     | 7.27          | 5.24         | 156.81                                            | 5.80                      | 1.34                       | 0.28                                      | 7.27         | 0.00                      | 0.57                      | 0.08           | 415.08                    | 0.60                                    | 13.89                   |
| 07/29/21 09:41:23                  | 64680                     | 8.66                     | 6.98          | 5.23         | 153.86                                            | 5.64                      | 1.29                       | 0.37                                      | 6.98         | 0.00                      | 0.58                      | 0.13           | 406.46                    | 0.53                                    | 15.59                   |
| 07/29/21 09:41:53                  | 64710                     | 8.66                     | 6.98          | 5.24         | 155.66                                            | 5.72                      | 1.29                       | 0.41                                      | 6.98         | 0.00                      | 0.55                      | 0.09           | 411.26                    | 0.51                                    | 14.77                   |
| 07/29/21 09:42:23                  | 64740                     | 8.66                     | 7.08          | 5.29         | 155.72                                            | 5.74                      | 1.29                       | 0.39                                      | 7.08         | 0.00                      | 0.58                      | 0.07           | 412.49                    | 0.52                                    | 14.72                   |
| 07/29/21 09:42:53                  | 64770                     | 8.65                     | 7.42          | 5.35         | 154.90                                            | 5.79                      | 1.27                       | 0.25                                      | 7.42         | 0.00                      | 0.57                      | 0.09           | 412.41                    | 0.45                                    | 14.19                   |
| 07/29/21 09:43:23                  | 64800                     | 8.65                     | 7.46          | 5.21         | 156.74                                            | 5.80                      | 1.30                       | 0.38                                      | 7.46         | 0.00                      | 0.52                      | 0.11           | 414.00                    | 0.47                                    | 13.82                   |
| 07/29/21 09:43:53                  | 64830                     | 8.65                     | 7.85          | 5.23         | 156.47                                            | 5.84                      | 1.34                       | 0.58                                      | 7.85         | 0.00                      | 0.55                      | 0.08           | 415.90                    | 0.48                                    | 13.49                   |
| 07/29/21 09:44:23                  | 64860                     | 8.65                     | 7.19          | 5.23         | 155.54                                            | 5.69                      | 1.27                       | 0.05                                      | 7.19         | 0.00                      | 0.54                      | 0.03           | 410.51                    | 0.64                                    | 14.97                   |
| 07/29/21 09:44:53                  | 64890                     | 8.65                     | 7.27          | 5.29         | 156.10                                            | 5.83                      | 1.33                       | 0.31                                      | 7.27         | 0.00                      | 0.53                      | 0.02           | 415.84                    | 0.46                                    | 13.68                   |
| 07/29/21 09:45:23                  | 64920                     | 8.65                     | 7.64          | 5.32         | 156.06                                            | 5.83                      | 1.32                       | 0.72                                      | 7.64         | 0.00                      | 0.52                      | 0.05           | 414.28                    | 0.69                                    | 13.67                   |
| 07/29/21 09:45:53                  | 64950                     | 8.66                     | 7.76          | 5.18         | 151.33                                            | 5.56                      | 1.23                       | 0.62                                      | 7.76         | 0.00                      | 0.57                      | 0.31           | 400.48                    | 0.53                                    | 16.76                   |
| 07/29/21 09:46:23                  | 64980                     | 8.66                     | 7.68          | 5.36         | 156.15                                            | 5.82                      | 1.33                       | 0.51                                      | 7.68         | 0.00                      | 0.53                      | 0.10           | 413.91                    | 0.58                                    | 13.79                   |
| 07/29/21 09:46:53                  | 65010                     | 8.66                     | 7.94          | 5.41         | 156.70                                            | 5.85                      | 1.37                       | 0.73                                      | 7.94         | 0.00                      | 0.53                      | 0.15           | 415.92                    | 0.52                                    | 13.53                   |
| 07/29/21 09:47:23                  | 65040                     | 8.67                     | 7.41          | 5.26         | 156.29                                            | 5.75                      | 1.31                       | 0.21                                      | 7.41         | 0.00                      | 0.53                      | 0.06           | 413.46                    | 0.51                                    | 14.44                   |
| 07/29/21 09:47:53                  | 65070                     | 8.66                     | 7.54          | 5.38         | 157.28                                            | 5.79                      | 1.32                       | 0.48                                      | 7.54         | 0.00                      | 0.52                      | 0.10           | 416.22                    | 0.52                                    | 13.93                   |
| 07/29/21 09:48:23                  | 65100                     | 8.65                     | 7.31          | 5.35         | 155.73                                            | 5.78                      | 1.31                       | 0.51                                      | 7.31         | 0.00                      | 0.52                      | 0.10           | 413.92                    | 0.53                                    | 14.18                   |
| 07/29/21 09:48:53                  | 65130                     | 8.67                     | 7.54          | 5.24         | 152.05                                            | 5.65                      | 1.26                       | 0.43                                      | 7.54         | 0.00                      | 0.57                      | 0.16           | 404.25                    | 0.36                                    | 16.05                   |
| 07/29/21 09:49:23                  | 65160                     | 8.67                     | 6.93          | 5.25         | 155.15                                            | 5.72                      | 1.29                       | 0.31                                      | 6.93         | 0.00                      | 0.51                      | 0.08           | 412.31                    | 0.52                                    | 14.72                   |
| 07/29/21 09:49:53                  | 65190                     | 8.67                     | 7.61          | 5.24         | 157.01                                            | 5.79                      | 1.34                       | 0.26                                      | 7.61         | 0.00                      | 0.51                      | 0.01           | 414.69                    | 0.55                                    | 14.03                   |
| 07/29/21 09:50:23                  | 65220                     | 8.67                     | 7.36          | 5.25         | 158.02                                            | 5.80                      | 1.36                       | 0.36                                      | 7.36         | 0.00                      | 0.50                      | 0.07           | 417.65                    | 0.35                                    | 13.99                   |
| 07/29/21 09:50:53                  | 65250                     | 8.67                     | 7.17          | 5.11         | 152.90                                            | 5.63                      | 1.29                       | 0.39                                      | 7.17         | 0.00                      | 0.55                      | 0.21           | 405.00                    | 0.39                                    | 16.22                   |
| 07/29/21 09:51:23                  | 65280                     | 8.67                     | 7.26          | 5.24         | 156.56                                            | 5.76                      | 1.31                       | 0.53                                      | 7.26         | 0.00                      | 0.49                      | 0.02           | 414.46                    | 0.46                                    | 14.34                   |
| 07/29/21 09:51:53                  | 65310                     | 8.68                     | 7.53          | 5.27         | 157.12                                            | 5.80                      | 1.37                       | 0.58                                      | 7.53         | 0.00                      | 0.52                      | 0.03           | 415.96                    | 0.49                                    | 13.91                   |
| 07/29/21 09:52:23                  | 65340                     | 8.68                     | 7.31          | 5.25         | 155.62                                            | 5.76                      | 1.39                       | 0.56                                      | 7.31         | 0.00                      | 0.49                      | 0.10           | 413.86                    | 0.40                                    | 14.28                   |
| 07/29/21 09:52:53                  | 65370                     | 8.69                     | 6.93          | 5.01         | 152.16                                            | 5.46                      | 1.26                       | 0.51                                      | 6.93         | 0.00                      | 0.55                      | 0.30           | 400.23                    | 0.53                                    | 17.60                   |
| 07/29/21 09:53:23                  | 65400                     | 8.68                     | 6.93          | 5.25         | 157.83                                            | 5.74                      | 1.33                       | 0.00                                      | 6.93         | 0.00                      | 0.49                      | 0.00           | 416.19                    | 0.63                                    | 14.47                   |
| 07/29/21 09:53:53                  | 65430                     | 8.67                     | 6.42          | 5.22         | 156.91                                            | 5.65                      | 1.30                       | 0.40                                      | 6.42         | 0.00                      | 0.49                      | 0.20           | 413.78                    | 0.51                                    | 15.42                   |
| 07/29/21 09:54:23                  | 65460                     | 8.67                     | 6.94          | 5.06         | 152.99                                            | 5.49                      | 1.26                       | 0.48                                      | 6.94         | 0.00                      | 0.56                      | 0.24           | 402.97                    | 0.43                                    | 17.51                   |
| 07/29/21 09:54:53                  | 65490                     | 8.67                     | 6.91          | 5.17         | 157.38                                            | 5.74                      | 1.34                       | 0.26                                      | 6.91         | 0.00                      | 0.51                      | 0.07           | 416.00                    | 0.45                                    | 14.44                   |
| 07/29/21 09:55:23                  | 65520                     | 8.67                     | 6.85          | 5.16         | 156.86                                            | 5.70                      | 1.32                       | 0.58                                      | 6.85         | 0.00                      | 0.49                      | 0.02           | 413.18                    | 0.33                                    | 14.89                   |
| 07/29/21 09:55:53                  | 65550                     | 8.67                     | 6.90          | 5.07         | 153.00                                            | 5.63                      | 1.28                       | 0.31                                      | 6.90         | 0.00                      | 0.51                      | 0.19           | 406.91                    | 0.42                                    | 16.15                   |
| 07/29/21 09:56:23                  | 65580                     | 8.66                     | 6.69          | 5.24         | 155.68                                            | 5.68                      | 1.32                       | 0.43                                      | 6.69         | 0.00                      | 0.48                      | 0.08           | 412.23                    | 0.37                                    | 15.24                   |
| 07/29/21 09:56:53                  | 65610                     | 8.67                     | 6.97          | 5.09         | 152.57                                            | 5.60                      | 1.28                       | 0.43                                      | 6.97         | 0.00                      | 0.53                      | 0.13           | 404.35                    | 0.34                                    | 16.62                   |
| 07/29/21 09:57:23                  | 65640                     | 8.66                     | 6.58          | 5.28         | 155.53                                            | 5.66                      | 1.34                       | 0.44                                      | 6.58         | 0.00                      | 0.49                      | 0.13           | 412.16                    | 0.52                                    | 15.34                   |
| 07/29/21 09:57:53                  | 65670                     | 8.67                     | 6.36          | 5.22         | 156.76                                            | 5.66                      | 1.31                       | 0.41                                      | 6.36         | 0.00                      | 0.49                      | 0.11           | 413.16                    | 0.58                                    | 15.30                   |
| 07/29/21 09:58:23                  | 65700                     | 8.66                     | 6.58          | 5.21         | 154.91                                            | 5.65                      | 1.26                       | 0.40                                      | 6.58         | 0.00                      | 0.49                      | 0.06           | 408.84                    | 0.50                                    | 15.58                   |
| 07/29/21 09:58:53                  | 65730                     | 8.67                     | 7.30          | 5.03         | 153.53                                            | 5.68                      | 1.30                       | 0.57                                      | 7.30         | 0.00                      | 0.52                      | 0.07           | 407.78                    | 0.38                                    | 15.67                   |
| 07/29/21 09:59:23                  | 65760                     | 8.66                     | 7.43          | 5.20         | 153.92                                            | 5.68                      | 1.33                       | 0.57                                      | 7.43         | 0.00                      | 0.53                      | 0.03           | 408.27                    | 0.34                                    | 15.67                   |
| 07/29/21 09:59:53                  | 65790                     | 8.67                     | 6.87          | 5.30         | 155.32                                            | 5.67                      | 1.33                       | 0.48                                      | 6.87         | 0.00                      | 0.47                      | 0.13           | 410.96                    | 0.46                                    | 15.29                   |
| 07/29/21 10:00:23                  | 65820                     | 8.67                     | 6.83          | 5.20         | 157.56                                            | 5.72                      | 1.31                       | 0.27                                      | 6.83         | 0.00                      | 0.48                      | 0.15           | 414.63                    | 0.64                                    | 14.74                   |
| 07/29/21 10:00:53                  | 65850                     | 8.67                     | 7.35          | 5.25         | 157.37                                            | 5.81                      | 1.40                       | 0.33                                      | 7.35         | 0.00                      | 0.47                      | 0.07           | 417.59                    | 0.57                                    | 13.78                   |
| 07/29/21 10:01:23                  | 65880                     | 8.67                     | 7.53          | 5.26         | 159.10                                            | 5.89                      | 1.43                       | 0.62                                      | 7.53         | 0.00                      | 0.44                      | 0.06           | 422.35                    | 0.44                                    | 12.91                   |
| 07/29/21 10:01:53                  | 65910                     | 8.67                     | 7.14          | 5.38         | 159.41                                            | 5.88                      | 1.45                       | 0.12                                      | 7.14         | 0.00                      | 0.44                      | -0.02          | 424.89                    | 0.46                                    | 12.44                   |
| 07/29/21 10:02:23                  | 65940                     | 8.69                     | 7.37          | 5.33         | 160.28                                            | 5.90                      | 1.45                       | 0.38                                      | 7.37         | 0.00                      | 0.41                      | 0.07           | 425.29                    | 0.58                                    | 12.09                   |
| 07/29/21 10:02:53                  | 65970                     | 8.70                     | 7.13          | 5.17         | 157.58                                            | 5.85                      | 1.42                       | 0.66                                      | 7.13         | 0.00                      | 0.42                      | 0.02           | 419.90                    | 0.43                                    | 13.24                   |
| 07/29/21 10:03:23                  | 66000                     | 8.69                     | 7.10          | 5.14         | 157.75                                            | 5.79                      | 1.41                       | 0.62                                      | 7.10         | 0.00                      | 0.42                      | 0.06           | 419.81                    | 0.51                                    | 13.73                   |
| 07/29/21 10:03:53                  | 66030                     | 8.69                     | 7.15          | 5.23         | 157.78                                            | 5.79                      | 1.40                       | 0.52                                      | 7.15         | 0.00                      | 0.42                      | 0.21           | 418.35                    | 0.33                                    | 13.67                   |
| 07/29/21 10:04:23                  | 66060                     | 8.69                     | 7.44          | 5.21         | 157.72                                            | 5.80                      | 1.43                       | 0.49                                      | 7.44         | 0.00                      | 0.39                      | 0.08           | 419.66                    | 0.62                                    | 13.52                   |
| 07/29/21 10:04:53                  | 66090                     | 8.70                     | 6.64          | 5.17         | 157.56                                            | 5.71                      | 1.42                       | 0.22                                      | 6.64         | 0.00                      | 0.44                      | 0.13           | 4                         |                                         |                         |



Catalytic Combustion Corporation  
July 29, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

**Fuel Data**

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 14.625 | SCFH          |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.90    | in. Hg                       |
| Relative Humidity   | 53       | %                            |
| Ambient Temperature | 98       | °F                           |
| Specific Humidity   | 0.020978 | lb H <sub>2</sub> O / lb air |

**Unit Data**

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 1,810.4 | horsepower |
| Meas. Stack Moisture     | 14.4    | %          |
| Stack Exhaust Flow (M19) | 215,406 | SCFH       |

50% Load, Run - 1-1

| Date/Time<br>(mm/dd/yy hh:mm:ss)                                                                                                                                                                                  | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vvd) | NOx<br>(ppmvw) | CO<br>(ppmvw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | CO <sub>2</sub><br>(%vvd) | N <sub>2</sub> O<br>(ppmvw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmvw) | NO<br>(ppmvw) | NO <sub>2</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) | HCHO<br>(ppmvw) | CH <sub>4</sub><br>(ppmvw) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------|----------------|---------------|----------------------------------------------------|---------------------------|-----------------------------|--------------------------------------------|---------------|----------------------------|----------------------------|-----------------|----------------------------|------------------------------------------|-------------------------|
| 07/29/21 10:24:23                                                                                                                                                                                                 | 67260                     | 8.71                     | 7.08           | 5.07          | 156.27                                             | 5.64                      | 1.39                        | 0.47                                       | 7.08          | 0.00                       | 0.39                       | 0.17            | 413.62                     | 0.50                                     | 15.82                   |
| 07/29/21 10:24:53                                                                                                                                                                                                 | 67290                     | 8.72                     | 6.60           | 5.11          | 160.35                                             | 5.81                      | 1.44                        | 0.56                                       | 6.60          | 0.00                       | 0.37                       | 0.04            | 426.11                     | 0.47                                     | 13.57                   |
| 07/29/21 10:25:23                                                                                                                                                                                                 | 67320                     | 8.71                     | 6.65           | 5.08          | 159.82                                             | 5.78                      | 1.45                        | 0.26                                       | 6.65          | 0.00                       | 0.36                       | 0.02            | 423.42                     | 0.50                                     | 13.83                   |
| 07/29/21 10:25:53                                                                                                                                                                                                 | 67350                     | 8.72                     | 6.28           | 5.07          | 157.14                                             | 5.66                      | 1.42                        | 0.56                                       | 6.28          | 0.00                       | 0.38                       | 0.09            | 415.31                     | 0.52                                     | 15.27                   |
| 07/29/21 10:26:23                                                                                                                                                                                                 | 67380                     | 8.74                     | 5.86           | 5.08          | 157.56                                             | 5.62                      | 1.41                        | 0.57                                       | 5.86          | 0.00                       | 0.37                       | 0.12            | 416.39                     | 0.48                                     | 15.59                   |
| 07/29/21 10:26:53                                                                                                                                                                                                 | 67410                     | 8.72                     | 6.63           | 4.96          | 156.44                                             | 5.65                      | 1.37                        | 0.43                                       | 6.63          | 0.00                       | 0.41                       | 0.10            | 413.82                     | 0.45                                     | 15.79                   |
| 07/29/21 10:27:23                                                                                                                                                                                                 | 67440                     | 8.73                     | 5.97           | 4.86          | 153.01                                             | 5.40                      | 1.33                        | 0.37                                       | 5.97          | 0.00                       | 0.43                       | 0.15            | 403.75                     | 0.55                                     | 18.18                   |
| 07/29/21 10:27:53                                                                                                                                                                                                 | 67470                     | 8.75                     | 6.32           | 5.09          | 158.31                                             | 5.65                      | 1.41                        | 0.08                                       | 6.32          | 0.00                       | 0.39                       | 0.11            | 417.51                     | 0.64                                     | 15.24                   |
| 07/29/21 10:28:23                                                                                                                                                                                                 | 67500                     | 8.75                     | 6.48           | 5.11          | 160.05                                             | 5.72                      | 1.44                        | 0.44                                       | 6.48          | 0.00                       | 0.37                       | 0.13            | 423.17                     | 0.54                                     | 14.46                   |
| 07/29/21 10:28:53                                                                                                                                                                                                 | 67530                     | 8.73                     | 6.34           | 5.05          | 161.20                                             | 5.77                      | 1.47                        | 0.59                                       | 6.34          | 0.00                       | 0.36                       | 0.07            | 425.53                     | 0.41                                     | 13.89                   |
| 07/29/21 10:29:23                                                                                                                                                                                                 | 67560                     | 8.75                     | 6.88           | 5.09          | 161.83                                             | 5.81                      | 1.48                        | 0.66                                       | 6.88          | 0.00                       | 0.33                       | 0.10            | 427.71                     | 0.60                                     | 13.43                   |
| 07/29/21 10:29:53                                                                                                                                                                                                 | 67590                     | 8.75                     | 6.79           | 5.07          | 160.96                                             | 5.83                      | 1.46                        | 0.38                                       | 6.79          | 0.00                       | 0.35                       | 0.12            | 428.39                     | 0.50                                     | 13.22                   |
| 07/29/21 10:30:23                                                                                                                                                                                                 | 67620                     | 8.74                     | 6.66           | 5.05          | 161.91                                             | 5.85                      | 1.50                        | 0.59                                       | 6.66          | 0.00                       | 0.37                       | -0.02           | 430.14                     | 0.45                                     | 13.16                   |
| 07/29/21 10:30:53                                                                                                                                                                                                 | 67650                     | 8.74                     | 6.77           | 5.01          | 160.93                                             | 5.84                      | 1.50                        | 0.51                                       | 6.77          | 0.00                       | 0.34                       | 0.03            | 428.55                     | 0.66                                     | 13.37                   |
| 07/29/21 10:31:23                                                                                                                                                                                                 | 67680                     | 8.74                     | 6.20           | 5.05          | 160.09                                             | 5.76                      | 1.44                        | 0.66                                       | 6.20          | 0.00                       | 0.35                       | 0.01            | 426.08                     | 0.56                                     | 13.99                   |
| 07/29/21 10:31:53                                                                                                                                                                                                 | 67710                     | 8.74                     | 6.02           | 4.99          | 158.94                                             | 5.70                      | 1.42                        | 0.36                                       | 6.02          | 0.00                       | 0.33                       | 0.09            | 422.59                     | 0.65                                     | 14.59                   |
| 07/29/21 10:32:23                                                                                                                                                                                                 | 67740                     | 8.73                     | 6.44           | 4.96          | 160.40                                             | 5.76                      | 1.43                        | 0.62                                       | 6.44          | 0.00                       | 0.34                       | 0.17            | 425.67                     | 0.50                                     | 13.81                   |
| 07/29/21 10:32:53                                                                                                                                                                                                 | 67770                     | 8.73                     | 6.37           | 5.02          | 159.65                                             | 5.77                      | 1.41                        | 0.60                                       | 6.37          | 0.00                       | 0.31                       | 0.15            | 425.11                     | 0.50                                     | 13.72                   |
| 07/29/21 10:33:23                                                                                                                                                                                                 | 67800                     | 8.73                     | 6.12           | 5.00          | 160.39                                             | 5.71                      | 1.44                        | 0.46                                       | 6.12          | 0.00                       | 0.37                       | 0.09            | 424.68                     | 0.37                                     | 14.53                   |
| 07/29/21 10:33:53                                                                                                                                                                                                 | 67830                     | 8.72                     | 6.47           | 4.94          | 159.83                                             | 5.76                      | 1.43                        | 0.47                                       | 6.47          | 0.00                       | 0.36                       | 0.15            | 424.18                     | 0.41                                     | 13.94                   |
| <b>RAW AVERAGE</b>                                                                                                                                                                                                |                           | <b>8.69</b>              | <b>6.97</b>    | <b>5.16</b>   | <b>157.35</b>                                      | <b>5.74</b>               | <b>1.36</b>                 | <b>0.45</b>                                | <b>6.97</b>   | <b>0.00</b>                | <b>0.46</b>                | <b>0.09</b>     | <b>417.32</b>              | <b>0.52</b>                              | <b>14.41</b>            |
| Serial Number: INST-O2-0026 INST-IR-0005 INST-IR-0005 INST-VC-0004 INST-IR-0005 INST-IR-0005 INST-IR-0005 INST-IR-0005 INST-IR-0005 INST-IR-0005 INST-IR-0005 INST-IR-0005 INST-IR-0005 INST-IR-0005 INST-IR-0005 |                           | O <sub>2</sub>           | NOx            | CO            | THC (as C <sub>3</sub> H <sub>8</sub> )            | CO <sub>2</sub>           | N <sub>2</sub> O            | C <sub>2</sub> H <sub>6</sub> O            | NO            | NO <sub>2</sub>            | NH <sub>3</sub>            | HCHO            | CH <sub>4</sub>            | C <sub>2</sub> H <sub>6</sub>            | H <sub>2</sub> O        |
|                                                                                                                                                                                                                   |                           | (%)                      |                |               | (ppmvw)                                            |                           |                             |                                            |               |                            |                            |                 |                            |                                          |                         |
|                                                                                                                                                                                                                   |                           | Initial Zero             |                |               | 2.53                                               |                           |                             |                                            |               |                            |                            |                 |                            |                                          |                         |
|                                                                                                                                                                                                                   |                           | Final Zero               |                |               | 0.12                                               |                           |                             |                                            |               |                            |                            |                 |                            |                                          |                         |
|                                                                                                                                                                                                                   |                           | Avg. Zero                |                |               | 1.33                                               |                           |                             |                                            |               |                            |                            |                 |                            |                                          |                         |
| Bias                                                                                                                                                                                                              | Initial UpScale           | 12.03                    |                |               | 306.71                                             |                           |                             |                                            |               |                            |                            |                 |                            |                                          |                         |
|                                                                                                                                                                                                                   | Final UpScale             | 11.98                    |                |               | 307.25                                             |                           |                             |                                            |               |                            |                            |                 |                            |                                          |                         |
|                                                                                                                                                                                                                   | Avg. UpScale              | 12.01                    |                |               | 306.98                                             |                           |                             |                                            |               |                            |                            |                 |                            |                                          |                         |
|                                                                                                                                                                                                                   | Upscale Cal Gas           | 11.99                    |                |               | 302.00                                             |                           |                             |                                            |               |                            |                            |                 |                            |                                          |                         |

| EMISSIONS DATA                          | O <sub>2</sub> | NOx    | CO     | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> O | NO     | NO <sub>2</sub> | NH <sub>3</sub> | HCHO   | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> ) | C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) | VOC (as C <sub>3</sub> H <sub>8</sub> ) |
|-----------------------------------------|----------------|--------|--------|-----------------------------------------|-----------------|------------------|---------------------------------|--------|-----------------|-----------------|--------|-----------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------|
| Corrected Raw Average (ppm/% dry basis) | 8.67           | 8.15   | 6.03   | 183.85                                  | 6.71            | 1.59             | 0.52                            | 8.15   | 0.00            | 0.54            | 0.11   | 178.78                                              | 0.40                                                              | 4.67                                    |
| Corrected Raw Average (ppm/% wet basis) | 7.41           | 6.97   | 5.16   | 157.35                                  | 5.74            | 1.36             | 0.45                            | 6.97   | 0.00            | 0.46            | 0.09   | 153.02                                              | 0.34                                                              | 3.99                                    |
| Concentration (ppm@ 15%O <sub>2</sub> ) | N/A            | 3.93   | 2.91   | 75.89                                   | 3.24            | 0.77             | 0.25                            | 3.93   | 0.00            | 0.26            | 0.05   | 86.22                                               | 0.19                                                              | 1.93                                    |
| Emission Rate (g/kW*hr)                 | N/A            | 0.0704 | 0.0317 | 1.3008                                  | 555             | 0.0132           | 0.0043                          | 0.0459 | 0.0000          | 0.0017          | 0.0006 | 1.4813                                              | 0.0033                                                            | 0.0330                                  |

Non-Bias Adjusted Averages Include:

Catalytic Combustion Corporation  
July 29, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

Fuel Data

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 14.511 | SCFH          |

Weather Data

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.90    | in. Hg                       |
| Relative Humidity   | 49       | %                            |
| Ambient Temperature | 99       | °F                           |
| Specific Humidity   | 0.019455 | lb H <sub>2</sub> O / lb air |

Unit Data

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 1,813.0 | horsepower |
| Meas. Stack Moisture     | 14.4    | %          |
| Stack Exhaust Flow (M19) | 215,084 | SCFH       |

50% Load, Run - 1-2

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vvd) | NOx<br>(ppmw) | CO<br>(ppmw) | THC (as C <sub>2</sub> H <sub>6</sub> )<br>(ppmw) | CO <sub>2</sub><br>(%vvd) | N <sub>2</sub> O<br>(ppmw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmw) | NO<br>(ppmw) | NO <sub>2</sub><br>(ppmw) | NH <sub>3</sub><br>(ppmw) | HCHO<br>(ppmw) | CH <sub>4</sub><br>(ppmw) | C <sub>2</sub> H <sub>6</sub><br>(ppmw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|--------------------------|---------------|--------------|---------------------------------------------------|---------------------------|----------------------------|-------------------------------------------|--------------|---------------------------|---------------------------|----------------|---------------------------|-----------------------------------------|-------------------------|
| 07/29/21 12:05:23                | 73320                     | 8.74                     | 5.65          | 4.97         | 157.72                                            | 5.52                      | 1.61                       | 0.36                                      | 5.65         | 0.00                      | 0.33                      | 0.20           | 417.26                    | 0.55                                    | 16.96                   |
| 07/29/21 12:05:53                | 73350                     | 8.74                     | 6.03          | 4.98         | 157.68                                            | 5.64                      | 1.61                       | 0.81                                      | 6.03         | 0.00                      | 0.32                      | 0.06           | 421.08                    | 0.48                                    | 15.97                   |
| 07/29/21 12:06:23                | 73380                     | 8.74                     | 6.02          | 4.99         | 158.22                                            | 5.59                      | 1.59                       | 0.76                                      | 6.02         | 0.00                      | 0.34                      | 0.19           | 420.26                    | 0.50                                    | 16.24                   |
| 07/29/21 12:06:53                | 73410                     | 8.75                     | 5.75          | 5.02         | 161.33                                            | 5.69                      | 1.61                       | 0.28                                      | 5.75         | 0.00                      | 0.23                      | 0.08           | 428.43                    | 0.69                                    | 14.82                   |
| 07/29/21 12:07:23                | 73440                     | 8.75                     | 5.85          | 5.07         | 162.11                                            | 5.72                      | 1.67                       | 0.53                                      | 5.85         | 0.00                      | 0.29                      | 0.06           | 429.42                    | 0.55                                    | 14.38                   |
| 07/29/21 12:07:53                | 73470                     | 8.76                     | 5.84          | 5.07         | 162.44                                            | 5.65                      | 1.63                       | 0.61                                      | 5.84         | 0.00                      | 0.27                      | 0.01           | 429.28                    | 0.59                                    | 14.98                   |
| 07/29/21 12:08:23                | 73500                     | 8.76                     | 5.90          | 5.23         | 163.11                                            | 5.72                      | 1.65                       | 0.71                                      | 5.90         | 0.00                      | 0.27                      | 0.06           | 432.71                    | 0.51                                    | 14.28                   |
| 07/29/21 12:08:53                | 73530                     | 8.75                     | 5.97          | 5.05         | 163.07                                            | 5.73                      | 1.62                       | 0.38                                      | 5.97         | 0.00                      | 0.27                      | -0.07          | 431.95                    | 0.50                                    | 14.29                   |
| 07/29/21 12:09:23                | 73560                     | 8.76                     | 6.16          | 5.01         | 159.80                                            | 5.58                      | 1.60                       | 0.49                                      | 6.16         | 0.00                      | 0.29                      | 0.19           | 422.74                    | 0.46                                    | 16.30                   |
| 07/29/21 12:09:53                | 73590                     | 8.76                     | 5.53          | 5.17         | 162.08                                            | 5.66                      | 1.63                       | 0.65                                      | 5.53         | 0.00                      | 0.26                      | 0.06           | 429.14                    | 0.52                                    | 14.97                   |
| 07/29/21 12:10:23                | 73620                     | 8.76                     | 5.75          | 5.01         | 162.41                                            | 5.70                      | 1.64                       | 0.70                                      | 5.75         | 0.00                      | 0.28                      | 0.05           | 430.34                    | 0.59                                    | 14.61                   |
| 07/29/21 12:10:53                | 73650                     | 8.76                     | 5.95          | 5.02         | 160.19                                            | 5.60                      | 1.59                       | 0.69                                      | 5.95         | 0.00                      | 0.34                      | 0.05           | 422.99                    | 0.50                                    | 16.17                   |
| 07/29/21 12:11:23                | 73680                     | 8.77                     | 5.99          | 4.93         | 159.46                                            | 5.62                      | 1.59                       | 0.72                                      | 5.99         | 0.00                      | 0.31                      | 0.06           | 422.94                    | 0.40                                    | 16.00                   |
| 07/29/21 12:11:53                | 73710                     | 8.75                     | 5.34          | 5.08         | 161.91                                            | 5.65                      | 1.60                       | 0.81                                      | 5.34         | 0.00                      | 0.26                      | 0.10           | 428.06                    | 0.54                                    | 14.98                   |
| 07/29/21 12:12:23                | 73740                     | 8.76                     | 5.42          | 5.09         | 163.03                                            | 5.67                      | 1.63                       | 0.68                                      | 5.42         | 0.00                      | 0.25                      | 0.09           | 431.63                    | 0.58                                    | 14.81                   |
| 07/29/21 12:12:53                | 73770                     | 8.76                     | 6.03          | 5.09         | 159.97                                            | 5.64                      | 1.62                       | 0.52                                      | 6.03         | 0.00                      | 0.29                      | -0.04          | 425.37                    | 0.59                                    | 15.70                   |
| 07/29/21 12:13:23                | 73800                     | 8.75                     | 5.49          | 4.99         | 162.34                                            | 5.65                      | 1.61                       | 0.55                                      | 5.49         | 0.00                      | 0.25                      | 0.04           | 428.83                    | 0.67                                    | 15.12                   |
| 07/29/21 12:13:53                | 73830                     | 8.75                     | 5.38          | 5.09         | 162.23                                            | 5.67                      | 1.64                       | 0.66                                      | 5.38         | 0.00                      | 0.28                      | 0.02           | 430.28                    | 0.50                                    | 14.83                   |
| 07/29/21 12:14:23                | 73860                     | 8.75                     | 5.76          | 5.04         | 162.72                                            | 5.71                      | 1.65                       | 0.65                                      | 5.76         | 0.00                      | 0.26                      | 0.05           | 431.55                    | 0.51                                    | 14.57                   |
| 07/29/21 12:14:53                | 73890                     | 8.75                     | 6.15          | 5.02         | 164.38                                            | 5.82                      | 1.67                       | 0.50                                      | 6.15         | 0.00                      | 0.23                      | 0.04           | 436.74                    | 0.41                                    | 13.44                   |
| 07/29/21 12:15:23                | 73920                     | 8.75                     | 6.26          | 5.17         | 164.12                                            | 5.85                      | 1.65                       | 0.65                                      | 6.26         | 0.00                      | 0.25                      | -0.03          | 437.36                    | 0.41                                    | 13.25                   |
| 07/29/21 12:15:53                | 73950                     | 8.74                     | 5.80          | 5.04         | 163.03                                            | 5.75                      | 1.65                       | 0.45                                      | 5.80         | 0.00                      | 0.26                      | 0.00           | 433.84                    | 0.51                                    | 14.21                   |
| 07/29/21 12:16:23                | 73980                     | 8.74                     | 6.14          | 5.08         | 163.39                                            | 5.81                      | 1.67                       | 0.19                                      | 6.14         | 0.00                      | 0.26                      | 0.01           | 435.61                    | 0.59                                    | 13.54                   |
| 07/29/21 12:16:53                | 74010                     | 8.75                     | 6.02          | 5.04         | 162.71                                            | 5.76                      | 1.66                       | 0.21                                      | 6.02         | 0.00                      | 0.26                      | 0.07           | 434.03                    | 0.53                                    | 14.00                   |
| 07/29/21 12:17:23                | 74040                     | 8.75                     | 6.47          | 5.25         | 164.94                                            | 5.84                      | 1.72                       | 0.58                                      | 6.47         | 0.00                      | 0.25                      | 0.01           | 438.59                    | 0.53                                    | 13.05                   |
| 07/29/21 12:17:53                | 74070                     | 8.74                     | 6.12          | 5.10         | 163.82                                            | 5.80                      | 1.71                       | 0.20                                      | 6.12         | 0.00                      | 0.26                      | 0.06           | 435.23                    | 0.70                                    | 13.60                   |
| 07/29/21 12:18:23                | 74100                     | 8.75                     | 6.05          | 5.15         | 163.94                                            | 5.81                      | 1.68                       | 0.60                                      | 6.05         | 0.00                      | 0.26                      | 0.04           | 436.18                    | 0.58                                    | 13.60                   |
| 07/29/21 12:18:53                | 74130                     | 8.75                     | 6.10          | 5.08         | 163.23                                            | 5.78                      | 1.67                       | 0.55                                      | 6.10         | 0.00                      | 0.25                      | 0.05           | 434.74                    | 0.56                                    | 13.79                   |
| 07/29/21 12:19:23                | 74160                     | 8.74                     | 6.47          | 5.11         | 165.21                                            | 5.88                      | 1.71                       | 0.38                                      | 6.37         | 0.09                      | 0.24                      | 0.12           | 440.00                    | 0.48                                    | 12.74                   |
| 07/29/21 12:19:53                | 74190                     | 8.74                     | 6.21          | 5.07         | 163.65                                            | 5.80                      | 1.69                       | 0.55                                      | 6.21         | 0.00                      | 0.25                      | 0.05           | 436.94                    | 0.62                                    | 13.63                   |
| 07/29/21 12:20:23                | 74220                     | 8.74                     | 6.18          | 5.19         | 163.88                                            | 5.79                      | 1.70                       | 0.81                                      | 6.18         | 0.00                      | 0.23                      | 0.01           | 436.29                    | 0.59                                    | 13.73                   |
| 07/29/21 12:20:53                | 74250                     | 8.73                     | 6.15          | 5.18         | 163.61                                            | 5.85                      | 1.72                       | 0.35                                      | 6.15         | 0.00                      | 0.25                      | 0.05           | 437.19                    | 0.44                                    | 13.17                   |
| 07/29/21 12:21:23                | 74280                     | 8.74                     | 6.20          | 5.06         | 163.47                                            | 5.82                      | 1.69                       | 0.72                                      | 6.20         | 0.00                      | 0.23                      | 0.08           | 435.26                    | 0.59                                    | 13.46                   |
| 07/29/21 12:21:53                | 74310                     | 8.73                     | 5.79          | 5.11         | 162.29                                            | 5.66                      | 1.63                       | 0.52                                      | 5.79         | 0.00                      | 0.25                      | 0.04           | 427.68                    | 0.61                                    | 15.15                   |
| 07/29/21 12:22:23                | 74340                     | 8.73                     | 6.17          | 5.17         | 163.74                                            | 5.80                      | 1.70                       | 0.33                                      | 6.17         | 0.00                      | 0.26                      | -0.02          | 434.80                    | 0.60                                    | 13.69                   |
| 07/29/21 12:22:53                | 74370                     | 8.74                     | 6.33          | 5.08         | 164.41                                            | 5.83                      | 1.73                       | 0.25                                      | 6.33         | 0.00                      | 0.27                      | 0.03           | 435.66                    | 0.58                                    | 13.35                   |
| 07/29/21 12:23:23                | 74400                     | 8.73                     | 5.27          | 5.06         | 160.25                                            | 5.62                      | 1.65                       | 0.61                                      | 5.27         | 0.00                      | 0.26                      | 0.08           | 425.18                    | 0.53                                    | 15.56                   |
| 07/29/21 12:23:53                | 74430                     | 8.73                     | 5.98          | 5.11         | 158.20                                            | 5.57                      | 1.57                       | 0.49                                      | 5.98         | 0.00                      | 0.32                      | 0.20           | 418.90                    | 0.49                                    | 16.73                   |
| 07/29/21 12:24:23                | 74460                     | 8.73                     | 5.57          | 4.96         | 157.07                                            | 5.48                      | 1.62                       | 0.75                                      | 5.57         | 0.00                      | 0.28                      | 0.16           | 415.73                    | 0.55                                    | 17.73                   |
| 07/29/21 12:24:53                | 74490                     | 8.74                     | 5.37          | 5.07         | 157.41                                            | 5.49                      | 1.61                       | 0.43                                      | 5.37         | 0.00                      | 0.29                      | 0.20           | 417.50                    | 0.59                                    | 17.52                   |
| 07/29/21 12:25:23                | 74520                     | 8.74                     | 5.58          | 5.10         | 158.52                                            | 5.58                      | 1.62                       | 0.69                                      | 5.58         | 0.00                      | 0.32                      | 0.18           | 421.52                    | 0.53                                    | 16.56                   |
| 07/29/21 12:25:53                | 74550                     | 8.75                     | 5.53          | 5.14         | 162.47                                            | 5.68                      | 1.65                       | 0.47                                      | 5.53         | 0.00                      | 0.26                      | 0.06           | 432.09                    | 0.51                                    | 14.99                   |
| 07/29/21 12:26:23                | 74580                     | 8.75                     | 5.80          | 5.21         | 164.01                                            | 5.78                      | 1.67                       | 0.59                                      | 5.80         | 0.00                      | 0.25                      | 0.13           | 435.94                    | 0.47                                    | 13.87                   |
| 07/29/21 12:26:53                | 74610                     | 8.74                     | 6.47          | 5.26         | 164.86                                            | 5.90                      | 1.74                       | 0.85                                      | 6.34         | 0.13                      | 0.26                      | 0.10           | 438.28                    | 0.58                                    | 12.72                   |
| 07/29/21 12:27:23                | 74640                     | 8.74                     | 6.22          | 5.22         | 166.45                                            | 5.88                      | 1.77                       | 0.54                                      | 6.22         | 0.00                      | 0.26                      | -0.05          | 442.81                    | 0.69                                    | 12.23                   |
| 07/29/21 12:27:53                | 74670                     | 8.74                     | 5.91          | 5.30         | 165.83                                            | 5.86                      | 1.73                       | 0.41                                      | 5.91         | 0.00                      | 0.24                      | 0.03           | 441.50                    | 0.69                                    | 12.59                   |
| 07/29/21 12:28:23                | 74700                     | 8.73                     | 6.07          | 5.32         | 166.04                                            | 5.87                      | 1.78                       | 0.02                                      | 6.07         | 0.00                      | 0.26                      | 0.03           | 442.40                    | 0.62                                    | 12.23                   |
| 07/29/21 12:28:53                | 74730                     | 8.73                     | 6.27          | 5.28         | 166.98                                            | 5.92                      | 1.77                       | 0.43                                      | 6.27         | 0.00                      | 0.20                      | -0.05          | 444.80                    | 0.80                                    | 11.80                   |
| 07/29/21 12:29:23                | 74760                     | 8.74                     | 6.11          | 5.30         | 166.98                                            | 5.91                      | 1.79                       | 0.30                                      | 6.11         | 0.00                      | 0.23                      | 0.00           | 444.26                    | 0.77                                    | 12.00                   |
| 07/29/21 12:29:53                | 74790                     | 8.74                     | 6.58          | 5.25         | 162.42                                            | 5.88                      | 1.75                       | 0.53                                      | 6.50         | 0.08                      | 0.25                      | 0.03           | 436.52                    | 0.57                                    | 12.95                   |
| 07/29/21 12:30:23                | 74820                     | 8.75                     | 5.78          | 5.29         | 166.17                                            | 5.86                      | 1.76                       | 0.44                                      | 5.78         | 0.00                      | 0.21                      | 0.11           | 442.71                    | 0.62                                    | 12.33                   |
| 07/29/21 12:30:53                | 74850                     | 8.75                     | 6.15          | 5.18         | 166.93                                            | 5.86                      | 1.81                       | 0.50                                      | 6.15         | 0.00                      | 0.21                      | 0.01           | 442.86                    | 0.73                                    | 12.32                   |
| 07/29/21 12:31:23                | 74880                     | 8.75                     | 6.48          | 5.21         | 163.60                                            | 5.86                      | 1.76                       | 0.48                                      | 6.44         | 0.04                      | 0.27                      | -0.03          | 436.85                    | 0.64                                    | 12.95                   |
| 07/29/21 12:31:53                | 74910                     | 8.75                     | 6.59          | 5.24         | 164.08                                            | 5.90                      | 1.79                       | 0.59                                      | 6.47         | 0.13                      | 0.26                      | -0.06          | 440.15                    | 0.54                                    | 12.68                   |
| 07/29/21 12:32:23                | 74940                     | 8.75                     | 5.79          | 5.18         | 162.49                                            | 5.67                      | 1.72                       | 1.04                                      | 5.79         | 0.00                      | 0.26                      | 0.13           | 430.90                    | 0.64                                    | 15.02                   |
| 07/29/21 12:32:53                | 74970                     | 8.77                     | 6.46          | 5.17         | 163.21                                            | 5.81                      | 1.77                       | 0.51                                      | 6.46         | 0.00                      | 0.23                      | 0.11           | 435.69                    | 0.61                                    | 13.41                   |
| 07/29/21 12:33:23                | 75000                     | 8.77                     | 6.39          | 5.22         | 164.40                                            | 5.81                      | 1.71                       | 0.83                                      | 6.39         | 0.00                      | 0.24                      | 0.16           | 437.64                    | 0.62                                    | 13.43                   |
| 07/29/21 12:33:53                | 75030                     | 8.77                     | 6.04          | 5.19         | 163.14                                            | 5.73                      | 1.70                       | 0.61                                      | 6.04         | 0.00                      | 0.24                      | -0.01          | 434.37                    | 0.64                                    | 14.22                   |
| 07/29/21 12:34:23                | 75060                     | 8.76                     | 6.39          | 5.07         | 159.93                                            | 5.62                      | 1.66                       | 0.59                                      | 6.14         | 0.25                      | 0.31                      | 0.16           | 426.09                    | 0.51                                    | 15.71                   |
| 07/29/21 12:34:53                | 75090                     | 8.77                     | 6.12          | 5.05         | 162.94                                            | 5.73                      | 1.70                       | 0.86                                      | 6.12         | 0.00                      | 0.24                      | 0.09           | 434.06                    | 0.58                                    | 14.36                   |
| 07/29/21 12:35:23                | 75120                     | 8.77                     | 6.13          | 5.12         | 164.71                                            | 5.74                      | 1.71                       | 0.76                                      | 6.13         | 0.00                      | 0.25                      | 0.07           | 437.40                    | 0.63                                    | 14.16                   |
| 07/29/21 12:35:53                | 75150                     | 8.76                     | 6.16          | 5.21         | 164.42                                            | 5.78                      | 1.7                        |                                           |              |                           |                           |                |                           |                                         |                         |

## Stewart &amp; Stevenson Integration Center

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8,632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 14,511 | SCFH          |

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.90    | in. Hg                       |
| Relative Humidity   | 49       | %                            |
| Ambient Temperature | 99       | °F                           |
| Specific Humidity   | 0.019455 | lb H <sub>2</sub> O / lb air |

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 1,813.0 | horsepower |
| Meas. Stack Moisture     | 14.4    | %          |
| Stack Exhaust Flow (M19) | 215.084 | SCFH       |

| Date/Time<br>(mm/dd/yy hr:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%v/d) | NO <sub>x</sub><br>(ppmvw) | CO<br>(ppmvw) | THC (as C <sub>2</sub> H <sub>6</sub> )<br>(ppmvw) | CO <sub>2</sub><br>(%v/w) | N <sub>2</sub> O<br>(ppmvw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmvw) | NO<br>(ppmvw) | NO <sub>2</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) | HCHO<br>(ppmvw) | CH <sub>4</sub><br>(ppmvw) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|--------------------------|----------------------------|---------------|----------------------------------------------------|---------------------------|-----------------------------|--------------------------------------------|---------------|----------------------------|----------------------------|-----------------|----------------------------|------------------------------------------|-------------------------|
| 07/29/21 12:55:23                | 76320                     | 8.76                     | 6.06                       | 5.10          | 167.19                                             | 5.86                      | 1.74                        | 0.41                                       | 6.06          | 0.00                       | 0.18                       | -0.07           | 445.98                     | 0.62                                     | 12.24                   |
| 07/29/21 12:55:53                | 76350                     | 8.76                     | 5.92                       | 5.16          | 167.99                                             | 5.86                      | 1.75                        | 0.55                                       | 5.92          | 0.00                       | 0.21                       | -0.03           | 445.39                     | 0.45                                     | 12.28                   |
| 07/29/21 12:56:23                | 76380                     | 8.76                     | 5.93                       | 5.23          | 167.33                                             | 5.84                      | 1.75                        | 0.29                                       | 5.93          | 0.00                       | 0.19                       | -0.02           | 444.51                     | 0.60                                     | 12.45                   |
| 07/29/21 12:56:53                | 76410                     | 8.75                     | 6.08                       | 5.05          | 163.58                                             | 5.73                      | 1.68                        | 0.58                                       | 6.08          | 0.00                       | 0.24                       | 0.12            | 434.27                     | 0.47                                     | 14.32                   |
| 07/29/21 12:57:23                | 76440                     | 8.76                     | 5.80                       | 5.20          | 167.64                                             | 5.85                      | 1.73                        | 0.50                                       | 5.80          | 0.00                       | 0.19                       | -0.09           | 445.33                     | 0.52                                     | 12.41                   |
| 07/29/21 12:57:53                | 76470                     | 8.75                     | 6.40                       | 5.17          | 165.84                                             | 5.84                      | 1.74                        | 0.46                                       | 6.40          | 0.00                       | 0.18                       | 0.05            | 440.59                     | 0.54                                     | 13.04                   |
| 07/29/21 12:58:23                | 76500                     | 8.76                     | 6.01                       | 5.12          | 167.99                                             | 5.85                      | 1.75                        | 0.51                                       | 6.01          | 0.00                       | 0.19                       | -0.07           | 446.51                     | 0.59                                     | 12.43                   |
| 07/29/21 12:58:53                | 76530                     | 8.77                     | 6.31                       | 5.12          | 167.32                                             | 5.85                      | 1.76                        | 0.69                                       | 6.31          | 0.00                       | 0.21                       | -0.02           | 443.84                     | 0.43                                     | 12.92                   |
| 07/29/21 12:59:23                | 76560                     | 8.75                     | 6.21                       | 5.26          | 164.10                                             | 5.76                      | 1.72                        | 1.11                                       | 6.21          | 0.00                       | 0.21                       | -0.02           | 436.99                     | 0.65                                     | 13.94                   |
| 07/29/21 12:59:53                | 76590                     | 8.75                     | 6.01                       | 5.18          | 163.97                                             | 5.73                      | 1.73                        | 0.53                                       | 6.01          | 0.00                       | 0.20                       | -0.01           | 435.04                     | 0.53                                     | 14.37                   |
| 07/29/21 13:00:23                | 76620                     | 8.75                     | 5.60                       | 5.03          | 160.43                                             | 5.57                      | 1.63                        | 0.75                                       | 5.60          | 0.00                       | 0.26                       | 0.11            | 423.43                     | 0.33                                     | 16.72                   |
| 07/29/21 13:00:53                | 76650                     | 8.75                     | 5.60                       | 4.94          | 159.29                                             | 5.56                      | 1.64                        | 0.59                                       | 5.60          | 0.00                       | 0.28                       | 0.19            | 421.81                     | 0.39                                     | 16.76                   |
| 07/29/21 13:01:23                | 76680                     | 8.75                     | 5.64                       | 4.93          | 158.82                                             | 5.53                      | 1.65                        | 0.57                                       | 5.64          | 0.00                       | 0.26                       | 0.13            | 420.39                     | 0.33                                     | 17.09                   |
| 07/29/21 13:01:53                | 76710                     | 8.75                     | 5.70                       | 5.08          | 159.50                                             | 5.57                      | 1.64                        | 0.81                                       | 5.70          | 0.00                       | 0.26                       | 0.03            | 422.34                     | 0.49                                     | 16.78                   |
| 07/29/21 13:02:23                | 76740                     | 8.76                     | 5.64                       | 5.11          | 159.63                                             | 5.58                      | 1.68                        | 0.75                                       | 5.64          | 0.00                       | 0.27                       | 0.05            | 424.61                     | 0.45                                     | 16.71                   |
| 07/29/21 13:02:53                | 76770                     | 8.76                     | 5.52                       | 5.04          | 159.95                                             | 5.56                      | 1.66                        | 0.68                                       | 5.52          | 0.00                       | 0.27                       | 0.19            | 423.86                     | 0.58                                     | 16.81                   |
| 07/29/21 13:03:23                | 76800                     | 8.77                     | 5.67                       | 5.04          | 161.08                                             | 5.59                      | 1.66                        | 0.63                                       | 5.67          | 0.00                       | 0.27                       | 0.26            | 427.24                     | 0.49                                     | 16.33                   |
| 07/29/21 13:03:53                | 76830                     | 8.76                     | 5.26                       | 5.05          | 163.14                                             | 5.62                      | 1.65                        | 0.43                                       | 5.26          | 0.00                       | 0.22                       | 0.04            | 431.38                     | 0.58                                     | 15.40                   |
| 07/29/21 13:04:23                | 76860                     | 8.77                     | 5.78                       | 5.15          | 163.71                                             | 5.70                      | 1.71                        | 0.32                                       | 5.78          | 0.00                       | 0.22                       | 0.08            | 433.27                     | 0.63                                     | 14.61                   |
| 07/29/21 13:04:53                | 76890                     | 8.78                     | 6.05                       | 5.14          | 164.89                                             | 5.78                      | 1.75                        | 0.54                                       | 6.05          | 0.00                       | 0.23                       | 0.13            | 439.92                     | 0.49                                     | 13.61                   |

[illegible]

| EMISSIONS DATA                           | O <sub>2</sub> | NO <sub>x</sub> | CO     | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> O | NO     | NO <sub>2</sub> | NH <sub>3</sub> | HCHO   | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> ) | C <sub>2</sub> H <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> ) | VOC (as C <sub>3</sub> H <sub>8</sub> ) |
|------------------------------------------|----------------|-----------------|--------|-----------------------------------------|-----------------|------------------|---------------------------------|--------|-----------------|-----------------|--------|-----------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------|
| Corrected Raw Average (ppm/1% dry basis) | 8.74           | 6.92            | 5.97   | 190.60                                  | 6.69            | 1.97             | 0.68                            | 6.91   | 0.01            | 0.29            | 0.07   | 185.57                                              | 0.44                                                              | 4.59                                    |
| Corrected Raw Average (ppm/1% wet basis) | 7.47           | 5.92            | 5.11   | 163.11                                  | 5.72            | 1.68             | 0.58                            | 5.91   | 0.01            | 0.25            | 0.06   | 158.80                                              | 0.37                                                              | 3.93                                    |
| Concentration (ppm@ 15%/O <sub>2</sub> ) | N/A            | 3.36            | 2.90   | 79.16                                   | 3.25            | 0.95             | 0.33                            | 3.35   | 0.004           | 0.14            | 0.03   | 90.07                                               | 0.21                                                              | 1.91                                    |
| Emission Rate (g/hp-hr)                  | N/A            | 0.0596          | 0.0313 | 1.3443                                  | 552             | 0.0162           | 0.0056                          | 0.0388 | 0.0001          | 0.0009          | 0.0004 | 1.5330                                              | 0.0036                                                            | 0.0324                                  |

|                                     |   |   |   |   |   |   |   |   |   |
|-------------------------------------|---|---|---|---|---|---|---|---|---|
| Non-Bias Adjusted Averages Include: | * | * | * | * | * | * | * | * | * |
|-------------------------------------|---|---|---|---|---|---|---|---|---|

Catalytic Combustion Corporation  
July 29, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

Fuel Data

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 14.541 | SCFH          |

Weather Data

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.84    | in. Hg                       |
| Relative Humidity   | 49       | %                            |
| Ambient Temperature | 96       | °F                           |
| Specific Humidity   | 0.018009 | lb H <sub>2</sub> O / lb air |

Unit Data

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 1,810.4 | horsepower |
| Meas. Stack Moisture     | 14.4    | %          |
| Stack Exhaust Flow (M19) | 216,383 | SCFH       |

50% Load, Run - 1-3

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vvd) | NOx<br>(ppmw) | CO<br>(ppmw) | THC (as C <sub>2</sub> H <sub>6</sub> )<br>(ppmw) | CO <sub>2</sub><br>(%vvd) | N <sub>2</sub> O<br>(ppmw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmw) | NO<br>(ppmw) | NO <sub>2</sub><br>(ppmw) | NH <sub>3</sub><br>(ppmw) | HCHO<br>(ppmw) | CH <sub>4</sub><br>(ppmw) | C <sub>2</sub> H <sub>6</sub><br>(ppmw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|--------------------------|---------------|--------------|---------------------------------------------------|---------------------------|----------------------------|-------------------------------------------|--------------|---------------------------|---------------------------|----------------|---------------------------|-----------------------------------------|-------------------------|
| 07/29/21 14:23:23                | 81600                     | 8.78                     | 4.95          | 5.16         | 160.80                                            | 5.49                      | 1.63                       | 2.32                                      | 4.95         | 0.00                      | 0.53                      | -0.04          | 424.48                    | 0.33                                    | 17.94                   |
| 07/29/21 14:23:53                | 81630                     | 8.80                     | 5.37          | 5.46         | 161.71                                            | 5.56                      | 1.63                       | 2.68                                      | 5.37         | 0.00                      | 0.53                      | 0.19           | 427.08                    | 0.20                                    | 17.27                   |
| 07/29/21 14:24:23                | 81660                     | 8.79                     | 5.31          | 5.38         | 165.50                                            | 5.71                      | 1.74                       | 1.99                                      | 5.31         | 0.00                      | 0.48                      | -0.04          | 437.77                    | 0.18                                    | 15.00                   |
| 07/29/21 14:24:53                | 81690                     | 8.79                     | 5.86          | 5.38         | 167.69                                            | 5.82                      | 1.74                       | 2.19                                      | 5.86         | 0.00                      | 0.49                      | 0.14           | 442.26                    | 0.28                                    | 13.92                   |
| 07/29/21 14:25:23                | 81720                     | 8.79                     | 6.05          | 5.45         | 168.15                                            | 5.88                      | 1.81                       | 2.56                                      | 6.05         | 0.00                      | 0.47                      | 0.04           | 446.56                    | 0.07                                    | 13.27                   |
| 07/29/21 14:25:53                | 81750                     | 8.80                     | 6.27          | 5.44         | 169.12                                            | 5.92                      | 1.77                       | 2.07                                      | 6.27         | 0.00                      | 0.49                      | 0.09           | 449.64                    | 0.14                                    | 12.83                   |
| 07/29/21 14:26:23                | 81780                     | 8.79                     | 5.52          | 5.43         | 170.76                                            | 5.88                      | 1.80                       | 2.33                                      | 5.52         | 0.00                      | 0.46                      | -0.05          | 452.62                    | 0.34                                    | 12.62                   |
| 07/29/21 14:26:53                | 81810                     | 8.78                     | 5.61          | 5.46         | 171.47                                            | 5.91                      | 1.85                       | 2.73                                      | 5.61         | 0.00                      | 0.46                      | -0.10          | 452.40                    | 0.08                                    | 12.43                   |
| 07/29/21 14:27:23                | 81840                     | 8.79                     | 5.77          | 5.52         | 169.64                                            | 5.93                      | 1.82                       | 3.17                                      | 5.77         | 0.00                      | 0.46                      | -0.14          | 452.20                    | 0.28                                    | 12.27                   |
| 07/29/21 14:27:53                | 81870                     | 8.80                     | 5.66          | 5.54         | 170.61                                            | 5.91                      | 1.80                       | 2.67                                      | 5.66         | 0.00                      | 0.46                      | -0.01          | 452.92                    | 0.41                                    | 12.32                   |
| 07/29/21 14:28:23                | 81900                     | 8.80                     | 5.91          | 5.48         | 172.15                                            | 5.93                      | 1.81                       | 2.80                                      | 5.91         | 0.00                      | 0.48                      | 0.09           | 453.61                    | 0.46                                    | 12.23                   |
| 07/29/21 14:28:53                | 81930                     | 8.80                     | 6.28          | 5.45         | 169.39                                            | 5.92                      | 1.78                       | 2.81                                      | 6.28         | 0.00                      | 0.48                      | 0.08           | 449.09                    | 0.27                                    | 12.78                   |
| 07/29/21 14:29:23                | 81960                     | 8.79                     | 6.28          | 5.44         | 168.54                                            | 5.88                      | 1.82                       | 2.37                                      | 6.28         | 0.00                      | 0.50                      | 0.01           | 445.93                    | 0.21                                    | 13.28                   |
| 07/29/21 14:29:53                | 81990                     | 8.79                     | 5.36          | 5.54         | 166.36                                            | 5.64                      | 1.69                       | 2.73                                      | 5.36         | 0.00                      | 0.54                      | 0.07           | 436.27                    | 0.31                                    | 15.67                   |
| 07/29/21 14:30:23                | 82020                     | 8.79                     | 5.22          | 5.39         | 165.98                                            | 5.72                      | 1.71                       | 2.83                                      | 5.22         | 0.00                      | 0.55                      | 0.04           | 439.28                    | 0.01                                    | 15.06                   |
| 07/29/21 14:30:53                | 82050                     | 8.79                     | 5.43          | 5.55         | 166.77                                            | 5.75                      | 1.70                       | 2.43                                      | 5.43         | 0.00                      | 0.51                      | 0.07           | 441.40                    | 0.14                                    | 14.62                   |
| 07/29/21 14:31:23                | 82080                     | 8.78                     | 6.19          | 5.48         | 169.12                                            | 5.91                      | 1.82                       | 3.16                                      | 6.19         | 0.00                      | 0.51                      | 0.02           | 449.39                    | -0.01                                   | 12.93                   |
| 07/29/21 14:31:53                | 82110                     | 8.78                     | 5.34          | 5.43         | 168.06                                            | 5.72                      | 1.74                       | 2.96                                      | 5.34         | 0.00                      | 0.53                      | 0.09           | 441.58                    | 0.19                                    | 15.00                   |
| 07/29/21 14:32:23                | 82140                     | 8.77                     | 5.89          | 5.57         | 167.80                                            | 5.84                      | 1.69                       | 2.57                                      | 5.89         | 0.00                      | 0.51                      | 0.04           | 444.75                    | 0.10                                    | 13.63                   |
| 07/29/21 14:32:53                | 82170                     | 8.78                     | 5.16          | 5.45         | 164.86                                            | 5.66                      | 1.72                       | 3.25                                      | 5.16         | 0.00                      | 0.50                      | -0.09          | 434.52                    | 0.03                                    | 15.59                   |
| 07/29/21 14:33:23                | 82200                     | 8.79                     | 5.16          | 5.45         | 166.79                                            | 5.70                      | 1.72                       | 3.17                                      | 5.16         | 0.00                      | 0.53                      | -0.05          | 438.21                    | 0.22                                    | 15.35                   |
| 07/29/21 14:33:53                | 82230                     | 8.78                     | 5.78          | 5.49         | 167.12                                            | 5.80                      | 1.78                       | 2.88                                      | 5.78         | 0.00                      | 0.53                      | 0.07           | 442.07                    | 0.03                                    | 14.33                   |
| 07/29/21 14:34:23                | 82260                     | 8.78                     | 5.58          | 5.58         | 167.75                                            | 5.77                      | 1.74                       | 3.29                                      | 5.58         | 0.00                      | 0.52                      | 0.10           | 442.15                    | 0.17                                    | 14.54                   |
| 07/29/21 14:34:53                | 82290                     | 8.78                     | 6.06          | 5.47         | 168.78                                            | 5.87                      | 1.82                       | 2.75                                      | 6.06         | 0.00                      | 0.51                      | 0.12           | 444.97                    | -0.08                                   | 13.60                   |
| 07/29/21 14:35:23                | 82320                     | 8.79                     | 5.56          | 5.45         | 166.09                                            | 5.73                      | 1.72                       | 3.07                                      | 5.56         | 0.00                      | 0.50                      | -0.13          | 440.25                    | 0.18                                    | 14.83                   |
| 07/29/21 14:35:53                | 82350                     | 8.80                     | 5.09          | 5.58         | 164.50                                            | 5.66                      | 1.74                       | 3.84                                      | 5.09         | 0.00                      | 0.51                      | 0.11           | 435.81                    | -0.11                                   | 15.61                   |
| 07/29/21 14:36:23                | 82380                     | 8.80                     | 5.39          | 5.38         | 166.11                                            | 5.69                      | 1.76                       | 3.86                                      | 5.39         | 0.00                      | 0.53                      | 0.15           | 438.50                    | 0.33                                    | 15.35                   |
| 07/29/21 14:36:53                | 82410                     | 8.80                     | 5.16          | 5.48         | 166.36                                            | 5.68                      | 1.73                       | 3.63                                      | 5.16         | 0.00                      | 0.49                      | -0.02          | 438.78                    | 0.17                                    | 15.48                   |
| 07/29/21 14:37:23                | 82440                     | 8.80                     | 5.38          | 5.47         | 167.09                                            | 5.72                      | 1.79                       | 2.63                                      | 5.38         | 0.00                      | 0.50                      | 0.03           | 440.56                    | 0.23                                    | 15.21                   |
| 07/29/21 14:37:53                | 82470                     | 8.79                     | 5.73          | 5.49         | 167.74                                            | 5.77                      | 1.76                       | 2.23                                      | 5.73         | 0.00                      | 0.53                      | 0.05           | 442.68                    | 0.30                                    | 14.51                   |
| 07/29/21 14:38:23                | 82500                     | 8.79                     | 5.93          | 5.57         | 167.54                                            | 5.84                      | 1.81                       | 2.20                                      | 5.93         | 0.00                      | 0.50                      | 0.05           | 442.88                    | 0.33                                    | 13.72                   |
| 07/29/21 14:38:53                | 82530                     | 8.80                     | 5.92          | 5.52         | 167.15                                            | 5.85                      | 1.78                       | 1.34                                      | 5.92         | 0.00                      | 0.46                      | -0.08          | 444.54                    | 0.37                                    | 13.64                   |
| 07/29/21 14:39:23                | 82560                     | 8.80                     | 5.96          | 5.39         | 168.48                                            | 5.86                      | 1.81                       | 1.79                                      | 5.96         | 0.00                      | 0.43                      | -0.07          | 446.71                    | 0.10                                    | 13.57                   |
| 07/29/21 14:39:53                | 82590                     | 8.80                     | 6.15          | 5.53         | 168.85                                            | 5.85                      | 1.79                       | 2.09                                      | 6.15         | 0.00                      | 0.49                      | -0.01          | 445.04                    | 0.05                                    | 13.56                   |
| 07/29/21 14:40:23                | 82620                     | 8.80                     | 5.75          | 5.52         | 164.93                                            | 5.67                      | 1.72                       | 2.59                                      | 5.75         | 0.00                      | 0.55                      | 0.10           | 434.83                    | -0.15                                   | 15.92                   |
| 07/29/21 14:40:53                | 82650                     | 8.80                     | 5.73          | 5.42         | 167.39                                            | 5.81                      | 1.77                       | 2.46                                      | 5.73         | 0.00                      | 0.50                      | 0.11           | 444.58                    | 0.13                                    | 14.15                   |
| 07/29/21 14:41:23                | 82680                     | 8.80                     | 5.98          | 5.47         | 168.67                                            | 5.81                      | 1.80                       | 2.56                                      | 5.98         | 0.00                      | 0.49                      | -0.04          | 444.49                    | 0.10                                    | 13.93                   |
| 07/29/21 14:41:53                | 82710                     | 8.80                     | 5.91          | 5.49         | 168.80                                            | 5.81                      | 1.73                       | 2.74                                      | 5.91         | 0.00                      | 0.50                      | 0.01           | 443.84                    | 0.23                                    | 14.01                   |
| 07/29/21 14:42:23                | 82740                     | 8.81                     | 6.11          | 5.59         | 169.71                                            | 5.90                      | 1.79                       | 2.94                                      | 6.11         | 0.00                      | 0.46                      | 0.03           | 448.08                    | 0.23                                    | 13.04                   |
| 07/29/21 14:42:53                | 82770                     | 8.81                     | 5.80          | 5.47         | 172.69                                            | 5.90                      | 1.83                       | 3.45                                      | 5.80         | 0.00                      | 0.48                      | -0.14          | 452.83                    | 0.24                                    | 12.42                   |
| 07/29/21 14:43:23                | 82800                     | 8.80                     | 5.81          | 5.67         | 172.59                                            | 5.91                      | 1.78                       | 3.07                                      | 5.81         | 0.00                      | 0.42                      | 0.02           | 453.92                    | 0.20                                    | 12.45                   |
| 07/29/21 14:43:53                | 82830                     | 8.81                     | 5.09          | 5.50         | 167.01                                            | 5.66                      | 1.72                       | 3.62                                      | 5.09         | 0.00                      | 0.47                      | 0.08           | 438.48                    | 0.14                                    | 15.58                   |
| 07/29/21 14:44:23                | 82860                     | 8.79                     | 5.39          | 5.49         | 167.29                                            | 5.70                      | 1.72                       | 3.40                                      | 5.39         | 0.00                      | 0.52                      | 0.01           | 439.63                    | 0.23                                    | 15.14                   |
| 07/29/21 14:44:53                | 82890                     | 8.81                     | 5.62          | 5.48         | 163.22                                            | 5.61                      | 1.70                       | 3.82                                      | 5.62         | 0.00                      | 0.55                      | 0.05           | 429.02                    | -0.14                                   | 16.69                   |
| 07/29/21 14:45:23                | 82920                     | 8.81                     | 5.73          | 5.30         | 164.65                                            | 5.69                      | 1.71                       | 2.95                                      | 5.73         | 0.00                      | 0.52                      | 0.13           | 434.04                    | -0.01                                   | 15.68                   |
| 07/29/21 14:45:53                | 82950                     | 8.81                     | 5.69          | 5.28         | 163.51                                            | 5.67                      | 1.70                       | 3.23                                      | 5.69         | 0.00                      | 0.54                      | 0.05           | 432.98                    | 0.05                                    | 16.07                   |
| 07/29/21 14:46:23                | 82980                     | 8.81                     | 6.03          | 5.40         | 170.06                                            | 5.83                      | 1.77                       | 3.20                                      | 6.03         | 0.00                      | 0.51                      | 0.06           | 446.16                    | 0.41                                    | 13.87                   |
| 07/29/21 14:46:53                | 83010                     | 8.82                     | 6.23          | 5.39         | 170.35                                            | 5.89                      | 1.76                       | 3.11                                      | 6.23         | 0.00                      | 0.49                      | 0.01           | 449.65                    | 0.18                                    | 13.15                   |
| 07/29/21 14:47:23                | 83040                     | 8.81                     | 6.42          | 5.45         | 172.15                                            | 5.91                      | 1.80                       | 3.33                                      | 6.42         | 0.00                      | 0.49                      | -0.06          | 451.03                    | 0.22                                    | 12.83                   |
| 07/29/21 14:47:53                | 83070                     | 8.81                     | 6.29          | 5.41         | 170.90                                            | 5.91                      | 1.78                       | 3.93                                      | 6.29         | 0.00                      | 0.47                      | 0.19           | 450.96                    | -0.10                                   | 13.04                   |
| 07/29/21 14:48:23                | 83100                     | 8.81                     | 5.86          | 5.54         | 171.81                                            | 5.87                      | 1.73                       | 3.40                                      | 5.86         | 0.00                      | 0.47                      | 0.17           | 450.39                    | 0.44                                    | 13.33                   |
| 07/29/21 14:48:53                | 83130                     | 8.79                     | 5.77          | 5.48         | 168.01                                            | 5.79                      | 1.75                       | 3.23                                      | 5.77         | 0.00                      | 0.49                      | 0.08           | 442.59                    | 0.37                                    | 14.26                   |
| 07/29/21 14:49:23                | 83160                     | 8.80                     | 6.08          | 5.36         | 167.93                                            | 5.85                      | 1.82                       | 3.41                                      | 6.08         | 0.00                      | 0.49                      | 0.02           | 444.75                    | 0.08                                    | 13.75                   |
| 07/29/21 14:49:53                | 83190                     | 8.80                     | 6.31          | 5.45         | 170.99                                            | 5.91                      | 1.77                       | 3.96                                      | 6.31         | 0.00                      | 0.48                      | 0.19           | 449.23                    | 0.05                                    | 13.02                   |
| 07/29/21 14:50:23                | 83220                     | 8.80                     | 5.93          | 5.47         | 171.70                                            | 5.91                      | 1.78                       | 3.28                                      | 5.87         | 0.05                      | 0.51                      | 0.04           | 453.00                    | 0.17                                    | 12.99                   |
| 07/29/21 14:50:53                | 83250                     | 8.79                     | 6.14          | 5.57         | 168.75                                            | 5.85                      | 1.79                       | 3.45                                      | 6.14         | 0.00                      | 0.47                      | -0.04          | 446.83                    | 0.16                                    | 13.73                   |
| 07/29/21 14:51:23                | 83280                     | 8.79                     | 5.42          | 5.64         | 167.50                                            | 5.73                      | 1.75                       | 2.88                                      | 5.42         | 0.00                      | 0.54                      | 0.11           | 442.06                    | 0.09                                    | 14.99                   |
| 07/29/21 14:51:53                | 83310                     | 8.79                     | 6.01          | 5.55         | 168.48                                            | 5.85                      | 1.79                       | 3.30                                      | 6.01         | 0.00                      | 0.50                      | -0.03          | 444.62                    | 0.41                                    | 13.68                   |
| 07/29/21 14:52:23                | 83340                     | 8.79                     | 5.94          | 5.55         | 169.27                                            | 5.87                      | 1.82                       | 3.90                                      | 5.94         | 0.00                      | 0.49                      | -0.04          | 446.93                    | 0.16                                    | 13.47                   |
| 07/29/21 14:52:53                | 83370                     | 8.80                     | 5.89          | 5.56         | 168.39                                            | 5.83                      | 1.74                       | 3.97                                      | 5.89         | 0.00                      | 0.48                      | -0.04          | 445.78                    | 0.05                                    | 13.98                   |
| 07/29/21 14:53:23                | 83400                     | 8.79                     | 5.57          | 5.34         | 168.40                                            | 5.79                      | 1.78                       | 3.78                                      | 5.57         | 0.00                      | 0.48                      | 0.10           | 441.72                    | 0.12                                    | 14.29                   |
| 07/29/21 14:53:53                | 83430                     | 8.79                     | 5.23          | 5.32         | 166.81                                            | 5.67                      | 1.70                       | 3.95                                      | 5.23         | 0.00                      | 0.48                      | -0.01          |                           |                                         |                         |

Catalytic Combustion Corporation  
July 29, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

**Fuel Data**

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 14.541 | SCFH          |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.84    | in. Hg                       |
| Relative Humidity   | 49       | %                            |
| Ambient Temperature | 96       | °F                           |
| Specific Humidity   | 0.018009 | lb H <sub>2</sub> O / lb air |

**Unit Data**

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 1,810.4 | horsepower |
| Meas. Stack Moisture     | 14.4    | %          |
| Stack Exhaust Flow (M19) | 216,383 | SCFH       |

50% Load, Run - 1-3

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vd) | NOx<br>(ppmvw) | CO<br>(ppmvw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | CO <sub>2</sub><br>(%vw) | N <sub>2</sub> O<br>(ppmvw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmvw) | NO<br>(ppmvw) | NO <sub>2</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) | HCHO<br>(ppmvw) | CH <sub>4</sub><br>(ppmvw) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|-------------------------|----------------|---------------|----------------------------------------------------|--------------------------|-----------------------------|--------------------------------------------|---------------|----------------------------|----------------------------|-----------------|----------------------------|------------------------------------------|-------------------------|
| 07/29/21 15:13:23                | 84600                     | 8.83                    | 5.44           | 5.44          | 166.88                                             | 5.62                     | 1.73                        | 4.17                                       | 5.44          | 0.00                       | 0.53                       | 0.11            | 434.57                     | -0.12                                    | 16.46                   |
| 07/29/21 15:13:53                | 84630                     | 8.83                    | 5.45           | 5.59          | 165.37                                             | 5.65                     | 1.74                        | 4.43                                       | 5.45          | 0.00                       | 0.52                       | 0.05            | 436.67                     | 0.11                                     | 16.28                   |
| 07/29/21 15:14:23                | 84660                     | 8.84                    | 5.64           | 5.58          | 166.92                                             | 5.67                     | 1.71                        | 4.63                                       | 5.64          | 0.00                       | 0.51                       | 0.08            | 439.81                     | 0.23                                     | 15.99                   |
| 07/29/21 15:14:53                | 84690                     | 8.82                    | 5.33           | 5.32          | 167.29                                             | 5.67                     | 1.66                        | 3.85                                       | 5.33          | 0.00                       | 0.47                       | 0.12            | 438.81                     | 0.29                                     | 15.82                   |
| 07/29/21 15:15:23                | 84720                     | 8.83                    | 5.72           | 5.51          | 167.33                                             | 5.70                     | 1.68                        | 4.61                                       | 5.72          | 0.00                       | 0.49                       | 0.19            | 439.77                     | 0.12                                     | 15.62                   |
| 07/29/21 15:15:53                | 84750                     | 8.84                    | 5.48           | 5.48          | 167.20                                             | 5.58                     | 1.70                        | 4.46                                       | 5.48          | 0.00                       | 0.52                       | 0.13            | 436.46                     | -0.02                                    | 16.86                   |
| 07/29/21 15:16:23                | 84780                     | 8.83                    | 4.91           | 5.28          | 165.62                                             | 5.56                     | 1.67                        | 4.50                                       | 4.91          | 0.00                       | 0.53                       | 0.01            | 434.79                     | 0.11                                     | 17.17                   |
| 07/29/21 15:16:53                | 84810                     | 8.82                    | 5.64           | 5.51          | 167.92                                             | 5.71                     | 1.75                        | 4.60                                       | 5.64          | 0.00                       | 0.51                       | 0.09            | 438.72                     | 0.29                                     | 15.73                   |
| 07/29/21 15:17:23                | 84840                     | 8.82                    | 5.13           | 5.57          | 171.10                                             | 5.70                     | 1.71                        | 4.33                                       | 5.13          | 0.00                       | 0.46                       | 0.13            | 445.85                     | -0.17                                    | 15.16                   |
| 07/29/21 15:17:53                | 84870                     | 8.81                    | 5.32           | 5.38          | 170.30                                             | 5.72                     | 1.68                        | 4.57                                       | 5.32          | 0.00                       | 0.46                       | 0.25            | 445.14                     | -0.16                                    | 14.85                   |
| 07/29/21 15:18:23                | 84900                     | 8.81                    | 5.08           | 5.30          | 171.02                                             | 5.75                     | 1.70                        | 3.91                                       | 5.08          | 0.00                       | 0.45                       | 0.12            | 447.31                     | -0.31                                    | 14.63                   |
| 07/29/21 15:18:53                | 84930                     | 8.79                    | 5.48           | 5.47          | 171.50                                             | 5.77                     | 1.72                        | 3.81                                       | 5.48          | 0.00                       | 0.46                       | 0.09            | 446.19                     | 0.02                                     | 14.61                   |
| 07/29/21 15:19:23                | 84960                     | 8.80                    | 5.41           | 5.48          | 171.19                                             | 5.78                     | 1.69                        | 4.40                                       | 5.41          | 0.00                       | 0.44                       | -0.08           | 447.68                     | -0.01                                    | 14.47                   |
| 07/29/21 15:19:53                | 84990                     | 8.79                    | 5.67           | 5.46          | 169.93                                             | 5.81                     | 1.78                        | 4.45                                       | 5.67          | 0.00                       | 0.47                       | 0.03            | 445.17                     | 0.23                                     | 14.41                   |
| 07/29/21 15:20:23                | 85020                     | 8.79                    | 5.59           | 5.39          | 169.78                                             | 5.81                     | 1.79                        | 3.92                                       | 5.59          | 0.00                       | 0.46                       | 0.10            | 445.79                     | 0.26                                     | 14.37                   |
| 07/29/21 15:20:53                | 85050                     | 8.79                    | 5.52           | 5.50          | 171.61                                             | 5.80                     | 1.70                        | 4.43                                       | 5.52          | 0.00                       | 0.49                       | 0.00            | 445.75                     | -0.18                                    | 14.27                   |
| 07/29/21 15:21:23                | 85080                     | 8.78                    | 5.59           | 5.52          | 170.83                                             | 5.80                     | 1.71                        | 4.20                                       | 5.59          | 0.00                       | 0.49                       | 0.25            | 446.24                     | -0.02                                    | 14.29                   |
| 07/29/21 15:21:53                | 85110                     | 8.78                    | 5.50           | 5.50          | 169.00                                             | 5.82                     | 1.69                        | 5.14                                       | 5.50          | 0.00                       | 0.45                       | 0.10            | 446.38                     | -0.10                                    | 14.24                   |
| 07/29/21 15:22:23                | 85140                     | 8.79                    | 5.73           | 5.27          | 171.34                                             | 5.82                     | 1.74                        | 4.55                                       | 5.73          | 0.00                       | 0.45                       | -0.17           | 447.28                     | 0.18                                     | 14.15                   |
| 07/29/21 15:22:53                | 85170                     | 8.79                    | 5.84           | 5.43          | 172.11                                             | 5.82                     | 1.74                        | 3.65                                       | 5.84          | 0.00                       | 0.44                       | -0.16           | 446.95                     | -0.30                                    | 14.16                   |
| <b>RAW AVERAGE</b>               |                           | <b>8.80</b>             | <b>5.71</b>    | <b>5.48</b>   | <b>168.64</b>                                      | <b>5.78</b>              | <b>1.75</b>                 | <b>3.45</b>                                | <b>5.71</b>   | <b>0.00</b>                | <b>0.49</b>                | <b>0.04</b>     | <b>443.69</b>              | <b>0.11</b>                              | <b>14.39</b>            |

| Bias            | Serial Number:  | INST-O2-0026   | INST-IR-0005 | INST-IR-0005 | INST-VC-0004 | INST-IR-0005 | INST-IR-0005 | INST-IR-0005                            | INST-IR-0005 | INST-IR-0005    | INST-IR-0005 | INST-IR-0005     | INST-IR-0005 | INST-IR-0005                    | INST-IR-0005 |
|-----------------|-----------------|----------------|--------------|--------------|--------------|--------------|--------------|-----------------------------------------|--------------|-----------------|--------------|------------------|--------------|---------------------------------|--------------|
|                 |                 | O <sub>2</sub> |              | NOx          |              | CO           |              | THC (as C <sub>3</sub> H <sub>8</sub> ) |              | CO <sub>2</sub> |              | N <sub>2</sub> O |              | C <sub>2</sub> H <sub>6</sub> O |              |
|                 |                 | (%)            |              | (ppmvw)      |              | (ppmvw)      |              | (ppmvw)                                 |              | (ppmvw)         |              | (ppmvw)          |              | (ppmvw)                         |              |
|                 | Initial Zero    | 0.08           |              | 0.21         |              | 0.17         |              | 0.19                                    |              |                 |              |                  |              |                                 |              |
|                 | Final Zero      | 0.09           |              | 0.17         |              | 0.17         |              | 0.19                                    |              |                 |              |                  |              |                                 |              |
|                 | Avg. Zero       | 0.09           |              | 0.19         |              |              |              |                                         |              |                 |              |                  |              |                                 |              |
|                 | Initial UpScale | 11.97          |              | 317.42       |              |              |              |                                         |              |                 |              |                  |              |                                 |              |
|                 | Final UpScale   | 11.98          |              | 314.03       |              |              |              |                                         |              |                 |              |                  |              |                                 |              |
|                 | Avg. UpScale    | 11.98          |              | 315.73       |              |              |              |                                         |              |                 |              |                  |              |                                 |              |
| Upscale Cal Gas |                 | 11.99          |              | 302.00       |              |              |              |                                         |              |                 |              |                  |              |                                 |              |

| EMISSIONS DATA                          | O <sub>2</sub> | NOx    | CO     | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> O | NO     | NO <sub>2</sub> | NH <sub>3</sub> | HCHO   | CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) | C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) | VOC (as C <sub>3</sub> H <sub>8</sub> ) |
|-----------------------------------------|----------------|--------|--------|-----------------------------------------|-----------------|------------------|---------------------------------|--------|-----------------|-----------------|--------|-----------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------|
| Corrected Raw Average (ppm/% dry basis) | 8.79           | 6.67   | 6.40   | 197.00                                  | 6.75            | 2.05             | 4.04                            | 6.67   | 0.00            | 0.57            | 0.05   | 190.04                                              | 0.09                                                              | 6.87                                    |
| Corrected Raw Average (ppm/% wet basis) | 7.51           | 5.71   | 5.48   | 168.64                                  | 5.78            | 1.75             | 3.45                            | 5.71   | 0.00            | 0.49            | 0.04   | 162.69                                              | 0.07                                                              | 5.88                                    |
| Concentration (ppm@ 15%O <sub>2</sub> ) | N/A            | 3.25   | 3.12   | 82.17                                   | 3.29            | 1.00             | 1.97                            | 3.25   | 0.00            | 0.28            | 0.02   | 92.60                                               | 0.04                                                              | 2.86                                    |
| Emission Rate (g/hp*hr)                 | N/A            | 0.0579 | 0.0338 | 1.4004                                  | 561             | 0.0170           | 0.0336                          | 0.0378 | 0.0000          | 0.0018          | 0.0003 | 1.5817                                              | 0.0007                                                            | 0.0488                                  |

Non-Bias Adjusted Averages Include:

## **EMISSION DATA RECORDS**

**75% Load**

**NO<sub>x</sub>, CO, THC, N<sub>2</sub>O, C<sub>2</sub>H<sub>4</sub>O, NH<sub>3</sub>, HCHO, CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, and H<sub>2</sub>O**  
**Reference Method Data**

Catalytic Combustion Corporation  
July 30, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

Fuel Data

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 20.603 | SCFH          |

Weather Data

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.89    | in. Hg                       |
| Relative Humidity   | 53       | %                            |
| Ambient Temperature | 94       | °F                           |
| Specific Humidity   | 0.018296 | lb H <sub>2</sub> O / lb air |

Unit Data

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 2.8914  | horsepower |
| Meas. Stack Moisture     | 13.9    | %          |
| Stack Exhaust Flow (M19) | 310.849 | SCFH       |

75% Load, Run - 2-1

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vvd) | NOx<br>(ppmw) | CO<br>(ppmw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmw) | CO <sub>2</sub><br>(%vvd) | N <sub>2</sub> O<br>(ppmw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmw) | NO<br>(ppmw) | NO <sub>2</sub><br>(ppmw) | NH <sub>3</sub><br>(ppmw) | HCHO<br>(ppmw) | CH <sub>4</sub><br>(ppmw) | C <sub>2</sub> H <sub>6</sub><br>(ppmw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|--------------------------|---------------|--------------|---------------------------------------------------|---------------------------|----------------------------|-------------------------------------------|--------------|---------------------------|---------------------------|----------------|---------------------------|-----------------------------------------|-------------------------|
| 07/30/21 13:45:23                | 165720                    | 8.94                     | 5.59          | 2.67         | 149.97                                            | 5.60                      | 1.40                       | 0.37                                      | 5.59         | 0.00                      | 15.45                     | -0.16          | 407.90                    | 0.76                                    | 14.54                   |
| 07/30/21 13:45:53                | 165750                    | 8.93                     | 5.69          | 2.63         | 149.97                                            | 5.62                      | 1.44                       | 0.54                                      | 5.69         | 0.00                      | 15.26                     | -0.27          | 407.38                    | 0.93                                    | 14.22                   |
| 07/30/21 13:46:23                | 165780                    | 8.94                     | 5.80          | 2.79         | 150.51                                            | 5.65                      | 1.42                       | 0.03                                      | 5.80         | 0.00                      | 14.83                     | -0.23          | 408.24                    | 0.74                                    | 14.05                   |
| 07/30/21 13:46:53                | 165810                    | 8.94                     | 5.78          | 2.72         | 150.09                                            | 5.61                      | 1.43                       | 0.80                                      | 5.78         | 0.00                      | 14.78                     | -0.23          | 406.16                    | 0.96                                    | 14.26                   |
| 07/30/21 13:47:23                | 165840                    | 8.95                     | 5.79          | 2.65         | 150.57                                            | 5.61                      | 1.41                       | 0.51                                      | 5.79         | 0.00                      | 15.18                     | -0.16          | 407.80                    | 0.82                                    | 14.30                   |
| 07/30/21 13:47:53                | 165870                    | 8.94                     | 5.73          | 2.78         | 152.51                                            | 5.64                      | 1.43                       | 0.24                                      | 5.73         | 0.00                      | 15.41                     | -0.15          | 407.10                    | 0.84                                    | 14.11                   |
| 07/30/21 13:48:23                | 165900                    | 8.94                     | 6.01          | 2.73         | 150.28                                            | 5.62                      | 1.43                       | 0.60                                      | 6.01         | 0.00                      | 15.24                     | -0.15          | 406.97                    | 0.89                                    | 14.24                   |
| 07/30/21 13:48:53                | 165930                    | 8.93                     | 5.79          | 2.71         | 148.46                                            | 5.57                      | 1.42                       | 0.67                                      | 5.79         | 0.00                      | 15.98                     | -0.28          | 403.63                    | 0.96                                    | 14.87                   |
| 07/30/21 13:49:23                | 165960                    | 8.94                     | 5.69          | 2.70         | 152.44                                            | 5.59                      | 1.41                       | 0.58                                      | 5.69         | 0.00                      | 16.27                     | -0.17          | 407.02                    | 0.84                                    | 14.53                   |
| 07/30/21 13:49:53                | 165990                    | 8.94                     | 5.69          | 2.68         | 150.92                                            | 5.59                      | 1.46                       | 0.58                                      | 5.69         | 0.00                      | 16.09                     | -0.24          | 405.18                    | 0.80                                    | 14.38                   |
| 07/30/21 13:50:23                | 166020                    | 8.94                     | 5.87          | 2.83         | 149.52                                            | 5.63                      | 1.47                       | 0.39                                      | 5.87         | 0.00                      | 15.75                     | -0.15          | 406.61                    | 0.86                                    | 14.26                   |
| 07/30/21 13:50:53                | 166050                    | 8.95                     | 5.87          | 2.82         | 151.94                                            | 5.63                      | 1.43                       | 0.48                                      | 5.87         | 0.00                      | 15.40                     | -0.15          | 408.83                    | 0.91                                    | 14.19                   |
| 07/30/21 13:51:23                | 166080                    | 8.95                     | 5.96          | 2.86         | 149.85                                            | 5.63                      | 1.44                       | 0.35                                      | 5.96         | 0.00                      | 15.33                     | -0.14          | 407.04                    | 0.80                                    | 14.19                   |
| 07/30/21 13:51:53                | 166110                    | 8.97                     | 6.04          | 2.84         | 150.42                                            | 5.63                      | 1.47                       | 0.38                                      | 6.04         | 0.00                      | 15.39                     | -0.21          | 407.58                    | 1.03                                    | 14.16                   |
| 07/30/21 13:52:23                | 166140                    | 8.97                     | 5.99          | 2.72         | 149.87                                            | 5.61                      | 1.52                       | 0.60                                      | 5.99         | 0.00                      | 15.35                     | -0.11          | 407.75                    | 0.79                                    | 14.07                   |
| 07/30/21 13:52:53                | 166170                    | 9.00                     | 5.92          | 2.73         | 150.51                                            | 5.60                      | 1.49                       | 0.49                                      | 5.92         | 0.00                      | 15.19                     | -0.14          | 409.27                    | 0.96                                    | 13.99                   |
| 07/30/21 13:53:23                | 166200                    | 8.98                     | 5.58          | 2.79         | 150.71                                            | 5.62                      | 1.44                       | 0.29                                      | 5.58         | 0.00                      | 15.04                     | -0.20          | 408.53                    | 0.93                                    | 13.98                   |
| 07/30/21 13:53:53                | 166230                    | 8.95                     | 5.73          | 2.83         | 150.82                                            | 5.66                      | 1.41                       | 0.67                                      | 5.73         | 0.00                      | 14.75                     | -0.19          | 410.88                    | 0.85                                    | 13.91                   |
| 07/30/21 13:54:23                | 166260                    | 8.97                     | 5.46          | 2.80         | 151.19                                            | 5.65                      | 1.40                       | 0.61                                      | 5.46         | 0.00                      | 14.33                     | -0.19          | 411.87                    | 0.92                                    | 13.76                   |
| 07/30/21 13:54:53                | 166290                    | 8.97                     | 5.68          | 2.67         | 153.46                                            | 5.67                      | 1.45                       | 0.71                                      | 5.68         | 0.00                      | 13.91                     | -0.27          | 411.25                    | 1.04                                    | 13.66                   |
| 07/30/21 13:55:23                | 166320                    | 8.96                     | 5.52          | 2.79         | 151.54                                            | 5.66                      | 1.42                       | 0.59                                      | 5.52         | 0.00                      | 13.72                     | -0.14          | 411.56                    | 0.70                                    | 13.73                   |
| 07/30/21 13:55:53                | 166350                    | 8.96                     | 5.38          | 2.66         | 151.37                                            | 5.64                      | 1.41                       | 0.75                                      | 5.38         | 0.00                      | 13.94                     | -0.14          | 411.48                    | 0.84                                    | 13.79                   |
| 07/30/21 13:56:23                | 166380                    | 8.97                     | 5.82          | 2.75         | 152.50                                            | 5.64                      | 1.42                       | 0.36                                      | 5.82         | 0.00                      | 14.23                     | -0.10          | 410.88                    | 0.66                                    | 13.82                   |
| 07/30/21 13:56:53                | 166410                    | 8.98                     | 6.10          | 2.68         | 150.29                                            | 5.65                      | 1.46                       | 0.99                                      | 6.10         | 0.00                      | 14.63                     | -0.09          | 409.47                    | 0.76                                    | 13.86                   |
| 07/30/21 13:57:23                | 166440                    | 8.97                     | 5.96          | 2.67         | 150.64                                            | 5.64                      | 1.44                       | 0.45                                      | 5.96         | 0.00                      | 14.80                     | -0.16          | 408.48                    | 0.72                                    | 13.80                   |
| 07/30/21 13:57:53                | 166470                    | 8.96                     | 5.37          | 2.83         | 150.92                                            | 5.66                      | 1.43                       | 0.93                                      | 5.37         | 0.00                      | 14.66                     | -0.13          | 410.90                    | 0.71                                    | 13.75                   |
| 07/30/21 13:58:23                | 166500                    | 8.97                     | 5.53          | 2.72         | 151.61                                            | 5.67                      | 1.43                       | 0.46                                      | 5.53         | 0.00                      | 14.19                     | -0.28          | 410.92                    | 0.72                                    | 13.67                   |
| 07/30/21 13:58:53                | 166530                    | 8.97                     | 5.37          | 2.83         | 153.19                                            | 5.63                      | 1.44                       | 0.58                                      | 5.37         | 0.00                      | 14.14                     | -0.19          | 409.85                    | 0.84                                    | 14.09                   |
| 07/30/21 13:59:23                | 166560                    | 8.96                     | 5.36          | 2.78         | 150.89                                            | 5.65                      | 1.43                       | 0.23                                      | 5.36         | 0.00                      | 13.96                     | -0.23          | 411.30                    | 0.61                                    | 13.89                   |
| 07/30/21 13:59:53                | 166590                    | 8.96                     | 5.35          | 2.81         | 151.49                                            | 5.64                      | 1.43                       | 0.29                                      | 5.35         | 0.00                      | 13.69                     | -0.21          | 411.12                    | 0.75                                    | 13.92                   |
| 07/30/21 14:00:23                | 166620                    | 8.96                     | 5.36          | 2.77         | 152.13                                            | 5.67                      | 1.41                       | 0.66                                      | 5.36         | 0.00                      | 13.36                     | -0.23          | 412.37                    | 0.85                                    | 13.61                   |
| 07/30/21 14:00:53                | 166650                    | 8.96                     | 5.53          | 2.68         | 152.22                                            | 5.70                      | 1.42                       | 0.49                                      | 5.53         | 0.00                      | 13.05                     | -0.18          | 414.28                    | 0.77                                    | 13.25                   |
| 07/30/21 14:01:23                | 166680                    | 8.96                     | 5.73          | 2.73         | 152.80                                            | 5.72                      | 1.45                       | 0.42                                      | 5.73         | 0.00                      | 12.83                     | -0.23          | 414.58                    | 0.88                                    | 13.05                   |
| 07/30/21 14:01:53                | 166710                    | 8.94                     | 5.63          | 2.82         | 152.68                                            | 5.75                      | 1.44                       | 0.76                                      | 5.63         | 0.00                      | 12.60                     | -0.20          | 415.96                    | 0.91                                    | 12.85                   |
| 07/30/21 14:02:23                | 166740                    | 8.94                     | 5.75          | 2.85         | 152.33                                            | 5.76                      | 1.41                       | 0.84                                      | 5.75         | 0.00                      | 12.43                     | -0.01          | 415.38                    | 0.90                                    | 12.79                   |
| 07/30/21 14:02:53                | 166770                    | 8.96                     | 5.79          | 2.87         | 152.72                                            | 5.75                      | 1.44                       | 0.99                                      | 5.79         | 0.00                      | 12.30                     | -0.19          | 416.46                    | 0.86                                    | 12.84                   |
| 07/30/21 14:03:23                | 166800                    | 8.95                     | 5.83          | 2.87         | 152.76                                            | 5.75                      | 1.43                       | 0.63                                      | 5.83         | 0.00                      | 12.38                     | -0.17          | 416.53                    | 0.97                                    | 12.84                   |
| 07/30/21 14:03:53                | 166830                    | 8.95                     | 5.78          | 2.80         | 152.87                                            | 5.75                      | 1.48                       | 0.16                                      | 5.78         | 0.00                      | 12.58                     | -0.22          | 416.46                    | 0.95                                    | 12.93                   |
| 07/30/21 14:04:23                | 166860                    | 8.95                     | 6.02          | 2.73         | 153.08                                            | 5.77                      | 1.46                       | 0.35                                      | 6.02         | 0.00                      | 12.74                     | -0.23          | 417.47                    | 0.72                                    | 12.80                   |
| 07/30/21 14:04:53                | 166890                    | 8.97                     | 6.26          | 2.75         | 152.62                                            | 5.76                      | 1.57                       | 0.22                                      | 6.26         | 0.00                      | 12.89                     | -0.31          | 416.15                    | 0.76                                    | 12.79                   |
| 07/30/21 14:05:23                | 166920                    | 8.97                     | 6.13          | 2.76         | 154.06                                            | 5.75                      | 1.52                       | 0.47                                      | 6.13         | 0.00                      | 13.16                     | -0.22          | 415.82                    | 0.82                                    | 12.77                   |
| 07/30/21 14:05:53                | 166950                    | 8.97                     | 6.03          | 2.80         | 151.98                                            | 5.75                      | 1.50                       | 0.88                                      | 6.03         | 0.00                      | 13.43                     | -0.21          | 414.42                    | 0.76                                    | 12.81                   |
| 07/30/21 14:06:23                | 166980                    | 8.97                     | 5.72          | 2.72         | 153.39                                            | 5.61                      | 1.44                       | 0.76                                      | 5.72         | 0.00                      | 14.26                     | -0.22          | 411.88                    | 0.77                                    | 14.20                   |
| 07/30/21 14:06:53                | 167010                    | 8.98                     | 5.59          | 2.78         | 151.06                                            | 5.62                      | 1.40                       | 0.56                                      | 5.59         | 0.00                      | 14.60                     | -0.02          | 408.23                    | 0.63                                    | 14.29                   |
| 07/30/21 14:07:23                | 167040                    | 8.97                     | 6.05          | 2.74         | 153.83                                            | 5.71                      | 1.50                       | 0.65                                      | 6.05         | 0.00                      | 14.62                     | -0.21          | 413.85                    | 0.78                                    | 13.26                   |
| 07/30/21 14:07:53                | 167070                    | 8.98                     | 6.02          | 2.78         | 151.59                                            | 5.74                      | 1.49                       | 0.55                                      | 6.02         | 0.00                      | 14.53                     | -0.23          | 412.80                    | 0.83                                    | 13.04                   |
| 07/30/21 14:08:23                | 167100                    | 8.97                     | 5.59          | 2.74         | 151.39                                            | 5.59                      | 1.43                       | 0.42                                      | 5.59         | 0.00                      | 15.29                     | -0.23          | 407.53                    | 0.75                                    | 14.60                   |
| 07/30/21 14:08:53                | 167130                    | 8.96                     | 5.84          | 2.77         | 150.86                                            | 5.68                      | 1.50                       | 0.49                                      | 5.84         | 0.00                      | 15.30                     | -0.17          | 408.89                    | 0.67                                    | 13.62                   |
| 07/30/21 14:09:23                | 167160                    | 8.96                     | 5.88          | 2.77         | 150.77                                            | 5.69                      | 1.45                       | 0.86                                      | 5.88         | 0.00                      | 15.35                     | -0.12          | 410.34                    | 0.81                                    | 13.47                   |
| 07/30/21 14:09:53                | 167190                    | 8.97                     | 5.86          | 2.86         | 150.95                                            | 5.67                      | 1.49                       | 0.88                                      | 5.86         | 0.00                      | 15.45                     | -0.19          | 411.50                    | 0.74                                    | 13.57                   |
| 07/30/21 14:10:23                | 167220                    | 8.96                     | 5.37          | 2.77         | 150.82                                            | 5.58                      | 1.44                       | 0.70                                      | 5.37         | 0.00                      | 16.26                     | -0.18          | 408.68                    | 0.91                                    | 14.68                   |
| 07/30/21 14:10:53                | 167250                    | 8.97                     | 5.46          | 2.68         | 150.73                                            | 5.58                      | 1.45                       | 0.71                                      | 5.46         | 0.00                      | 16.65                     | -0.21          | 408.83                    | 0.89                                    | 14.65                   |
| 07/30/21 14:11:23                | 167280                    | 8.96                     | 5.68          | 2.78         | 150.28                                            | 5.65                      | 1.51                       | 0.90                                      | 5.68         | 0.00                      | 16.98                     | -0.27          | 409.45                    | 0.71                                    | 14.07                   |
| 07/30/21 14:11:53                | 167310                    | 8.97                     | 5.41          | 2.87         | 151.28                                            | 5.65                      | 1.47                       | 1.08                                      | 5.41         | 0.00                      | 16.77                     | -0.32          | 411.15                    | 0.79                                    | 13.85                   |
| 07/30/21 14:12:23                | 167340                    | 8.97                     | 5.82          | 2.71         | 151.71                                            | 5.67                      | 1.46                       | 0.95                                      | 5.82         | 0.00                      | 16.65                     | -0.11          | 410.56                    | 0.66                                    | 13.86                   |
| 07/30/21 14:12:53                | 167370                    | 8.96                     | 5.64          | 2.78         | 151.38                                            | 5.68                      | 1.48                       | 0.38                                      | 5.64         | 0.00                      | 16.27                     | -0.33          | 411.61                    | 0.76                                    | 13.64                   |
| 07/30/21 14:13:23                | 167400                    | 8.97                     | 5.57          | 2.72         | 151.56                                            | 5.66                      | 1.49                       | 0.41                                      | 5.57         | 0.00                      | 16.18                     | -0.18          | 411.72                    | 0.85                                    | 13.87                   |
| 07/30/21 14:13:53                | 167430                    | 8.97                     | 5.44          | 2.86         | 150.30                                            | 5.65                      | 1.46                       | 0.92                                      | 5.44         | 0.00                      | 16.44                     | -0.26          | 409.70                    | 0.91                                    | 14.09                   |
| 07/30/21 14:14:23                | 167460                    | 8.98                     | 5.32          | 2.71         | 150.51                                            | 5.61                      | 1.48                       | 0.97                                      | 5.32         | 0.00                      | 16.70                     | -0.21          | 408.13                    | 0.78                                    | 14.36                   |
| 07/30/21 14:14:53                | 167490                    | 8.97                     | 5.29          | 2.78         | 151.40                                            | 5.60                      | 1.40                       | 1.01                                      | 5.29         | 0.00                      | 16.91                     | -0.23          | 409.96                    | 0.69                                    | 14.57                   |
| 07/30/21 14:15:23                | 167520                    | 8.95                     | 5.33          | 2.78         | 151.65                                            | 5.60                      | 1.44                       | 0.68                                      | 5.33         | 0.00                      | 16.89                     | -0.            |                           |                                         |                         |

Catalytic Combustion Corporation  
July 30, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

**Fuel Data**

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 20.603 | SCFH          |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.89    | in. Hg                       |
| Relative Humidity   | 53       | %                            |
| Ambient Temperature | 94       | °F                           |
| Specific Humidity   | 0.018296 | lb H <sub>2</sub> O / lb air |

**Unit Data**

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 2.6914  | horsepower |
| Meas. Stack Moisture     | 13.9    | %          |
| Stack Exhaust Flow (M19) | 310.849 | SCFH       |

75% Load, Run - 2-1

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vvd) | NOx<br>(ppmvw) | CO<br>(ppmvw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | CO <sub>2</sub><br>(%vvd) | N <sub>2</sub> O<br>(ppmvw) | C <sub>2</sub> H <sub>2</sub> O<br>(ppmvw) | NO<br>(ppmvw) | NO <sub>2</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) | HCHO<br>(ppmvw) | CH <sub>4</sub><br>(ppmvw) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|--------------------------|----------------|---------------|----------------------------------------------------|---------------------------|-----------------------------|--------------------------------------------|---------------|----------------------------|----------------------------|-----------------|----------------------------|------------------------------------------|-------------------------|
| 07/30/21 14:35:23                | 168720                    | 8.97                     | 5.15           | 2.77          | 152.90                                             | 5.61                      | 1.44                        | 1.70                                       | 5.15          | 0.00                       | 17.43                      | -0.22           | 410.71                     | 0.68                                     | 14.44                   |
| 07/30/21 14:35:53                | 168750                    | 8.98                     | 5.40           | 2.85          | 151.24                                             | 5.63                      | 1.43                        | 1.41                                       | 5.40          | 0.00                       | 17.47                      | -0.22           | 409.78                     | 0.62                                     | 14.36                   |
| 07/30/21 14:36:23                | 168780                    | 8.98                     | 5.53           | 2.83          | 152.34                                             | 5.65                      | 1.43                        | 1.65                                       | 5.53          | 0.00                       | 17.28                      | -0.26           | 410.71                     | 0.62                                     | 14.21                   |
| 07/30/21 14:36:53                | 168810                    | 8.99                     | 5.38           | 2.91          | 154.17                                             | 5.64                      | 1.42                        | 1.54                                       | 5.38          | 0.00                       | 17.27                      | -0.19           | 411.62                     | 0.69                                     | 14.34                   |
| 07/30/21 14:37:23                | 168840                    | 9.00                     | 5.24           | 2.91          | 153.21                                             | 5.64                      | 1.45                        | 1.13                                       | 5.24          | 0.00                       | 17.28                      | -0.24           | 411.68                     | 0.64                                     | 14.28                   |
| 07/30/21 14:37:53                | 168870                    | 8.97                     | 5.47           | 2.81          | 152.42                                             | 5.65                      | 1.45                        | 1.78                                       | 5.47          | 0.00                       | 17.10                      | -0.23           | 411.69                     | 0.63                                     | 14.20                   |
| 07/30/21 14:38:23                | 168900                    | 8.98                     | 5.42           | 2.80          | 152.65                                             | 5.66                      | 1.43                        | 1.48                                       | 5.42          | 0.00                       | 16.90                      | -0.19           | 411.89                     | 0.77                                     | 14.12                   |
| 07/30/21 14:38:53                | 168930                    | 8.99                     | 5.44           | 2.91          | 152.73                                             | 5.67                      | 1.44                        | 1.58                                       | 5.44          | 0.00                       | 16.52                      | -0.24           | 414.89                     | 0.86                                     | 13.76                   |
| 07/30/21 14:39:23                | 168960                    | 8.98                     | 5.79           | 2.93          | 152.87                                             | 5.72                      | 1.50                        | 1.54                                       | 5.79          | 0.00                       | 15.56                      | -0.26           | 412.79                     | 0.49                                     | 13.53                   |
| 07/30/21 14:39:53                | 168990                    | 8.99                     | 5.89           | 2.98          | 152.32                                             | 5.73                      | 1.48                        | 1.86                                       | 5.89          | 0.00                       | 14.95                      | -0.12           | 414.92                     | 0.77                                     | 13.45                   |
| 07/30/21 14:40:23                | 169020                    | 8.98                     | 5.65           | 2.83          | 154.63                                             | 5.74                      | 1.52                        | 1.71                                       | 5.65          | 0.00                       | 14.64                      | -0.23           | 416.08                     | 0.77                                     | 13.25                   |
| 07/30/21 14:40:53                | 169050                    | 8.98                     | 5.95           | 2.86          | 152.01                                             | 5.76                      | 1.49                        | 1.69                                       | 5.95          | 0.00                       | 14.33                      | -0.14           | 414.33                     | 0.54                                     | 13.02                   |
| 07/30/21 14:41:23                | 169080                    | 8.99                     | 5.76           | 2.87          | 153.24                                             | 5.75                      | 1.46                        | 2.06                                       | 5.76          | 0.00                       | 14.00                      | -0.22           | 417.51                     | 0.76                                     | 12.78                   |
| 07/30/21 14:41:53                | 169110                    | 8.98                     | 5.81           | 2.91          | 152.70                                             | 5.76                      | 1.44                        | 1.49                                       | 5.81          | 0.00                       | 13.88                      | -0.26           | 415.53                     | 0.71                                     | 12.75                   |
| 07/30/21 14:42:23                | 169140                    | 8.98                     | 5.69           | 2.88          | 154.77                                             | 5.77                      | 1.50                        | 1.65                                       | 5.69          | 0.00                       | 13.94                      | -0.31           | 416.26                     | 0.70                                     | 12.77                   |
| 07/30/21 14:42:53                | 169170                    | 8.99                     | 4.94           | 2.93          | 155.75                                             | 5.73                      | 1.52                        | 1.27                                       | 4.94          | 0.00                       | 14.04                      | -0.47           | 419.17                     | 0.92                                     | 12.69                   |
| 07/30/21 14:43:23                | 169200                    | 9.00                     | 4.85           | 2.81          | 155.30                                             | 5.73                      | 1.53                        | 1.90                                       | 4.85          | 0.00                       | 14.03                      | -0.27           | 419.67                     | 0.70                                     | 12.52                   |
| 07/30/21 14:43:53                | 169230                    | 9.01                     | 5.06           | 3.03          | 155.34                                             | 5.74                      | 1.47                        | 1.67                                       | 5.06          | 0.00                       | 13.98                      | -0.31           | 422.97                     | 0.78                                     | 12.44                   |
| 07/30/21 14:44:23                | 169260                    | 9.02                     | 5.04           | 2.93          | 157.03                                             | 5.75                      | 1.47                        | 1.92                                       | 5.04          | 0.00                       | 13.99                      | -0.26           | 421.95                     | 0.75                                     | 12.44                   |
| 07/30/21 14:44:53                | 169290                    | 9.01                     | 4.92           | 2.93          | 155.37                                             | 5.75                      | 1.47                        | 1.73                                       | 4.92          | 0.00                       | 14.09                      | -0.32           | 420.53                     | 0.76                                     | 12.47                   |
| <b>RAW AVERAGE</b>               |                           | <b>8.97</b>              | <b>5.59</b>    | <b>2.78</b>   | <b>151.87</b>                                      | <b>5.66</b>               | <b>1.45</b>                 | <b>0.97</b>                                | <b>5.59</b>   | <b>0.00</b>                | <b>15.64</b>               | <b>0.00</b>     | <b>410.84</b>              | <b>0.76</b>                              | <b>13.91</b>            |

|                        |                 |                |              |              |              |              |              |                                         |              |                 |              |                  |              |                                 |              |
|------------------------|-----------------|----------------|--------------|--------------|--------------|--------------|--------------|-----------------------------------------|--------------|-----------------|--------------|------------------|--------------|---------------------------------|--------------|
| Bias                   | Serial Number:  | INST-O2-0026   | INST-IR-0005 | INST-IR-0005 | INST-VC-0004 | INST-IR-0005 | INST-IR-0005 | INST-IR-0005                            | INST-IR-0005 | INST-IR-0005    | INST-IR-0005 | INST-IR-0005     | INST-IR-0005 | INST-IR-0005                    | INST-IR-0005 |
|                        |                 | O <sub>2</sub> |              | NOx          |              | CO           |              | THC (as C <sub>3</sub> H <sub>8</sub> ) |              | CO <sub>2</sub> |              | N <sub>2</sub> O |              | C <sub>2</sub> H <sub>2</sub> O |              |
|                        |                 | (%)            |              |              |              |              |              | (ppmvw)                                 |              |                 |              |                  |              |                                 |              |
|                        | Initial Zero    | 0.07           |              |              |              |              |              | 0.13                                    |              |                 |              |                  |              |                                 |              |
|                        | Final Zero      | 0.06           |              |              |              |              |              | 0.27                                    |              |                 |              |                  |              |                                 |              |
|                        | Avg. Zero       | 0.07           |              |              |              |              |              | 0.20                                    |              |                 |              |                  |              |                                 |              |
|                        | Initial UpScale | 12.01          |              |              |              |              |              | 304.51                                  |              |                 |              |                  |              |                                 |              |
|                        | Final UpScale   | 11.97          |              |              |              |              |              | 310.21                                  |              |                 |              |                  |              |                                 |              |
|                        | Avg. UpScale    | 11.99          |              |              |              |              |              | 307.36                                  |              |                 |              |                  |              |                                 |              |
| <b>Upscale Cal Gas</b> |                 | 11.99          |              |              |              |              |              | 302.00                                  |              |                 |              |                  |              |                                 |              |

| EMISSIONS DATA                          | O <sub>2</sub> | NOx    | CO     | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>2</sub> O | NO     | NO <sub>2</sub> | NH <sub>3</sub> | HCHO   | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> ) | C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) | VOC (as C <sub>3</sub> H <sub>8</sub> ) |
|-----------------------------------------|----------------|--------|--------|-----------------------------------------|-----------------|------------------|---------------------------------|--------|-----------------|-----------------|--------|-----------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------|
| Corrected Raw Average (ppm/% dry basis) | 8.95           | 6.49   | 3.23   | 176.40                                  | 6.57            | 1.68             | 1.12                            | 6.49   | 0.00            | 18.17           | 0.00   | 174.98                                              | 0.59                                                              | 0.83                                    |
| Corrected Raw Average (ppm/% wet basis) | 7.70           | 5.59   | 2.78   | 151.87                                  | 5.66            | 1.45             | 0.97                            | 5.59   | 0.00            | 15.64           | 0.00   | 150.64                                              | 0.51                                                              | 0.72                                    |
| Concentration (ppm@ 15%O <sub>2</sub> ) | N/A            | 3.20   | 1.60   | 74.99                                   | 3.24            | 0.83             | 0.55                            | 3.20   | 0.00            | 8.97            | 0.00   | 86.41                                               | 0.29                                                              | 0.35                                    |
| Emission Rate (g/kw*hr)                 | N/A            | 0.0544 | 0.0165 | 1.2186                                  | 527             | 0.0135           | 0.0090                          | 0.0355 | 0.0000          | 0.0564          | 0.0000 | 1.4073                                              | 0.0047                                                            | 0.0058                                  |

Non-Bias Adjusted Averages Include:



Catalytic Combustion Corporation  
July 30, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

Fuel Data

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 20.591 | SCFH          |

Weather Data

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.87    | in. Hg                       |
| Relative Humidity   | 47       | %                            |
| Ambient Temperature | 97       | °F                           |
| Specific Humidity   | 0.017841 | lb H <sub>2</sub> O / lb air |

Unit Data

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 2,698.1 | horsepower |
| Meas. Stack Moisture     | 13.9    | %          |
| Stack Exhaust Flow (M19) | 310.873 | SCFH       |

75% Load, Run - 2-2

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vvd) | NOx<br>(ppmw) | CO<br>(ppmw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmw) | CO <sub>2</sub><br>(%vvd) | N <sub>2</sub> O<br>(ppmw) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmw) | NO<br>(ppmw) | NO <sub>2</sub><br>(ppmw) | NH <sub>3</sub><br>(ppmw) | HCHO<br>(ppmw) | CH <sub>4</sub><br>(ppmw) | C <sub>2</sub> H <sub>6</sub><br>(ppmw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|--------------------------|---------------|--------------|---------------------------------------------------|---------------------------|----------------------------|-------------------------------------------|--------------|---------------------------|---------------------------|----------------|---------------------------|-----------------------------------------|-------------------------|
| 07/30/21 15:00:23                | 170220                    | 9.00                     | 5.28          | 2.96         | 154.08                                            | 5.69                      | 1.35                       | 2.12                                      | 5.28         | 0.00                      | 17.06                     | -0.04          | 414.63                    | 0.44                                    | 13.70                   |
| 07/30/21 15:00:53                | 170250                    | 8.98                     | 5.34          | 2.94         | 154.11                                            | 5.70                      | 1.41                       | 2.27                                      | 5.34         | 0.00                      | 16.86                     | -0.22          | 412.25                    | 0.31                                    | 13.74                   |
| 07/30/21 15:01:23                | 170280                    | 9.00                     | 5.30          | 2.86         | 154.99                                            | 5.68                      | 1.42                       | 2.21                                      | 5.30         | 0.00                      | 16.40                     | -0.15          | 415.77                    | 0.50                                    | 13.68                   |
| 07/30/21 15:01:53                | 170310                    | 9.00                     | 5.33          | 2.95         | 154.83                                            | 5.69                      | 1.45                       | 2.15                                      | 5.33         | 0.00                      | 16.23                     | -0.09          | 412.74                    | 0.82                                    | 13.66                   |
| 07/30/21 15:02:23                | 170340                    | 9.00                     | 5.33          | 2.89         | 154.31                                            | 5.68                      | 1.33                       | 2.21                                      | 5.33         | 0.00                      | 16.25                     | -0.25          | 410.69                    | 0.72                                    | 13.66                   |
| 07/30/21 15:02:53                | 170370                    | 9.01                     | 5.33          | 2.88         | 156.72                                            | 5.68                      | 1.40                       | 2.19                                      | 5.33         | 0.00                      | 16.35                     | -0.19          | 416.89                    | 0.74                                    | 13.69                   |
| 07/30/21 15:03:23                | 170400                    | 9.00                     | 5.42          | 2.86         | 156.36                                            | 5.70                      | 1.45                       | 2.43                                      | 5.42         | 0.00                      | 16.60                     | -0.20          | 415.69                    | 0.58                                    | 13.71                   |
| 07/30/21 15:03:53                | 170430                    | 9.00                     | 5.46          | 2.84         | 155.44                                            | 5.68                      | 1.42                       | 2.48                                      | 5.46         | 0.00                      | 16.53                     | -0.23          | 415.13                    | 0.41                                    | 13.69                   |
| 07/30/21 15:04:23                | 170460                    | 9.00                     | 5.36          | 2.76         | 152.95                                            | 5.70                      | 1.40                       | 2.24                                      | 5.36         | 0.00                      | 16.20                     | -0.17          | 413.52                    | 0.61                                    | 13.66                   |
| 07/30/21 15:04:53                | 170490                    | 8.99                     | 5.44          | 2.91         | 154.46                                            | 5.68                      | 1.37                       | 1.98                                      | 5.44         | 0.00                      | 15.62                     | -0.27          | 410.42                    | 0.79                                    | 13.67                   |
| 07/30/21 15:05:23                | 170520                    | 8.99                     | 5.49          | 2.95         | 154.82                                            | 5.69                      | 1.39                       | 2.20                                      | 5.49         | 0.00                      | 15.45                     | -0.19          | 410.93                    | 0.67                                    | 13.67                   |
| 07/30/21 15:05:53                | 170550                    | 8.99                     | 5.65          | 2.88         | 156.15                                            | 5.71                      | 1.49                       | 1.90                                      | 5.65         | 0.00                      | 15.42                     | -0.56          | 413.05                    | 0.45                                    | 13.65                   |
| 07/30/21 15:06:23                | 170580                    | 8.98                     | 5.55          | 2.89         | 154.97                                            | 5.75                      | 1.40                       | 2.17                                      | 5.55         | 0.00                      | 15.43                     | -0.38          | 411.31                    | 0.41                                    | 13.49                   |
| 07/30/21 15:06:53                | 170610                    | 8.98                     | 5.88          | 2.88         | 155.71                                            | 5.71                      | 1.44                       | 2.45                                      | 5.88         | 0.00                      | 15.45                     | -0.16          | 413.83                    | 0.54                                    | 13.58                   |
| 07/30/21 15:07:23                | 170640                    | 8.98                     | 5.41          | 2.94         | 155.21                                            | 5.69                      | 1.44                       | 2.71                                      | 5.41         | 0.00                      | 16.01                     | -0.22          | 410.80                    | 0.40                                    | 13.77                   |
| 07/30/21 15:07:53                | 170670                    | 8.99                     | 5.21          | 2.85         | 153.21                                            | 5.69                      | 1.37                       | 2.38                                      | 5.21         | 0.00                      | 16.44                     | -0.19          | 412.71                    | 0.48                                    | 13.73                   |
| 07/30/21 15:08:23                | 170700                    | 8.99                     | 5.28          | 2.93         | 156.26                                            | 5.69                      | 1.43                       | 2.41                                      | 5.28         | 0.00                      | 16.55                     | -0.21          | 413.90                    | 0.79                                    | 13.75                   |
| 07/30/21 15:08:53                | 170730                    | 8.99                     | 5.09          | 2.95         | 153.40                                            | 5.61                      | 1.43                       | 2.76                                      | 5.09         | 0.00                      | 17.65                     | -0.20          | 408.10                    | 0.53                                    | 14.82                   |
| 07/30/21 15:09:23                | 170760                    | 8.99                     | 5.37          | 3.03         | 153.58                                            | 5.65                      | 1.43                       | 2.45                                      | 5.37         | 0.00                      | 18.36                     | -0.20          | 409.03                    | 0.45                                    | 14.45                   |
| 07/30/21 15:09:53                | 170790                    | 8.99                     | 5.37          | 2.89         | 155.68                                            | 5.67                      | 1.46                       | 2.02                                      | 5.37         | 0.00                      | 17.32                     | -0.27          | 411.40                    | 0.40                                    | 13.96                   |
| 07/30/21 15:10:23                | 170820                    | 8.99                     | 5.55          | 2.98         | 154.21                                            | 5.72                      | 1.41                       | 2.35                                      | 5.55         | 0.00                      | 16.25                     | -0.17          | 412.97                    | 0.45                                    | 13.56                   |
| 07/30/21 15:10:53                | 170850                    | 8.97                     | 5.59          | 2.90         | 154.93                                            | 5.78                      | 1.47                       | 2.14                                      | 5.59         | 0.00                      | 15.50                     | -0.42          | 411.69                    | 0.66                                    | 13.33                   |
| 07/30/21 15:11:23                | 170880                    | 8.97                     | 5.60          | 2.93         | 153.82                                            | 5.77                      | 1.42                       | 2.56                                      | 5.60         | 0.00                      | 15.00                     | -0.29          | 413.84                    | 0.61                                    | 13.14                   |
| 07/30/21 15:11:53                | 170910                    | 8.96                     | 5.77          | 3.03         | 152.91                                            | 5.79                      | 1.45                       | 2.60                                      | 5.77         | 0.00                      | 14.81                     | -0.30          | 411.83                    | 0.28                                    | 13.16                   |
| 07/30/21 15:12:23                | 170940                    | 8.98                     | 5.71          | 2.90         | 154.96                                            | 5.79                      | 1.51                       | 2.07                                      | 5.71         | 0.00                      | 14.69                     | -0.19          | 413.08                    | 0.68                                    | 12.87                   |
| 07/30/21 15:12:53                | 170970                    | 8.97                     | 5.25          | 49.44        | 972.03                                            | 4.16                      | 5.63                       | 1.60                                      | 5.25         | 0.00                      | 14.02                     | 0.35           | 2,591.39                  | 13.89                                   | 11.81                   |
| 07/30/21 15:13:23                | 171000                    | 8.96                     | 4.53          | 35.32        | 615.49                                            | 0.45                      | 16.68                      | 1.57                                      | 4.16         | 0.37                      | 14.81                     | 1.32           | 1,673.96                  | 0.66                                    | 10.89                   |
| 07/30/21 15:13:53                | 171030                    | 8.96                     | 5.33          | 2.88         | 156.72                                            | 5.68                      | 1.40                       | 2.19                                      | 5.14         | 0.19                      | 11.39                     | 1.27           | 595.22                    | 0.03                                    | 5.85                    |
| 07/30/21 15:14:23                | 171060                    | 8.96                     | 5.42          | 2.86         | 156.36                                            | 5.70                      | 1.45                       | 2.43                                      | 5.42         | 0.00                      | 11.41                     | 1.83           | 554.73                    | -0.06                                   | 6.02                    |
| 07/30/21 15:14:53                | 171090                    | 8.97                     | 5.46          | 2.84         | 155.44                                            | 5.68                      | 1.42                       | 2.48                                      | 5.46         | 0.00                      | 13.64                     | 0.19           | 231.15                    | 0.08                                    | 12.48                   |
| 07/30/21 15:15:23                | 171120                    | 8.97                     | 5.36          | 2.76         | 152.95                                            | 5.70                      | 1.40                       | 2.24                                      | 5.36         | 0.00                      | 11.13                     | -0.01          | 289.72                    | -0.19                                   | 12.78                   |
| 07/30/21 15:15:53                | 171150                    | 8.97                     | 5.44          | 2.91         | 154.46                                            | 5.68                      | 1.37                       | 1.98                                      | 5.44         | 0.00                      | 16.35                     | -0.19          | 416.89                    | 0.74                                    | 13.69                   |
| 07/30/21 15:16:23                | 171180                    | 8.97                     | 5.49          | 2.95         | 154.82                                            | 5.69                      | 1.39                       | 2.20                                      | 5.49         | 0.00                      | 16.60                     | -0.20          | 415.69                    | 0.58                                    | 13.71                   |
| 07/30/21 15:16:53                | 171210                    | 8.98                     | 5.65          | 2.88         | 156.15                                            | 5.71                      | 1.49                       | 1.90                                      | 5.65         | 0.00                      | 16.53                     | -0.23          | 415.13                    | 0.41                                    | 13.69                   |
| 07/30/21 15:17:23                | 171240                    | 8.97                     | 5.55          | 2.89         | 154.97                                            | 5.75                      | 1.40                       | 2.17                                      | 5.55         | 0.00                      | 16.20                     | -0.17          | 413.52                    | 0.61                                    | 13.66                   |
| 07/30/21 15:17:53                | 171270                    | 8.95                     | 5.88          | 2.88         | 155.71                                            | 5.71                      | 1.44                       | 2.45                                      | 5.88         | 0.00                      | 15.62                     | -0.27          | 410.42                    | 0.79                                    | 13.67                   |
| 07/30/21 15:18:23                | 171300                    | 8.95                     | 5.41          | 2.94         | 155.21                                            | 5.69                      | 1.44                       | 2.71                                      | 5.41         | 0.00                      | 15.45                     | -0.19          | 410.93                    | 0.67                                    | 13.67                   |
| 07/30/21 15:18:53                | 171330                    | 8.95                     | 5.21          | 2.85         | 153.21                                            | 5.69                      | 1.37                       | 2.38                                      | 5.21         | 0.00                      | 15.42                     | -0.56          | 413.05                    | 0.45                                    | 13.65                   |
| 07/30/21 15:19:23                | 171360                    | 8.95                     | 6.23          | 2.93         | 153.34                                            | 5.80                      | 1.55                       | 2.28                                      | 6.23         | 0.00                      | 15.43                     | -0.38          | 411.31                    | 0.41                                    | 13.49                   |
| 07/30/21 15:19:53                | 171390                    | 8.93                     | 5.82          | 2.84         | 159.23                                            | 5.78                      | 1.52                       | 2.45                                      | 5.82         | 0.00                      | 15.45                     | -0.16          | 413.83                    | 0.54                                    | 13.58                   |
| 07/30/21 15:20:23                | 171420                    | 8.93                     | 6.13          | 2.78         | 162.43                                            | 5.81                      | 1.51                       | 2.58                                      | 6.13         | 0.00                      | 15.42                     | -0.22          | 410.80                    | 0.40                                    | 13.77                   |
| 07/30/21 15:20:53                | 171450                    | 8.93                     | 6.34          | 2.79         | 162.71                                            | 5.82                      | 1.47                       | 2.94                                      | 6.34         | 0.00                      | 15.43                     | -0.19          | 412.71                    | 0.48                                    | 13.73                   |
| 07/30/21 15:21:23                | 171480                    | 8.94                     | 6.00          | 2.83         | 163.18                                            | 5.81                      | 1.52                       | 2.14                                      | 6.00         | 0.00                      | 15.45                     | -0.30          | 435.66                    | 0.40                                    | 12.26                   |
| 07/30/21 15:21:53                | 171510                    | 8.93                     | 5.81          | 2.90         | 162.58                                            | 5.78                      | 1.52                       | 2.30                                      | 5.81         | 0.00                      | 16.01                     | -0.26          | 433.01                    | 0.47                                    | 12.62                   |
| 07/30/21 15:22:23                | 171540                    | 8.92                     | 5.81          | 2.79         | 158.77                                            | 5.68                      | 1.45                       | 2.65                                      | 5.81         | 0.00                      | 16.44                     | -0.32          | 422.40                    | 0.20                                    | 14.33                   |
| 07/30/21 15:22:53                | 171570                    | 8.94                     | 5.88          | 2.86         | 158.19                                            | 5.68                      | 1.44                       | 2.56                                      | 5.88         | 0.00                      | 16.55                     | -0.17          | 422.76                    | 0.23                                    | 14.02                   |
| 07/30/21 15:23:23                | 171600                    | 8.94                     | 6.26          | 2.79         | 160.29                                            | 5.80                      | 1.50                       | 2.40                                      | 6.26         | 0.00                      | 17.65                     | -0.20          | 430.19                    | 0.48                                    | 12.85                   |
| 07/30/21 15:23:53                | 171630                    | 8.94                     | 5.89          | 2.92         | 160.26                                            | 5.69                      | 1.44                       | 2.52                                      | 5.89         | 0.00                      | 18.36                     | -0.24          | 425.61                    | 0.36                                    | 14.08                   |
| 07/30/21 15:24:23                | 171660                    | 8.94                     | 6.01          | 2.74         | 161.11                                            | 5.76                      | 1.48                       | 2.67                                      | 6.01         | 0.00                      | 17.32                     | -0.27          | 428.17                    | 0.15                                    | 13.26                   |
| 07/30/21 15:24:53                | 171690                    | 8.94                     | 5.69          | 2.75         | 161.33                                            | 5.73                      | 1.48                       | 2.37                                      | 5.69         | 0.00                      | 16.25                     | -0.37          | 427.32                    | 0.22                                    | 13.73                   |
| 07/30/21 15:25:23                | 171720                    | 8.94                     | 6.32          | 2.84         | 160.38                                            | 5.77                      | 1.46                       | 3.06                                      | 6.32         | 0.00                      | 12.05                     | -0.14          | 428.12                    | 0.34                                    | 13.23                   |
| 07/30/21 15:25:53                | 171750                    | 8.94                     | 5.52          | 2.96         | 159.66                                            | 5.64                      | 1.41                       | 2.81                                      | 5.52         | 0.00                      | 13.02                     | -0.25          | 422.83                    | 0.51                                    | 14.58                   |
| 07/30/21 15:26:23                | 171780                    | 8.94                     | 5.20          | 2.89         | 158.70                                            | 5.62                      | 1.42                       | 3.04                                      | 5.20         | 0.00                      | 13.55                     | -0.36          | 422.13                    | 0.27                                    | 14.96                   |
| 07/30/21 15:26:53                | 171810                    | 8.94                     | 5.61          | 2.80         | 157.68                                            | 5.58                      | 1.39                       | 2.98                                      | 5.61         | 0.00                      | 14.30                     | -0.19          | 416.17                    | 0.31                                    | 15.94                   |
| 07/30/21 15:27:23                | 171840                    | 8.94                     | 4.85          | 2.97         | 159.58                                            | 5.58                      | 1.39                       | 3.26                                      | 4.85         | 0.00                      | 14.48                     | -0.26          | 420.91                    | 0.25                                    | 15.15                   |
| 07/30/21 15:27:53                | 171870                    | 8.92                     | 4.86          | 2.82         | 158.95                                            | 5.60                      | 1.40                       | 3.06                                      | 4.86         | 0.00                      | 15.07                     | -0.18          | 418.97                    | 0.23                                    | 15.16                   |
| 07/30/21 15:28:23                | 171900                    | 8.94                     | 4.97          | 2.89         | 158.70                                            | 5.61                      | 1.40                       | 2.78                                      | 4.97         | 0.00                      | 15.27                     | -0.23          | 419.98                    | 0.47                                    | 15.12                   |
| 07/30/21 15:28:53                | 171930                    | 8.94                     | 5.09          | 3.03         | 158.28                                            | 5.58                      | 1.36                       | 3.15                                      | 5.09         | 0.00                      | 15.48                     | -0.23          | 418.18                    | 0.37                                    | 15.50                   |
| 07/30/21 15:29:23                | 171960                    | 8.94                     | 5.19          | 2.87         | 155.45                                            | 5.49                      | 1.32                       | 3.61                                      | 5.19         | 0.00                      | 16.64                     | -0.20          | 411.78                    | 0.26                                    | 17.07                   |
| 07/30/21 15:29:53                | 171990                    | 8.94                     | 5.10          | 3.01         | 156.35                                            | 5.53                      | 1.38                       | 3.48                                      | 5.10         | 0.00                      | 16.92                     | -0.13          | 413.70                    | 0.12                                    | 16.75                   |
| 07/30/21 15:30:23                | 172020                    | 8.94                     | 5.22          | 2.94         | 157.11                                            | 5.57                      | 1.36                       | 3.84                                      | 5.22         | 0.00                      | 16.76                     |                |                           |                                         |                         |

Catalytic Combustion Corporation  
July 30, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

**Fuel Data**

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 20.591 | SCFH          |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.87    | in. Hg                       |
| Relative Humidity   | 47       | %                            |
| Ambient Temperature | 97       | °F                           |
| Specific Humidity   | 0.017841 | lb H <sub>2</sub> O / lb air |

**Unit Data**

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 2.698.1 | horsepower |
| Meas. Stack Moisture     | 13.9    | %          |
| Stack Exhaust Flow (M19) | 310.873 | SCFH       |

75% Load, Run - 2-2

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vvd) | NOx<br>(ppmvw) | CO<br>(ppmvw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | CO <sub>2</sub><br>(%vw) | N <sub>2</sub> O<br>(ppmvw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmvw) | NO<br>(ppmvw) | NO <sub>2</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) | HCHO<br>(ppmvw) | CH <sub>4</sub><br>(ppmvw) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|--------------------------|----------------|---------------|----------------------------------------------------|--------------------------|-----------------------------|--------------------------------------------|---------------|----------------------------|----------------------------|-----------------|----------------------------|------------------------------------------|-------------------------|
| 07/30/21 15:50:23                | 173220                    | 8.94                     | 5.38           | 2.92          | 162.58                                             | 5.72                     | 1.49                        | 3.88                                       | 5.38          | 0.00                       | 12.84                      | -0.17           | 428.03                     | 0.17                                     | 13.94                   |
| 07/30/21 15:50:53                | 173250                    | 8.94                     | 5.13           | 2.98          | 161.45                                             | 5.73                     | 1.46                        | 3.83                                       | 5.13          | 0.00                       | 12.77                      | -0.24           | 428.88                     | 0.14                                     | 13.93                   |
| 07/30/21 15:51:23                | 173280                    | 8.94                     | 5.31           | 3.12          | 162.25                                             | 5.70                     | 1.42                        | 4.07                                       | 5.31          | 0.00                       | 12.56                      | -0.27           | 428.79                     | 0.28                                     | 13.84                   |
| 07/30/21 15:51:53                | 173310                    | 8.93                     | 5.32           | 3.01          | 164.97                                             | 5.73                     | 1.44                        | 3.80                                       | 5.32          | 0.00                       | 12.58                      | -0.12           | 430.57                     | 0.05                                     | 13.87                   |
| 07/30/21 15:52:23                | 173340                    | 8.93                     | 5.31           | 3.01          | 160.59                                             | 5.71                     | 1.55                        | 3.98                                       | 5.31          | 0.00                       | 12.47                      | -0.20           | 427.20                     | 0.59                                     | 13.79                   |
| 07/30/21 15:52:53                | 173370                    | 8.93                     | 5.43           | 3.18          | 162.47                                             | 5.72                     | 1.50                        | 4.11                                       | 5.43          | 0.00                       | 12.33                      | -0.21           | 429.06                     | 0.40                                     | 13.77                   |
| 07/30/21 15:53:23                | 173400                    | 8.93                     | 5.38           | 3.08          | 163.86                                             | 5.75                     | 1.52                        | 3.62                                       | 5.38          | 0.00                       | 12.21                      | -0.34           | 432.27                     | 0.73                                     | 13.78                   |
| 07/30/21 15:53:53                | 173430                    | 8.93                     | 5.43           | 3.21          | 162.27                                             | 5.72                     | 1.52                        | 3.72                                       | 5.43          | 0.00                       | 12.05                      | -0.28           | 430.05                     | 0.76                                     | 13.78                   |
| 07/30/21 15:54:23                | 173460                    | 8.93                     | 5.34           | 3.07          | 163.45                                             | 5.74                     | 1.52                        | 4.14                                       | 5.34          | 0.00                       | 11.97                      | -0.42           | 429.83                     | 0.53                                     | 13.79                   |
| 07/30/21 15:54:53                | 173490                    | 8.92                     | 5.24           | 3.00          | 162.66                                             | 5.72                     | 1.55                        | 3.96                                       | 5.24          | 0.00                       | 11.91                      | -0.21           | 431.25                     | 0.57                                     | 13.77                   |
| 07/30/21 15:55:23                | 173520                    | 8.92                     | 5.28           | 3.19          | 162.09                                             | 5.73                     | 1.41                        | 3.60                                       | 5.28          | 0.00                       | 11.92                      | -0.28           | 429.57                     | 0.60                                     | 13.80                   |
| 07/30/21 15:55:53                | 173550                    | 8.93                     | 5.40           | 3.09          | 162.63                                             | 5.73                     | 1.47                        | 4.02                                       | 5.40          | 0.00                       | 12.03                      | -0.43           | 429.29                     | 0.68                                     | 13.80                   |
| 07/30/21 15:56:23                | 173580                    | 8.94                     | 5.42           | 3.11          | 164.49                                             | 5.73                     | 1.47                        | 3.77                                       | 5.42          | 0.00                       | 12.00                      | -0.30           | 430.85                     | 0.50                                     | 13.79                   |
| 07/30/21 15:56:53                | 173610                    | 8.93                     | 5.28           | 3.09          | 163.16                                             | 5.73                     | 1.54                        | 5.16                                       | 5.28          | 0.00                       | 11.99                      | -0.37           | 430.41                     | 0.47                                     | 13.79                   |
| 07/30/21 15:57:23                | 173640                    | 8.93                     | 5.49           | 2.99          | 162.50                                             | 5.74                     | 1.50                        | 3.71                                       | 5.49          | 0.00                       | 11.86                      | -0.29           | 430.53                     | 0.42                                     | 13.78                   |
| 07/30/21 15:57:53                | 173670                    | 8.92                     | 5.54           | 3.12          | 164.68                                             | 5.74                     | 1.59                        | 3.74                                       | 5.54          | 0.00                       | 11.68                      | -0.38           | 431.24                     | 0.41                                     | 13.78                   |
| 07/30/21 15:58:23                | 173700                    | 8.92                     | 5.35           | 3.07          | 164.13                                             | 5.75                     | 1.47                        | 4.18                                       | 5.35          | 0.00                       | 11.71                      | -0.34           | 430.66                     | 0.69                                     | 13.79                   |
| 07/30/21 15:58:53                | 173730                    | 8.92                     | 5.11           | 3.16          | 163.97                                             | 5.75                     | 1.49                        | 4.13                                       | 5.11          | 0.00                       | 11.87                      | -0.47           | 430.71                     | 0.75                                     | 13.79                   |
| 07/30/21 15:59:23                | 173760                    | 8.92                     | 5.18           | 3.04          | 165.27                                             | 5.73                     | 1.53                        | 4.48                                       | 5.18          | 0.00                       | 11.89                      | -0.39           | 431.55                     | 0.73                                     | 13.79                   |
| 07/30/21 15:59:53                | 173790                    | 8.91                     | 5.25           | 3.10          | 164.57                                             | 5.72                     | 1.41                        | 3.74                                       | 5.25          | 0.00                       | 12.04                      | -0.22           | 431.44                     | 0.54                                     | 13.80                   |
| <b>RAW AVERAGE</b>               |                           | <b>8.95</b>              | <b>5.38</b>    | <b>3.62</b>   | <b>169.71</b>                                      | <b>5.64</b>              | <b>1.60</b>                 | <b>3.01</b>                                | <b>5.38</b>   | <b>0.00</b>                | <b>14.33</b>               | <b>0.00</b>     | <b>450.35</b>              | <b>0.54</b>                              | <b>13.86</b>            |

| Serial Number:  | O <sub>2</sub> | NOx          | CO           | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> O | NO           | NO <sub>2</sub> | NH <sub>3</sub> | HCHO         | CH <sub>4</sub> | C <sub>2</sub> H <sub>6</sub> | H <sub>2</sub> O |
|-----------------|----------------|--------------|--------------|-----------------------------------------|-----------------|------------------|---------------------------------|--------------|-----------------|-----------------|--------------|-----------------|-------------------------------|------------------|
|                 | INST-O2-0026   | INST-IR-0005 | INST-IR-0005 | INST-VC-0004                            | INST-IR-0005    | INST-IR-0005     | INST-IR-0005                    | INST-IR-0005 | INST-IR-0005    | INST-IR-0005    | INST-IR-0005 | INST-IR-0005    | INST-IR-0005                  | INST-IR-0005     |
|                 | (%)            |              |              | (ppmw)                                  |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
| Initial Zero    | 0.06           |              |              | 0.27                                    |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
| Final Zero      | 0.04           |              |              | 0.44                                    |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
| Avg. Zero       | 0.05           |              |              | 0.36                                    |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
| Bias            |                |              |              |                                         |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
| Initial UpScale | 11.97          |              |              | 310.21                                  |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
| Final UpScale   | 11.95          |              |              | 303.21                                  |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
| Avg. UpScale    | 11.96          |              |              | 306.71                                  |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
|                 | 11.99          |              |              | 302.00                                  |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |

| EMISSIONS DATA                          | O <sub>2</sub> | NOx    | CO     | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> O | NO     | NO <sub>2</sub> | NH <sub>3</sub> | HCHO   | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> ) | C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) | VOC (as C <sub>3</sub> H <sub>8</sub> ) |
|-----------------------------------------|----------------|--------|--------|-----------------------------------------|-----------------|------------------|---------------------------------|--------|-----------------|-----------------|--------|-----------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------|
| Corrected Raw Average (ppm/% dry basis) | 8.96           | 6.25   | 4.20   | 197.01                                  | 6.55            | 1.86             | 3.50                            | 6.24   | 0.01            | 16.63           | 0.00   | 191.69                                              | 0.42                                                              | 4.90                                    |
| Corrected Raw Average (ppm/% wet basis) | 7.71           | 5.38   | 3.62   | 169.71                                  | 5.64            | 1.60             | 3.01                            | 5.38   | 0.00            | 14.33           | 0.00   | 165.13                                              | 0.36                                                              | 4.22                                    |
| Concentration (ppm@ 15%O <sub>2</sub> ) | N/A            | 3.09   | 2.08   | 83.86                                   | 3.24            | 0.92             | 1.73                            | 3.08   | 0.00            | 8.22            | 0.00   | 94.72                                               | 0.21                                                              | 2.09                                    |
| Emission Rate (g/kw*hr)                 | N/A            | 0.0523 | 0.0214 | 1.3585                                  | 524             | 0.0149           | 0.0280                          | 0.0341 | 0.0000          | 0.0515          | 0.0000 | 1.5380                                              | 0.0033                                                            | 0.0338                                  |

Non-Bias Adjusted Averages Include:

Catalytic Combustion Corporation  
July 30, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

Fuel Data

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 20.172 | SCFH          |

Weather Data

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.85    | in. Hg                       |
| Relative Humidity   | 42       | %                            |
| Ambient Temperature | 97       | °F                           |
| Specific Humidity   | 0.015856 | lb H <sub>2</sub> O / lb air |

Unit Data

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 2.616.3 | horsepower |
| Meas. Stack Moisture     | 13.6    | %          |
| Stack Exhaust Flow (M19) | 303,928 | SCFH       |

75% Load, Run - 2-3

| Date/Time<br>(mm/dd/yyyy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vvd) | NOx<br>(ppmw) | CO<br>(ppmw) | THC (as C <sub>2</sub> H <sub>6</sub> )<br>(ppmw) | CO <sub>2</sub><br>(%vww) | N <sub>2</sub> O<br>(ppmw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmw) | NO<br>(ppmw) | NO <sub>2</sub><br>(ppmw) | NH <sub>3</sub><br>(ppmw) | HCHO<br>(ppmw) | CH <sub>4</sub><br>(ppmw) | C <sub>2</sub> H <sub>6</sub><br>(ppmw) | H <sub>2</sub> O<br>(%) |
|------------------------------------|---------------------------|--------------------------|---------------|--------------|---------------------------------------------------|---------------------------|----------------------------|-------------------------------------------|--------------|---------------------------|---------------------------|----------------|---------------------------|-----------------------------------------|-------------------------|
| 07/30/21 16:27:23                  | 175440                    | 8.96                     | 5.20          | 3.09         | 162.24                                            | 5.68                      | 1.52                       | 4.26                                      | 5.20         | 0.00                      | 13.65                     | -0.14          | 427.16                    | 0.26                                    | 14.22                   |
| 07/30/21 16:27:53                  | 175470                    | 8.96                     | 5.51          | 3.11         | 161.66                                            | 5.68                      | 1.55                       | 4.06                                      | 5.51         | 0.00                      | 13.76                     | -0.10          | 427.30                    | 0.22                                    | 14.07                   |
| 07/30/21 16:28:23                  | 175500                    | 8.97                     | 5.37          | 3.07         | 162.33                                            | 5.70                      | 1.57                       | 4.19                                      | 5.37         | 0.00                      | 13.70                     | -0.33          | 428.91                    | 0.07                                    | 13.95                   |
| 07/30/21 16:28:53                  | 175530                    | 8.98                     | 5.45          | 3.14         | 161.73                                            | 5.70                      | 1.52                       | 3.78                                      | 5.45         | 0.00                      | 13.56                     | -0.16          | 428.59                    | 0.33                                    | 13.81                   |
| 07/30/21 16:29:23                  | 175560                    | 8.98                     | 5.37          | 3.16         | 163.32                                            | 5.69                      | 1.46                       | 3.41                                      | 5.37         | 0.00                      | 13.58                     | -0.22          | 430.94                    | 0.45                                    | 13.79                   |
| 07/30/21 16:29:53                  | 175590                    | 8.96                     | 5.32          | 3.18         | 162.36                                            | 5.70                      | 1.51                       | 4.28                                      | 5.32         | 0.00                      | 13.59                     | -0.02          | 429.85                    | 0.34                                    | 13.80                   |
| 07/30/21 16:30:23                  | 175620                    | 8.96                     | 5.28          | 3.15         | 162.84                                            | 5.71                      | 1.49                       | 3.61                                      | 5.28         | 0.00                      | 13.58                     | -0.04          | 432.52                    | 0.06                                    | 13.81                   |
| 07/30/21 16:30:53                  | 175650                    | 8.97                     | 5.19          | 3.02         | 164.45                                            | 5.71                      | 1.51                       | 3.37                                      | 5.19         | 0.00                      | 13.74                     | -0.25          | 431.85                    | 0.53                                    | 13.90                   |
| 07/30/21 16:31:23                  | 175680                    | 8.98                     | 5.32          | 3.01         | 163.06                                            | 5.71                      | 1.56                       | 3.86                                      | 5.32         | 0.00                      | 13.86                     | -0.26          | 431.18                    | 0.59                                    | 13.89                   |
| 07/30/21 16:31:53                  | 175710                    | 8.98                     | 5.37          | 3.06         | 163.49                                            | 5.70                      | 1.54                       | 4.16                                      | 5.37         | 0.00                      | 13.87                     | -0.22          | 430.46                    | 0.18                                    | 13.88                   |
| 07/30/21 16:32:23                  | 175740                    | 8.97                     | 5.23          | 3.12         | 161.58                                            | 5.71                      | 1.50                       | 3.96                                      | 5.23         | 0.00                      | 13.73                     | -0.14          | 428.70                    | 0.43                                    | 13.80                   |
| 07/30/21 16:32:53                  | 175770                    | 8.97                     | 5.20          | 3.09         | 161.94                                            | 5.71                      | 1.48                       | 3.71                                      | 5.20         | 0.00                      | 13.67                     | -0.11          | 429.38                    | 0.47                                    | 13.75                   |
| 07/30/21 16:33:23                  | 175800                    | 8.97                     | 5.26          | 3.09         | 161.52                                            | 5.71                      | 1.48                       | 3.36                                      | 5.26         | 0.00                      | 13.54                     | -0.08          | 429.34                    | 0.43                                    | 13.74                   |
| 07/30/21 16:33:53                  | 175830                    | 8.96                     | 5.21          | 3.09         | 162.99                                            | 5.71                      | 1.53                       | 3.70                                      | 5.21         | 0.00                      | 13.48                     | -0.35          | 430.08                    | 0.94                                    | 13.72                   |
| 07/30/21 16:34:23                  | 175860                    | 8.97                     | 5.15          | 3.05         | 162.67                                            | 5.70                      | 1.46                       | 3.61                                      | 5.15         | 0.00                      | 13.42                     | -0.22          | 430.77                    | 0.40                                    | 13.72                   |
| 07/30/21 16:34:53                  | 175890                    | 8.97                     | 5.11          | 3.09         | 161.73                                            | 5.69                      | 1.52                       | 3.26                                      | 5.11         | 0.00                      | 13.41                     | -0.26          | 430.83                    | 0.81                                    | 13.71                   |
| 07/30/21 16:35:23                  | 175920                    | 8.97                     | 5.29          | 3.02         | 163.62                                            | 5.71                      | 1.48                       | 3.99                                      | 5.29         | 0.00                      | 13.35                     | -0.27          | 430.14                    | 0.62                                    | 13.72                   |
| 07/30/21 16:35:53                  | 175950                    | 8.97                     | 5.16          | 3.16         | 165.32                                            | 5.70                      | 1.51                       | 3.04                                      | 5.16         | 0.00                      | 13.34                     | -0.26          | 434.18                    | 0.65                                    | 13.73                   |
| 07/30/21 16:36:23                  | 175980                    | 8.96                     | 5.23          | 3.00         | 163.44                                            | 5.72                      | 1.51                       | 3.74                                      | 5.23         | 0.00                      | 13.35                     | -0.52          | 428.88                    | 0.59                                    | 13.74                   |
| 07/30/21 16:36:53                  | 176010                    | 8.96                     | 5.45          | 2.93         | 163.48                                            | 5.70                      | 1.52                       | 4.05                                      | 5.45         | 0.00                      | 13.30                     | -0.11          | 430.31                    | 0.58                                    | 13.67                   |
| 07/30/21 16:37:23                  | 176040                    | 8.96                     | 5.37          | 2.92         | 164.02                                            | 5.70                      | 1.49                       | 3.34                                      | 5.37         | 0.00                      | 13.36                     | -0.39          | 432.22                    | 0.47                                    | 13.65                   |
| 07/30/21 16:37:53                  | 176070                    | 8.95                     | 5.34          | 2.94         | 164.51                                            | 5.72                      | 1.52                       | 3.73                                      | 5.34         | 0.00                      | 13.47                     | -0.32          | 432.87                    | 0.82                                    | 13.69                   |
| 07/30/21 16:38:23                  | 176100                    | 8.95                     | 5.38          | 3.20         | 164.50                                            | 5.72                      | 1.53                       | 3.24                                      | 5.38         | 0.00                      | 13.48                     | -0.26          | 434.26                    | 0.55                                    | 13.71                   |
| 07/30/21 16:38:53                  | 176130                    | 8.95                     | 5.59          | 3.11         | 166.19                                            | 5.73                      | 1.57                       | 4.16                                      | 5.59         | 0.00                      | 13.54                     | -0.31          | 432.39                    | 0.70                                    | 13.72                   |
| 07/30/21 16:39:23                  | 176160                    | 8.95                     | 5.41          | 3.16         | 165.30                                            | 5.72                      | 1.49                       | 3.55                                      | 5.41         | 0.00                      | 13.64                     | -0.18          | 435.13                    | 0.59                                    | 13.73                   |
| 07/30/21 16:39:53                  | 176190                    | 8.94                     | 5.41          | 3.17         | 163.86                                            | 5.73                      | 1.53                       | 3.69                                      | 5.41         | 0.00                      | 13.72                     | -0.11          | 432.05                    | 0.41                                    | 13.73                   |
| 07/30/21 16:40:23                  | 176220                    | 8.94                     | 5.31          | 3.04         | 165.67                                            | 5.72                      | 1.53                       | 4.04                                      | 5.31         | 0.00                      | 13.74                     | 0.02           | 433.43                    | 0.32                                    | 13.73                   |
| 07/30/21 16:40:53                  | 176250                    | 8.94                     | 5.19          | 3.17         | 164.72                                            | 5.72                      | 1.54                       | 4.07                                      | 5.19         | 0.00                      | 13.69                     | -0.12          | 433.49                    | 0.53                                    | 13.74                   |
| 07/30/21 16:41:23                  | 176280                    | 8.94                     | 5.32          | 3.13         | 165.07                                            | 5.72                      | 1.54                       | 4.17                                      | 5.32         | 0.00                      | 13.63                     | -0.12          | 433.90                    | 0.26                                    | 13.74                   |
| 07/30/21 16:41:53                  | 176310                    | 8.95                     | 5.24          | 3.11         | 165.63                                            | 5.73                      | 1.54                       | 3.91                                      | 5.24         | 0.00                      | 13.66                     | -0.20          | 432.97                    | 0.71                                    | 13.73                   |
| 07/30/21 16:42:23                  | 176340                    | 8.96                     | 5.33          | 3.11         | 164.83                                            | 5.72                      | 1.59                       | 3.64                                      | 5.33         | 0.00                      | 13.70                     | -0.32          | 433.01                    | 0.41                                    | 13.74                   |
| 07/30/21 16:42:53                  | 176370                    | 8.98                     | 5.44          | 3.08         | 165.03                                            | 5.73                      | 1.55                       | 3.59                                      | 5.44         | 0.00                      | 13.76                     | -0.08          | 434.03                    | 0.53                                    | 13.74                   |
| 07/30/21 16:43:23                  | 176400                    | 8.97                     | 5.22          | 3.17         | 164.73                                            | 5.73                      | 1.56                       | 3.89                                      | 5.22         | 0.00                      | 13.97                     | -0.28          | 432.25                    | 0.71                                    | 13.72                   |
| 07/30/21 16:43:53                  | 176430                    | 8.97                     | 5.41          | 3.15         | 163.83                                            | 5.73                      | 1.51                       | 3.91                                      | 5.41         | 0.00                      | 14.18                     | -0.26          | 431.82                    | 0.60                                    | 13.74                   |
| 07/30/21 16:44:23                  | 176460                    | 8.98                     | 5.40          | 3.05         | 164.98                                            | 5.72                      | 1.51                       | 3.81                                      | 5.40         | 0.00                      | 14.19                     | -0.29          | 433.20                    | 0.61                                    | 13.75                   |
| 07/30/21 16:44:53                  | 176490                    | 8.98                     | 5.62          | 3.15         | 165.96                                            | 5.73                      | 1.47                       | 4.23                                      | 5.62         | 0.00                      | 14.34                     | -0.07          | 432.68                    | 0.28                                    | 13.73                   |
| 07/30/21 16:45:23                  | 176520                    | 8.97                     | 5.49          | 3.16         | 164.48                                            | 5.74                      | 1.58                       | 4.56                                      | 5.49         | 0.00                      | 14.46                     | -0.21          | 432.58                    | 0.58                                    | 13.73                   |
| 07/30/21 16:45:53                  | 176550                    | 8.97                     | 5.19          | 3.19         | 165.52                                            | 5.73                      | 1.52                       | 3.75                                      | 5.19         | 0.00                      | 14.36                     | -0.17          | 434.05                    | 0.33                                    | 13.76                   |
| 07/30/21 16:46:23                  | 176580                    | 8.96                     | 5.42          | 3.18         | 163.83                                            | 5.73                      | 1.57                       | 4.26                                      | 5.42         | 0.00                      | 13.97                     | -0.21          | 431.62                    | 0.46                                    | 13.76                   |
| 07/30/21 16:46:53                  | 176610                    | 8.96                     | 5.27          | 3.13         | 165.74                                            | 5.73                      | 1.47                       | 4.41                                      | 5.27         | 0.00                      | 13.55                     | -0.28          | 432.33                    | 0.33                                    | 13.76                   |
| 07/30/21 16:47:23                  | 176640                    | 8.96                     | 5.35          | 3.02         | 164.14                                            | 5.73                      | 1.54                       | 4.01                                      | 5.35         | 0.00                      | 13.34                     | -0.27          | 432.18                    | 0.30                                    | 13.76                   |
| 07/30/21 16:47:53                  | 176670                    | 8.97                     | 5.30          | 3.10         | 164.58                                            | 5.72                      | 1.57                       | 4.25                                      | 5.30         | 0.00                      | 13.30                     | -0.21          | 431.82                    | 0.48                                    | 13.77                   |
| 07/30/21 16:48:23                  | 176700                    | 8.97                     | 5.23          | 3.07         | 166.09                                            | 5.73                      | 1.52                       | 4.47                                      | 5.23         | 0.00                      | 13.30                     | -0.14          | 433.25                    | 0.59                                    | 13.79                   |
| 07/30/21 16:48:53                  | 176730                    | 8.95                     | 5.46          | 3.14         | 164.59                                            | 5.73                      | 1.56                       | 5.08                                      | 5.46         | 0.00                      | 13.07                     | -0.29          | 433.13                    | 0.24                                    | 13.75                   |
| 07/30/21 16:49:23                  | 176760                    | 8.96                     | 5.25          | 3.19         | 159.22                                            | 5.50                      | 1.43                       | 4.02                                      | 5.25         | 0.00                      | 15.24                     | -0.25          | 414.50                    | 0.38                                    | 16.82                   |
| 07/30/21 16:49:53                  | 176790                    | 8.95                     | 4.89          | 3.04         | 164.21                                            | 5.66                      | 1.43                       | 4.06                                      | 4.89         | 0.00                      | 14.06                     | -0.22          | 429.74                    | 0.34                                    | 14.43                   |
| 07/30/21 16:50:23                  | 176820                    | 8.95                     | 4.96          | 3.06         | 166.83                                            | 5.71                      | 1.52                       | 3.66                                      | 4.96         | 0.00                      | 13.79                     | -0.18          | 431.24                    | 0.32                                    | 13.95                   |
| 07/30/21 16:50:53                  | 176850                    | 8.94                     | 5.18          | 3.12         | 166.23                                            | 5.73                      | 1.52                       | 4.20                                      | 5.18         | 0.00                      | 13.66                     | -0.29          | 434.25                    | 0.69                                    | 13.79                   |
| 07/30/21 16:51:23                  | 176880                    | 8.95                     | 5.37          | 3.10         | 164.52                                            | 5.75                      | 1.55                       | 4.35                                      | 5.37         | 0.00                      | 13.70                     | -0.28          | 432.03                    | 0.29                                    | 13.76                   |
| 07/30/21 16:51:53                  | 176910                    | 8.96                     | 5.15          | 3.13         | 164.16                                            | 5.74                      | 1.50                       | 4.77                                      | 5.15         | 0.00                      | 13.74                     | -0.05          | 432.73                    | 0.29                                    | 13.65                   |
| 07/30/21 16:52:23                  | 176940                    | 8.98                     | 5.28          | 3.14         | 163.56                                            | 5.74                      | 1.56                       | 4.53                                      | 5.28         | 0.00                      | 13.63                     | -0.06          | 431.91                    | 0.57                                    | 13.48                   |
| 07/30/21 16:52:53                  | 176970                    | 8.97                     | 5.38          | 3.05         | 164.15                                            | 5.77                      | 1.52                       | 4.71                                      | 5.38         | 0.00                      | 13.35                     | -0.12          | 433.33                    | 0.53                                    | 13.29                   |
| 07/30/21 16:53:23                  | 177000                    | 8.97                     | 5.36          | 3.10         | 166.71                                            | 5.78                      | 1.55                       | 3.63                                      | 5.36         | 0.00                      | 13.11                     | -0.36          | 435.10                    | 0.46                                    | 13.15                   |
| 07/30/21 16:53:53                  | 177030                    | 8.98                     | 5.61          | 3.03         | 165.77                                            | 5.78                      | 1.49                       | 4.58                                      | 5.61         | 0.00                      | 12.89                     | -0.08          | 437.33                    | 0.21                                    | 13.09                   |
| 07/30/21 16:54:23                  | 177060                    | 8.98                     | 5.38          | 3.14         | 165.90                                            | 5.78                      | 1.53                       | 4.35                                      | 5.38         | 0.00                      | 12.84                     | -0.24          | 436.28                    | 0.56                                    | 13.04                   |
| 07/30/21 16:54:53                  | 177090                    | 8.97                     | 5.38          | 3.11         | 166.61                                            | 5.77                      | 1.58                       | 3.78                                      | 5.38         | 0.00                      | 12.83                     | -0.28          | 436.12                    | 0.34                                    | 12.92                   |
| 07/30/21 16:55:23                  | 177120                    | 8.97                     | 5.56          | 3.18         | 166.49                                            | 5.79                      | 1.50                       | 3.87                                      | 5.56         | 0.00                      | 12.84                     | -0.22          | 438.02                    | 0.45                                    | 12.91                   |
| 07/30/21 16:55:53                  | 177150                    | 8.96                     | 5.35          | 2.95         | 165.62                                            | 5.78                      | 1.54                       | 4.40                                      | 5.35         | 0.00                      | 12.93                     | -0.23          | 438.22                    | 0.58                                    | 12.94                   |
| 07/30/21 16:56:23                  | 177180                    | 8.96                     | 5.36          | 3.07         | 165.60                                            | 5.78                      | 1.57                       | 4.13                                      | 5.36         | 0.00                      | 13.12                     | -0.29          | 436.74                    | 0.55                                    | 12.95                   |
| 07/30/21 16:56:53                  | 177210                    | 8.96                     | 5.63          | 3.08         | 164.50                                            | 5.82                      | 1.54                       | 4.54                                      | 5.63         | 0.00                      | 13.20                     | -0.27          | 435.95                    | 0.44                                    | 12.83                   |
| 07/30/21 16:57:23                  | 177240                    | 8.97                     | 5.57          | 3.13         | 165.64                                            | 5.82                      | 1.52                       | 4.36                                      | 5.57         | 0.00                      | 13.03                     | -0.26          | 435.31                    | 0.75                                    | 12.78                   |
| 07/30/21 16:1                      |                           |                          |               |              |                                                   |                           |                            |                                           |              |                           |                           |                |                           |                                         |                         |

Catalytic Combustion Corporation  
July 30, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

**Fuel Data**

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 20.172 | SCFH          |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.85    | in. Hg                       |
| Relative Humidity   | 42       | %                            |
| Ambient Temperature | 97       | °F                           |
| Specific Humidity   | 0.015856 | lb H <sub>2</sub> O / lb air |

**Unit Data**

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 2.616.3 | horsepower |
| Meas. Stack Moisture     | 13.6    | %          |
| Stack Exhaust Flow (M19) | 303,928 | SCFH       |

75% Load, Run - 2-3

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%vvd) | NOx<br>(ppmvw) | CO<br>(ppmvw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | CO <sub>2</sub><br>(%vvd) | N <sub>2</sub> O<br>(ppmvw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmvw) | NO<br>(ppmvw) | NO <sub>2</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) | HCHO<br>(ppmvw) | CH <sub>4</sub><br>(ppmvw) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|--------------------------|----------------|---------------|----------------------------------------------------|---------------------------|-----------------------------|--------------------------------------------|---------------|----------------------------|----------------------------|-----------------|----------------------------|------------------------------------------|-------------------------|
| 07/30/21 17:17:23                | 178440                    | 8.84                     | 5.06           | 3.06          | 168.22                                             | 5.87                      | 1.48                        | 4.52                                       | 5.06          | 0.00                       | 10.62                      | -0.27           | 444.05                     | 0.73                                     | 12.33                   |
| 07/30/21 17:17:53                | 178470                    | 8.84                     | 5.30           | 3.02          | 171.17                                             | 5.94                      | 1.55                        | 4.36                                       | 5.30          | 0.00                       | 10.61                      | -0.28           | 447.17                     | 0.31                                     | 11.65                   |
| 07/30/21 17:18:23                | 178500                    | 8.81                     | 5.32           | 3.03          | 167.25                                             | 5.74                      | 1.38                        | 4.98                                       | 5.32          | 0.00                       | 11.60                      | -0.13           | 434.22                     | 0.22                                     | 14.18                   |
| 07/30/21 17:18:53                | 178530                    | 8.81                     | 5.05           | 3.02          | 161.55                                             | 5.64                      | 1.36                        | 4.12                                       | 5.05          | 0.00                       | 12.65                      | -0.12           | 423.40                     | 0.04                                     | 16.10                   |
| 07/30/21 17:19:23                | 178560                    | 8.80                     | 4.90           | 2.96          | 168.67                                             | 5.88                      | 1.49                        | 4.74                                       | 4.90          | 0.00                       | 11.89                      | -0.21           | 443.32                     | 0.42                                     | 12.45                   |
| 07/30/21 17:19:53                | 178590                    | 8.80                     | 5.71           | 2.97          | 165.63                                             | 5.90                      | 1.44                        | 4.58                                       | 5.71          | 0.00                       | 12.25                      | -0.32           | 437.62                     | 0.22                                     | 12.82                   |
| 07/30/21 17:20:23                | 178620                    | 8.81                     | 5.62           | 3.02          | 165.57                                             | 5.90                      | 1.44                        | 4.78                                       | 5.62          | 0.00                       | 11.99                      | -0.36           | 437.27                     | 0.63                                     | 12.83                   |
| 07/30/21 17:20:53                | 178650                    | 8.82                     | 5.04           | 3.07          | 168.18                                             | 5.90                      | 1.49                        | 4.09                                       | 5.04          | 0.00                       | 11.94                      | -0.29           | 442.26                     | 0.29                                     | 12.23                   |
| 07/30/21 17:21:23                | 178680                    | 8.80                     | 5.13           | 2.89          | 167.87                                             | 5.91                      | 1.44                        | 4.67                                       | 5.13          | 0.00                       | 11.81                      | -0.22           | 443.18                     | 0.14                                     | 12.13                   |
| 07/30/21 17:21:53                | 178710                    | 8.80                     | 5.14           | 2.99          | 168.77                                             | 5.93                      | 1.42                        | 4.56                                       | 5.14          | 0.00                       | 11.75                      | -0.17           | 445.98                     | 0.37                                     | 11.95                   |
| 07/30/21 17:22:23                | 178740                    | 8.81                     | 5.05           | 2.95          | 165.21                                             | 5.80                      | 1.42                        | 4.54                                       | 5.05          | 0.00                       | 12.50                      | -0.16           | 432.28                     | 0.24                                     | 13.83                   |
| 07/30/21 17:22:53                | 178770                    | 8.82                     | 4.97           | 2.92          | 167.78                                             | 5.90                      | 1.38                        | 4.53                                       | 4.97          | 0.00                       | 12.18                      | -0.19           | 442.61                     | 0.30                                     | 12.28                   |
| 07/30/21 17:23:23                | 178800                    | 8.81                     | 4.29           | 3.02          | 165.00                                             | 5.66                      | 1.37                        | 4.95                                       | 4.29          | 0.00                       | 13.55                      | -0.21           | 430.24                     | 0.68                                     | 15.27                   |
| 07/30/21 17:23:53                | 178830                    | 8.80                     | 5.00           | 3.02          | 167.91                                             | 5.91                      | 1.42                        | 4.24                                       | 5.00          | 0.00                       | 12.66                      | -0.44           | 444.46                     | 0.53                                     | 12.03                   |
| 07/30/21 17:24:23                | 178860                    | 8.77                     | 5.24           | 2.91          | 165.43                                             | 5.82                      | 1.37                        | 4.11                                       | 5.24          | 0.00                       | 13.45                      | -0.35           | 433.08                     | -0.01                                    | 13.55                   |
| 07/30/21 17:24:53                | 178890                    | 8.78                     | 5.14           | 2.98          | 163.19                                             | 5.82                      | 1.43                        | 4.20                                       | 5.14          | 0.00                       | 13.33                      | -0.31           | 429.44                     | 0.23                                     | 13.65                   |
| 07/30/21 17:25:23                | 178920                    | 8.78                     | 5.15           | 2.94          | 164.70                                             | 5.89                      | 1.45                        | 4.45                                       | 5.15          | 0.00                       | 13.14                      | -0.30           | 432.50                     | 0.39                                     | 13.06                   |
| 07/30/21 17:25:53                | 178950                    | 8.76                     | 5.27           | 3.04          | 166.33                                             | 5.89                      | 1.39                        | 4.44                                       | 5.27          | 0.00                       | 13.25                      | -0.31           | 435.67                     | 0.38                                     | 13.20                   |
| 07/30/21 17:26:23                | 178980                    | 8.75                     | 4.69           | 2.97          | 166.88                                             | 5.91                      | 1.41                        | 4.39                                       | 4.69          | 0.00                       | 13.03                      | -0.23           | 440.21                     | 0.30                                     | 12.47                   |
| 07/30/21 17:26:53                | 179010                    | 8.76                     | 4.62           | 3.00          | 167.04                                             | 5.91                      | 1.42                        | 4.54                                       | 4.62          | 0.00                       | 13.10                      | -0.30           | 438.17                     | 0.24                                     | 12.40                   |
| <b>RAW AVERAGE</b>               |                           | <b>8.91</b>              | <b>5.23</b>    | <b>3.10</b>   | <b>164.95</b>                                      | <b>5.75</b>               | <b>1.47</b>                 | <b>4.21</b>                                | <b>5.15</b>   | <b>0.08</b>                | <b>13.44</b>               | <b>0.00</b>     | <b>433.59</b>              | <b>0.38</b>                              | <b>13.59</b>            |

| Serial Number: | O <sub>2</sub>  | NOx          | CO           | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> O | NO           | NO <sub>2</sub> | NH <sub>3</sub> | HCHO         | CH <sub>4</sub> | C <sub>2</sub> H <sub>6</sub> | H <sub>2</sub> O |
|----------------|-----------------|--------------|--------------|-----------------------------------------|-----------------|------------------|---------------------------------|--------------|-----------------|-----------------|--------------|-----------------|-------------------------------|------------------|
|                | INST-O2-0026    | INST-IR-0005 | INST-IR-0005 | INST-VC-0004                            | INST-IR-0005    | INST-IR-0005     | INST-IR-0005                    | INST-IR-0005 | INST-IR-0005    | INST-IR-0005    | INST-IR-0005 | INST-IR-0005    | INST-IR-0005                  | INST-IR-0005     |
|                | (%)             |              |              | (ppmw)                                  |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
|                | Initial Zero    | 0.04         |              | 0.44                                    |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
|                | Final Zero      | 0.06         |              | 1.21                                    |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
|                | Avg. Zero       | 0.05         |              | 0.83                                    |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
|                | Initial UpScale | 11.95        |              | 303.21                                  |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
|                | Final UpScale   | 11.94        |              | 312.59                                  |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
|                | Avg. UpScale    | 11.95        |              | 307.90                                  |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |
|                |                 | 11.99        |              | 302.00                                  |                 |                  |                                 |              |                 |                 |              |                 |                               |                  |

| EMISSIONS DATA                          | O <sub>2</sub> | NOx    | CO     | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> O | NO     | NO <sub>2</sub> | NH <sub>3</sub> | HCHO   | CH <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) | C <sub>2</sub> H <sub>6</sub> (as C <sub>3</sub> H <sub>8</sub> ) | VOC (as C <sub>3</sub> H <sub>8</sub> ) |
|-----------------------------------------|----------------|--------|--------|-----------------------------------------|-----------------|------------------|---------------------------------|--------|-----------------|-----------------|--------|-----------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------|
| Corrected Raw Average (ppm/% dry basis) | 8.94           | 6.05   | 3.59   | 190.89                                  | 6.66            | 1.70             | 4.87                            | 5.96   | 0.09            | 15.56           | 0.00   | 183.99                                              | 0.30                                                              | 6.61                                    |
| Corrected Raw Average (ppm/% wet basis) | 7.71           | 5.23   | 3.10   | 164.95                                  | 5.75            | 1.47             | 4.21                            | 5.15   | 0.08            | 13.44           | 0.00   | 158.98                                              | 0.26                                                              | 5.71                                    |
| Concentration (ppm@ 15%O <sub>2</sub> ) | N/A            | 2.98   | 1.77   | 81.34                                   | 3.28            | 0.84             | 2.40                            | 2.94   | 0.04            | 7.67            | 0.00   | 90.73                                               | 0.15                                                              | 2.82                                    |
| Emission Rate (g/kw*hr)                 | N/A            | 0.0511 | 0.0184 | 1.3313                                  | 538             | 0.0137           | 0.0393                          | 0.0328 | 0.0008          | 0.0486          | 0.0000 | 1.4883                                              | 0.0024                                                            | 0.0461                                  |

Non-Bias Adjusted Averages Include:

## **EMISSION DATA RECORDS**

**100% Load**

**NO<sub>x</sub>, CO, THC, N<sub>2</sub>O, C<sub>2</sub>H<sub>4</sub>O, NH<sub>3</sub>, HCHO, CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, and H<sub>2</sub>O  
Reference Method Data**

Catalytic Combustion Corporation  
September 1, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

Fuel Data

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 26.278 | SCFH          |

Weather Data

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.73    | in. Hg                       |
| Relative Humidity   | 70       | %                            |
| Ambient Temperature | 88       | °F                           |
| Specific Humidity   | 0.020202 | lb H <sub>2</sub> O / lb air |

Unit Data

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 3,598.0 | horsepower |
| Meas. Stack Moisture     | 13.6    | %          |
| Stack Exhaust Flow (M19) | 386,201 | SCFH       |

100% Load, Run - 3-1

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | NOx<br>(ppmv) | CO<br>(ppmv) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmv) | CO <sub>2</sub><br>(%) | N <sub>2</sub> O<br>(ppmv) | C <sub>2</sub> H <sub>2</sub> O<br>(ppmv) | NO<br>(ppmv) | NO <sub>2</sub><br>(ppmv) | NH <sub>3</sub><br>(ppmv) | HCHO<br>(ppmv) | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> )<br>(ppmv) | C <sub>2</sub> H <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmv) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|-----------------------|---------------|--------------|---------------------------------------------------|------------------------|----------------------------|-------------------------------------------|--------------|---------------------------|---------------------------|----------------|---------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------|
| 09/01/21 9:23:57                 | 12140                     | 8.62                  | 15.56         | 4.29         | 96.72                                             | 5.91                   | 1.12                       | 0.80                                      | 12.77        | 2.79                      | 0.60                      | 1.33           | 412.49                                                        | -0.42                                                                       | 13.13                   |
| 09/01/21 9:24:27                 | 12170                     | 8.61                  | 14.59         | 4.28         | 97.14                                             | 5.91                   | 1.07                       | 0.84                                      | 12.15        | 2.44                      | 0.66                      | 1.37           | 411.33                                                        | -0.37                                                                       | 13.10                   |
| 09/01/21 9:24:57                 | 12200                     | 8.61                  | 13.74         | 4.22         | 98.52                                             | 5.88                   | 1.26                       | 0.76                                      | 12.95        | 0.80                      | 0.60                      | 1.30           | 410.45                                                        | -0.20                                                                       | 13.48                   |
| 09/01/21 9:25:27                 | 12230                     | 8.62                  | 14.09         | 4.13         | 98.75                                             | 5.90                   | 1.31                       | 0.83                                      | 13.01        | 1.08                      | 0.58                      | 1.25           | 412.16                                                        | -0.35                                                                       | 13.30                   |
| 09/01/21 9:25:57                 | 12260                     | 8.61                  | 13.84         | 3.64         | 98.21                                             | 5.84                   | 1.33                       | 0.94                                      | 12.72        | 1.12                      | 0.62                      | 1.27           | 409.75                                                        | -0.42                                                                       | 14.07                   |
| 09/01/21 9:26:27                 | 12290                     | 8.61                  | 15.11         | 3.67         | 98.45                                             | 5.87                   | 1.34                       | 0.88                                      | 13.46        | 1.65                      | 0.61                      | 1.32           | 411.82                                                        | -0.48                                                                       | 13.88                   |
| 09/01/21 9:26:57                 | 12320                     | 8.61                  | 14.09         | 4.16         | 98.85                                             | 5.92                   | 1.32                       | 0.77                                      | 13.21        | 0.87                      | 0.66                      | 1.25           | 412.09                                                        | -0.34                                                                       | 13.09                   |
| 09/01/21 9:27:27                 | 12350                     | 8.62                  | 15.47         | 3.67         | 98.04                                             | 5.82                   | 1.40                       | 0.85                                      | 11.72        | 3.74                      | 0.67                      | 1.30           | 406.15                                                        | -0.76                                                                       | 14.56                   |
| 09/01/21 9:27:57                 | 12380                     | 8.61                  | 14.73         | 3.64         | 97.91                                             | 5.87                   | 1.38                       | 0.85                                      | 12.00        | 2.73                      | 0.65                      | 1.32           | 413.16                                                        | -0.48                                                                       | 13.88                   |
| 09/01/21 9:28:27                 | 12410                     | 8.60                  | 15.08         | 3.79         | 97.37                                             | 5.89                   | 1.36                       | 0.78                                      | 12.51        | 2.57                      | 0.63                      | 1.28           | 413.74                                                        | -0.61                                                                       | 13.54                   |
| 09/01/21 9:28:57                 | 12440                     | 8.61                  | 14.66         | 3.70         | 98.69                                             | 5.91                   | 1.38                       | 0.86                                      | 12.77        | 1.89                      | 0.64                      | 1.31           | 409.17                                                        | -0.54                                                                       | 13.54                   |
| 09/01/21 9:29:27                 | 12470                     | 8.60                  | 14.26         | 3.51         | 99.77                                             | 5.66                   | 1.35                       | 0.86                                      | 12.12        | 2.14                      | 0.63                      | 1.26           | 396.82                                                        | -0.63                                                                       | 16.52                   |
| 09/01/21 9:29:57                 | 12500                     | 8.62                  | 14.33         | 3.68         | 99.41                                             | 5.88                   | 1.35                       | 0.86                                      | 13.23        | 1.09                      | 0.60                      | 1.34           | 411.48                                                        | -0.49                                                                       | 13.77                   |
| 09/01/21 9:30:27                 | 12530                     | 8.60                  | 13.37         | 4.16         | 99.32                                             | 5.91                   | 1.33                       | 0.74                                      | 13.00        | 0.37                      | 0.65                      | 1.24           | 412.99                                                        | -0.27                                                                       | 13.24                   |
| 09/01/21 9:30:57                 | 12560                     | 8.61                  | 12.95         | 4.18         | 98.88                                             | 5.90                   | 1.35                       | 0.75                                      | 12.62        | 0.33                      | 0.58                      | 1.26           | 412.49                                                        | -0.35                                                                       | 13.31                   |
| 09/01/21 9:31:27                 | 12590                     | 8.61                  | 11.75         | 4.20         | 98.87                                             | 5.91                   | 1.32                       | 0.83                                      | 10.55        | 1.20                      | 0.63                      | 1.23           | 415.45                                                        | -0.33                                                                       | 13.05                   |
| 09/01/21 9:31:57                 | 12620                     | 8.58                  | 12.15         | 4.26         | 98.90                                             | 5.93                   | 1.35                       | 0.80                                      | 10.26        | 1.88                      | 0.62                      | 1.18           | 418.34                                                        | -0.37                                                                       | 12.81                   |
| 09/01/21 9:32:27                 | 12650                     | 8.60                  | 12.47         | 4.23         | 98.83                                             | 5.95                   | 1.34                       | 0.83                                      | 10.05        | 2.42                      | 0.62                      | 1.21           | 414.49                                                        | -0.43                                                                       | 12.70                   |
| 09/01/21 9:32:57                 | 12680                     | 8.61                  | 12.08         | 4.31         | 99.55                                             | 5.93                   | 1.33                       | 0.81                                      | 10.56        | 1.52                      | 0.61                      | 1.22           | 414.63                                                        | -0.40                                                                       | 12.78                   |
| 09/01/21 9:33:27                 | 12710                     | 8.61                  | 11.71         | 4.29         | 99.63                                             | 5.92                   | 1.39                       | 0.74                                      | 10.06        | 1.65                      | 0.58                      | 1.24           | 414.51                                                        | -0.34                                                                       | 12.89                   |
| 09/01/21 9:33:57                 | 12740                     | 8.61                  | 11.73         | 3.60         | 99.19                                             | 5.86                   | 1.56                       | 0.85                                      | 9.61         | 2.12                      | 0.53                      | 1.23           | 410.55                                                        | -0.56                                                                       | 13.96                   |
| 09/01/21 9:34:27                 | 12770                     | 8.61                  | 11.85         | 4.04         | 99.10                                             | 5.90                   | 1.50                       | 0.72                                      | 10.28        | 1.57                      | 0.58                      | 1.19           | 417.42                                                        | -0.32                                                                       | 13.33                   |
| 09/01/21 9:34:57                 | 12800                     | 8.60                  | 12.40         | 4.07         | 99.20                                             | 5.92                   | 1.57                       | 0.75                                      | 9.69         | 2.71                      | 0.62                      | 1.18           | 414.89                                                        | -0.39                                                                       | 13.18                   |
| 09/01/21 9:35:27                 | 12830                     | 8.60                  | 11.63         | 3.65         | 98.54                                             | 5.73                   | 1.56                       | 1.07                                      | 10.25        | 1.37                      | 0.62                      | 1.25           | 407.38                                                        | -0.61                                                                       | 15.56                   |
| 09/01/21 9:35:57                 | 12860                     | 8.60                  | 10.48         | 4.01         | 98.58                                             | 5.91                   | 1.55                       | 0.73                                      | 9.29         | 1.19                      | 0.61                      | 1.15           | 416.02                                                        | -0.29                                                                       | 13.26                   |
| 09/01/21 9:36:27                 | 12890                     | 8.59                  | 10.35         | 3.95         | 97.36                                             | 5.91                   | 1.55                       | 0.76                                      | 8.63         | 1.72                      | 0.60                      | 1.17           | 413.49                                                        | -0.30                                                                       | 13.22                   |
| 09/01/21 9:36:57                 | 12920                     | 8.60                  | 11.02         | 3.62         | 97.01                                             | 5.86                   | 1.55                       | 0.80                                      | 9.55         | 1.46                      | 0.59                      | 1.19           | 413.11                                                        | -0.45                                                                       | 13.83                   |
| 09/01/21 9:37:27                 | 12950                     | 8.59                  | 10.68         | 3.49         | 97.85                                             | 5.85                   | 1.58                       | 0.76                                      | 8.76         | 1.92                      | 0.63                      | 1.23           | 410.69                                                        | -0.46                                                                       | 14.23                   |
| 09/01/21 9:37:57                 | 12980                     | 8.60                  | 11.40         | 3.67         | 97.87                                             | 5.89                   | 1.59                       | 0.81                                      | 8.45         | 2.94                      | 0.66                      | 1.19           | 414.51                                                        | -0.60                                                                       | 13.51                   |
| 09/01/21 9:38:27                 | 13010                     | 8.59                  | 10.81         | 3.59         | 96.68                                             | 5.83                   | 1.59                       | 0.91                                      | 9.17         | 1.64                      | 0.56                      | 1.22           | 412.72                                                        | -0.41                                                                       | 14.31                   |
| 09/01/21 9:38:57                 | 13040                     | 8.59                  | 11.02         | 3.55         | 96.65                                             | 5.88                   | 1.60                       | 0.87                                      | 9.62         | 1.40                      | 0.58                      | 1.20           | 412.59                                                        | -0.48                                                                       | 13.85                   |
| 09/01/21 9:39:27                 | 13070                     | 8.60                  | 10.74         | 3.57         | 97.43                                             | 5.87                   | 1.58                       | 0.81                                      | 9.35         | 1.39                      | 0.58                      | 1.18           | 415.48                                                        | -0.50                                                                       | 13.78                   |
| 09/01/21 9:39:57                 | 13100                     | 8.59                  | 10.94         | 3.47         | 97.90                                             | 5.68                   | 1.46                       | 1.08                                      | 8.77         | 2.17                      | 0.51                      | 1.23           | 405.34                                                        | -0.33                                                                       | 15.78                   |
| 09/01/21 9:40:27                 | 13130                     | 8.61                  | 10.60         | 3.58         | 97.97                                             | 5.83                   | 1.55                       | 0.84                                      | 9.10         | 1.49                      | 0.57                      | 1.17           | 412.95                                                        | -0.36                                                                       | 14.28                   |
| 09/01/21 9:40:57                 | 13160                     | 8.61                  | 11.05         | 3.63         | 98.84                                             | 5.88                   | 1.58                       | 0.79                                      | 9.11         | 1.95                      | 0.63                      | 1.17           | 417.33                                                        | -0.53                                                                       | 13.56                   |
| 09/01/21 9:41:27                 | 13190                     | 8.58                  | 10.68         | 3.97         | 98.42                                             | 5.89                   | 1.54                       | 0.80                                      | 8.66         | 2.02                      | 0.70                      | 1.17           | 413.48                                                        | -0.27                                                                       | 13.36                   |
| 09/01/21 9:41:57                 | 13220                     | 8.59                  | 9.90          | 4.06         | 98.57                                             | 5.90                   | 1.53                       | 0.69                                      | 8.18         | 1.72                      | 0.57                      | 1.13           | 416.94                                                        | -0.35                                                                       | 13.16                   |
| 09/01/21 9:42:27                 | 13250                     | 8.59                  | 9.71          | 4.09         | 99.03                                             | 5.91                   | 1.57                       | 0.61                                      | 8.34         | 1.37                      | 0.57                      | 1.17           | 416.75                                                        | -0.36                                                                       | 13.10                   |
| 09/01/21 9:42:57                 | 13280                     | 8.59                  | 10.09         | 3.61         | 98.64                                             | 5.81                   | 1.62                       | 0.78                                      | 8.32         | 1.77                      | 0.60                      | 1.16           | 410.12                                                        | -0.79                                                                       | 14.49                   |
| 09/01/21 9:43:27                 | 13310                     | 8.60                  | 9.59          | 3.96         | 98.71                                             | 5.90                   | 1.56                       | 0.74                                      | 8.46         | 1.13                      | 0.57                      | 1.16           | 414.07                                                        | -0.25                                                                       | 13.28                   |
| 09/01/21 9:43:57                 | 13340                     | 8.58                  | 9.51          | 4.01         | 98.46                                             | 5.88                   | 1.53                       | 0.71                                      | 8.56         | 0.95                      | 0.62                      | 1.16           | 412.61                                                        | -0.29                                                                       | 13.46                   |
| 09/01/21 9:44:27                 | 13370                     | 8.60                  | 10.70         | 4.07         | 98.15                                             | 5.89                   | 1.54                       | 0.76                                      | 8.08         | 2.62                      | 0.64                      | 1.15           | 414.87                                                        | -0.31                                                                       | 13.25                   |
| 09/01/21 9:44:57                 | 13400                     | 8.59                  | 10.03         | 4.07         | 99.17                                             | 5.92                   | 1.55                       | 0.72                                      | 7.65         | 2.38                      | 0.56                      | 1.11           | 419.67                                                        | -0.32                                                                       | 13.01                   |
| 09/01/21 9:45:27                 | 13430                     | 8.60                  | 10.44         | 4.19         | 98.32                                             | 5.93                   | 1.58                       | 0.71                                      | 7.88         | 2.56                      | 0.60                      | 1.16           | 416.90                                                        | -0.33                                                                       | 12.88                   |
| 09/01/21 9:45:57                 | 13460                     | 8.60                  | 10.32         | 4.10         | 97.91                                             | 5.93                   | 1.56                       | 0.77                                      | 7.77         | 2.55                      | 0.59                      | 1.13           | 417.20                                                        | -0.41                                                                       | 12.87                   |
| 09/01/21 9:46:27                 | 13490                     | 8.58                  | 10.05         | 4.14         | 97.87                                             | 5.93                   | 1.58                       | 0.72                                      | 7.74         | 2.31                      | 0.58                      | 1.12           | 417.22                                                        | -0.37                                                                       | 12.82                   |
| 09/01/21 9:46:57                 | 13520                     | 8.60                  | 8.91          | 3.27         | 97.69                                             | 5.76                   | 1.67                       | 0.87                                      | 7.76         | 1.15                      | 0.58                      | 1.15           | 408.08                                                        | -0.45                                                                       | 15.13                   |
| 09/01/21 9:47:27                 | 13550                     | 8.58                  | 8.82          | 4.08         | 98.83                                             | 5.90                   | 1.74                       | 0.69                                      | 7.41         | 1.41                      | 0.55                      | 1.09           | 416.95                                                        | -0.34                                                                       | 13.18                   |
| 09/01/21 9:47:57                 | 13580                     | 8.59                  | 9.00          | 3.97         | 98.81                                             | 5.91                   | 1.77                       | 0.67                                      | 7.67         | 1.33                      | 0.57                      | 1.06           | 417.72                                                        | -0.33                                                                       | 13.10                   |
| 09/01/21 9:48:27                 | 13610                     | 8.60                  | 9.05          | 3.96         | 98.90                                             | 5.92                   | 1.73                       | 0.70                                      | 7.20         | 1.85                      | 0.64                      | 1.08           | 414.75                                                        | -0.36                                                                       | 13.06                   |
| 09/01/21 9:48:57                 | 13640                     | 8.59                  | 8.78          | 3.94         | 99.05                                             | 5.92                   | 1.79                       | 0.75                                      | 7.16         | 1.62                      | 0.58                      | 1.08           | 414.08                                                        | -0.29                                                                       | 13.08                   |
| 09/01/21 9:49:27                 | 13670                     | 8.59                  | 9.13          | 3.33         | 98.52                                             | 5.82                   | 1.75                       | 0.78                                      | 7.22         | 1.91                      | 0.58                      | 1.16           | 412.21                                                        | -0.38                                                                       | 14.35                   |
| 09/01/21 9:49:57                 | 13700                     | 8.58                  | 8.77          | 3.92         | 98.09                                             | 5.90                   | 1.75                       | 0.77                                      | 7.25         | 1.51                      | 0.59                      | 1.05           | 419.28                                                        | -0.26                                                                       | 13.22                   |
| 09/01/21 9:50:27                 | 13730                     | 8.58                  | 8.83          | 3.57         | 97.72                                             | 5.86                   | 1.77                       | 0.83                                      | 7.02         | 1.81                      | 0.61                      | 1.08           | 418.58                                                        | -0.47                                                                       | 13.80                   |
| 09/01/21 9:50:57                 | 13760                     | 8.59                  | 8.48          | 4.00         | 98.23                                             | 5.94                   | 1.75                       | 0.81                                      | 6.97         | 1.50                      | 0.60                      | 1.08           | 416.36                                                        | -0.35                                                                       | 13.06                   |
| 09/01/21 9:51:27                 | 13790                     | 8.56                  | 8.49          | 3.93         | 99.06                                             | 5.92                   | 1.80                       | 0.72                                      | 6.88         | 1.61                      | 0.56                      | 1.06           | 418.98                                                        | -0.32                                                                       | 13.05                   |
| 09/01/21 9:51:57                 | 13820                     | 8.58                  | 8.58          | 3.93         | 99.00                                             | 5.91                   | 1.71                       | 0.79                                      | 6.95         | 1.63                      | 0.63                      | 1.06           | 417.16                                                        | -0.36                                                                       | 13.24                   |
| 09/01/21 9:52:27                 | 13850                     | 8.57                  | 8.55          | 3.64         | 98.96                                             | 5.89                   | 1.89                       | 0.93                                      | 6.93         | 1.62                      | 0.56                      | 1.08           | 415.79                                                        | -0.57                                                                       | 13.52                   |
| 09/01/21 9:52:57                 | 13880                     | 8.58                  | 8.48          | 3.38         | 99.12                                             | 5.82                   | 1.97                       | 0.89                                      | 6.85         | 1.63                      | 0.61                      | 1.07           | 411.76                                                        | -0.75                                                                       | 14.55                   |
| 09/01/21 9:53:27                 | 13910                     | 8.58                  | 8.45          | 3.51         | 98.30                                             | 5.87                   | 1.97                       | 0.82                                      | 7.15         | 1.30                      | 0.61                      | 1.08           | 414.58                                                        | -0.50                                                                       | 13.83                   |
| 09/01/21 9:53:57                 | 13940                     | 8.59                  | 8.35          | 3.50         | 99.04                                             | 5.89                   | 1.99                       | 0.80                                      | 7.15         | 1.19                      | 0.55                      | 1.05           | 411.33                                                        | -0.53                                                                       | 13.71                   |
| 09/01/21 9:54:27                 | 13970                     | 8.60                  | 8.39          | 3.56         | 99.26                                             | 5.88                   | 1.96                       | 0.77                                      | 6.81         | 1.5                       |                           |                |                                                               |                                                                             |                         |

**Stewart & Stevenson Integration Center**

Catalytic Combustion Corporation  
September 1, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

Fuel Data

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 26.278 | SCFH          |

Weather Data

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.73    | in. Hg                       |
| Relative Humidity   | 57       | %                            |
| Ambient Temperature | 93       | °F                           |
| Specific Humidity   | 0.019207 | lb H <sub>2</sub> O / lb air |

Unit Data

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 3,598.0 | horsepower |
| Meas. Stack Moisture     | 12.9    | %          |
| Stack Exhaust Flow (M19) | 399,898 | SCFH       |

100% Load, Run - 3-2

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | NOx<br>(ppmv) | CO<br>(ppmvw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | CO <sub>2</sub><br>(%) | N <sub>2</sub> O<br>(ppmvw) | C <sub>2</sub> H <sub>2</sub> O<br>(ppmvw) | NO<br>(ppmv) | NO <sub>2</sub><br>(ppmv) | NH <sub>3</sub><br>(ppmvw) | HCHO<br>(ppmvw) | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> )<br>(ppmvw) | C <sub>2</sub> H <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|-----------------------|---------------|---------------|----------------------------------------------------|------------------------|-----------------------------|--------------------------------------------|--------------|---------------------------|----------------------------|-----------------|----------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------|
| 09/01/21 10:26:27                | 15890                     | 8.63                  | 10.93         | 3.24          | 99.31                                              | 5.91                   | 3.81                        | 0.76                                       | 9.15         | 1.78                      | 0.63                       | 0.97            | 417.84                                                         | -0.48                                                                        | 13.55                   |
| 09/01/21 10:26:57                | 15920                     | 8.62                  | 10.77         | 3.37          | 99.38                                              | 5.91                   | 3.80                        | 0.70                                       | 9.23         | 1.54                      | 0.64                       | 0.94            | 417.36                                                         | -0.50                                                                        | 13.58                   |
| 09/01/21 10:27:27                | 15950                     | 8.62                  | 11.03         | 3.20          | 99.52                                              | 5.90                   | 3.80                        | 0.75                                       | 9.08         | 1.95                      | 0.58                       | 0.97            | 418.06                                                         | -0.53                                                                        | 13.63                   |
| 09/01/21 10:27:57                | 15980                     | 8.64                  | 11.41         | 3.23          | 99.55                                              | 5.90                   | 3.80                        | 0.72                                       | 9.23         | 2.18                      | 0.54                       | 0.97            | 418.20                                                         | -0.54                                                                        | 13.69                   |
| 09/01/21 10:28:27                | 16010                     | 8.63                  | 10.75         | 3.16          | 100.19                                             | 5.76                   | 3.83                        | 0.75                                       | 9.29         | 1.47                      | 0.60                       | 0.96            | 411.88                                                         | -0.66                                                                        | 15.24                   |
| 09/01/21 10:28:57                | 16040                     | 8.62                  | 11.56         | 3.16          | 100.40                                             | 5.86                   | 3.77                        | 0.67                                       | 9.07         | 2.49                      | 0.65                       | 0.97            | 419.57                                                         | -0.48                                                                        | 14.04                   |
| 09/01/21 10:29:27                | 16070                     | 8.64                  | 10.82         | 3.21          | 100.54                                             | 5.87                   | 3.82                        | 0.74                                       | 9.16         | 1.66                      | 0.60                       | 1.01            | 417.74                                                         | -0.48                                                                        | 13.89                   |
| 09/01/21 10:29:57                | 16100                     | 8.63                  | 11.67         | 3.30          | 100.76                                             | 5.90                   | 3.81                        | 0.72                                       | 8.47         | 3.20                      | 0.68                       | 1.03            | 417.82                                                         | -0.57                                                                        | 13.62                   |
| 09/01/21 10:30:27                | 16130                     | 8.63                  | 11.55         | 3.24          | 101.14                                             | 5.88                   | 3.79                        | 0.65                                       | 8.51         | 3.04                      | 0.61                       | 0.94            | 416.35                                                         | -0.55                                                                        | 13.79                   |
| 09/01/21 10:30:57                | 16160                     | 8.62                  | 11.02         | 3.18          | 100.86                                             | 5.86                   | 3.81                        | 0.76                                       | 9.11         | 1.91                      | 0.73                       | 0.99            | 417.79                                                         | -0.45                                                                        | 14.07                   |
| 09/01/21 10:31:27                | 16190                     | 8.64                  | 10.62         | 3.60          | 100.74                                             | 5.91                   | 3.80                        | 0.72                                       | 9.30         | 1.32                      | 0.78                       | 0.90            | 417.79                                                         | -0.28                                                                        | 13.22                   |
| 09/01/21 10:31:57                | 16220                     | 8.63                  | 10.90         | 3.63          | 100.52                                             | 5.93                   | 3.79                        | 0.54                                       | 8.61         | 2.29                      | 0.69                       | 0.91            | 418.91                                                         | -0.34                                                                        | 13.08                   |
| 09/01/21 10:32:27                | 16250                     | 8.62                  | 10.51         | 3.66          | 100.73                                             | 5.94                   | 3.85                        | 0.59                                       | 8.86         | 1.65                      | 0.72                       | 0.92            | 423.48                                                         | -0.35                                                                        | 12.90                   |
| 09/01/21 10:32:57                | 16280                     | 8.63                  | 11.03         | 3.76          | 100.97                                             | 5.95                   | 3.85                        | 0.59                                       | 9.04         | 2.00                      | 0.73                       | 0.96            | 422.53                                                         | -0.34                                                                        | 12.83                   |
| 09/01/21 10:33:27                | 16310                     | 8.63                  | 11.24         | 3.72          | 101.35                                             | 5.96                   | 3.82                        | 0.64                                       | 8.07         | 3.17                      | 0.72                       | 0.95            | 423.24                                                         | -0.40                                                                        | 12.77                   |
| 09/01/21 10:33:57                | 16340                     | 8.62                  | 11.70         | 3.79          | 101.21                                             | 5.94                   | 2.89                        | 0.66                                       | 8.48         | 3.22                      | 0.76                       | 0.95            | 421.14                                                         | -0.39                                                                        | 12.89                   |
| 09/01/21 10:34:27                | 16370                     | 8.63                  | 11.19         | 4.01          | 100.92                                             | 5.95                   | 2.11                        | 0.75                                       | 9.39         | 1.80                      | 0.72                       | 1.03            | 419.17                                                         | -0.43                                                                        | 12.79                   |
| 09/01/21 10:36:27                | 16490                     | 9.10                  | 12.43         | 3.44          | 94.25                                              | 5.82                   | 2.06                        | 0.76                                       | 11.49        | 0.94                      | 0.76                       | 1.08            | 418.85                                                         | -0.35                                                                        | 14.34                   |
| 09/01/21 10:36:57                | 16520                     | 9.10                  | 11.91         | 3.53          | 92.81                                              | 5.90                   | 2.05                        | 0.85                                       | 11.10        | 0.80                      | 0.72                       | 1.01            | 417.41                                                         | -0.60                                                                        | 13.50                   |
| 09/01/21 10:37:27                | 16550                     | 9.11                  | 11.35         | 3.52          | 92.70                                              | 5.86                   | 2.11                        | 0.80                                       | 10.63        | 0.72                      | 0.79                       | 1.05            | 416.14                                                         | -0.50                                                                        | 13.96                   |
| 09/01/21 10:37:57                | 16580                     | 9.10                  | 10.93         | 3.93          | 92.36                                              | 5.91                   | 2.05                        | 0.72                                       | 10.22        | 0.71                      | 0.82                       | 1.01            | 420.27                                                         | -0.29                                                                        | 13.24                   |
| 09/01/21 10:38:27                | 16610                     | 9.12                  | 10.18         | 3.96          | 92.36                                              | 5.92                   | 2.08                        | 0.70                                       | 9.89         | 0.29                      | 0.76                       | 1.01            | 419.51                                                         | -0.27                                                                        | 13.13                   |
| 09/01/21 10:38:57                | 16640                     | 9.12                  | 9.99          | 3.98          | 92.28                                              | 5.92                   | 2.09                        | 0.65                                       | 9.07         | 0.92                      | 0.76                       | 1.01            | 421.75                                                         | -0.32                                                                        | 13.12                   |
| 09/01/21 10:39:27                | 16670                     | 9.12                  | 9.84          | 4.04          | 92.08                                              | 5.94                   | 2.06                        | 0.65                                       | 9.75         | 0.09                      | 0.68                       | 1.04            | 419.46                                                         | -0.31                                                                        | 12.98                   |
| 09/01/21 10:39:57                | 16700                     | 9.13                  | 10.03         | 4.04          | 92.56                                              | 5.95                   | 2.06                        | 0.68                                       | 9.38         | 0.65                      | 0.73                       | 1.02            | 419.79                                                         | -0.35                                                                        | 12.82                   |
| 09/01/21 10:40:27                | 16730                     | 9.13                  | 10.20         | 4.11          | 92.74                                              | 5.95                   | 2.05                        | 0.76                                       | 9.55         | 0.65                      | 0.80                       | 1.02            | 421.15                                                         | -0.39                                                                        | 12.74                   |
| 09/01/21 10:40:57                | 16760                     | 9.13                  | 9.77          | 4.10          | 92.69                                              | 5.93                   | 2.11                        | 0.74                                       | 9.42         | 0.35                      | 0.79                       | 0.99            | 420.08                                                         | -0.36                                                                        | 12.86                   |
| 09/01/21 11:19:57                | 19100                     | 9.13                  | 9.83          | 1.47          | 92.40                                              | 5.64                   | 0.19                        | 0.91                                       | 9.06         | 0.77                      | 1.06                       | 0.72            | 386.10                                                         | 0.58                                                                         | 12.92                   |
| 09/01/21 11:20:27                | 19130                     | 9.14                  | 9.52          | 1.52          | 92.04                                              | 5.63                   | 0.14                        | 1.01                                       | 9.28         | 0.25                      | 1.04                       | 0.69            | 384.29                                                         | 0.53                                                                         | 12.89                   |
| 09/01/21 11:20:57                | 19160                     | 9.16                  | 9.84          | 1.57          | 91.43                                              | 5.64                   | 0.17                        | 0.98                                       | 9.41         | 0.43                      | 1.08                       | 0.68            | 382.45                                                         | 0.46                                                                         | 12.83                   |
| 09/01/21 11:21:27                | 19190                     | 9.13                  | 8.90          | 1.48          | 92.93                                              | 5.64                   | 0.16                        | 0.94                                       | 8.85         | 0.05                      | 1.07                       | 0.71            | 385.14                                                         | 0.50                                                                         | 12.83                   |
| 09/01/21 11:21:57                | 19220                     | 9.12                  | 8.91          | 1.47          | 94.59                                              | 5.64                   | 0.18                        | 0.96                                       | 8.43         | 0.48                      | 1.03                       | 0.73            | 386.35                                                         | 0.56                                                                         | 12.83                   |
| 09/01/21 11:22:27                | 19250                     | 9.13                  | 9.57          | 1.59          | 95.23                                              | 5.65                   | 0.18                        | 0.94                                       | 9.05         | 0.52                      | 0.99                       | 0.70            | 385.74                                                         | 0.57                                                                         | 12.78                   |
| 09/01/21 11:22:57                | 19280                     | 9.13                  | 9.12          | 1.51          | 96.70                                              | 5.66                   | 0.16                        | 0.86                                       | 8.55         | 0.57                      | 0.99                       | 0.71            | 386.92                                                         | 0.53                                                                         | 12.74                   |
| 09/01/21 11:23:27                | 19310                     | 9.14                  | 9.22          | 1.54          | 97.02                                              | 5.66                   | 0.17                        | 0.94                                       | 8.56         | 0.66                      | 0.95                       | 0.70            | 384.21                                                         | 0.50                                                                         | 12.72                   |
| 09/01/21 11:23:57                | 19340                     | 9.13                  | 9.05          | 1.53          | 94.70                                              | 5.67                   | 0.18                        | 0.91                                       | 8.31         | 0.73                      | 0.97                       | 0.69            | 385.10                                                         | 0.47                                                                         | 12.71                   |
| 09/01/21 11:24:27                | 19370                     | 9.13                  | 9.11          | 1.51          | 90.93                                              | 5.67                   | 0.17                        | 0.95                                       | 8.16         | 0.95                      | 0.97                       | 0.72            | 383.32                                                         | 0.49                                                                         | 12.71                   |
| 09/01/21 11:24:57                | 19400                     | 9.12                  | 8.84          | 1.62          | 90.99                                              | 5.67                   | 0.19                        | 0.94                                       | 7.96         | 0.89                      | 0.96                       | 0.67            | 385.77                                                         | 0.54                                                                         | 12.68                   |
| 09/01/21 11:25:27                | 19430                     | 9.10                  | 8.21          | 1.46          | 91.15                                              | 5.67                   | 0.19                        | 0.94                                       | 8.08         | 0.13                      | 0.90                       | 0.72            | 388.70                                                         | 0.58                                                                         | 12.69                   |
| 09/01/21 11:25:57                | 19460                     | 9.10                  | 9.17          | 1.50          | 91.11                                              | 5.65                   | 0.19                        | 1.04                                       | 8.46         | 0.70                      | 0.89                       | 0.70            | 387.60                                                         | 0.53                                                                         | 12.69                   |
| 09/01/21 11:26:27                | 19490                     | 9.10                  | 9.48          | 1.56          | 90.72                                              | 5.66                   | 0.17                        | 0.89                                       | 8.81         | 0.68                      | 0.88                       | 0.68            | 387.71                                                         | 0.50                                                                         | 12.68                   |
| 09/01/21 11:26:57                | 19520                     | 9.11                  | 8.98          | 1.48          | 91.72                                              | 5.66                   | 0.18                        | 0.93                                       | 8.60         | 0.38                      | 0.96                       | 0.71            | 385.46                                                         | 0.48                                                                         | 12.67                   |
| 09/01/21 11:27:27                | 19550                     | 9.08                  | 8.55          | 0.82          | 91.56                                              | 5.47                   | 0.17                        | -0.28                                      | 8.32         | 0.24                      | 1.49                       | 0.64            | 366.29                                                         | 1.65                                                                         | 15.26                   |
| 09/01/21 11:27:57                | 19580                     | 9.10                  | 9.20          | 1.56          | 91.15                                              | 5.66                   | 0.14                        | 0.93                                       | 8.62         | 0.58                      | 1.75                       | 0.74            | 385.12                                                         | 0.48                                                                         | 12.86                   |
| 09/01/21 11:28:27                | 19610                     | 9.10                  | 9.17          | 1.37          | 91.47                                              | 5.65                   | 0.15                        | 1.01                                       | 8.32         | 0.85                      | 1.19                       | 0.71            | 386.86                                                         | 0.68                                                                         | 12.47                   |
| 09/01/21 11:28:57                | 19640                     | 9.09                  | 8.81          | 1.40          | 91.46                                              | 5.66                   | 0.12                        | 0.99                                       | 8.24         | 0.57                      | 1.07                       | 0.69            | 386.87                                                         | 0.64                                                                         | 12.41                   |
| 09/01/21 11:29:27                | 19670                     | 9.08                  | 8.29          | 1.33          | 90.05                                              | 5.67                   | 0.16                        | 1.00                                       | 7.93         | 0.36                      | 0.95                       | 0.71            | 380.96                                                         | 0.62                                                                         | 12.39                   |
| 09/01/21 11:29:57                | 19700                     | 9.09                  | 8.35          | 1.47          | 89.21                                              | 5.67                   | 0.15                        | 0.96                                       | 8.09         | 0.26                      | 0.87                       | 0.69            | 383.01                                                         | 0.69                                                                         | 12.39                   |
| 09/01/21 11:30:27                | 19730                     | 9.07                  | 8.22          | 1.46          | 89.57                                              | 5.66                   | 0.17                        | 1.01                                       | 7.70         | 0.51                      | 0.89                       | 0.71            | 394.32                                                         | 0.76                                                                         | 12.32                   |
| 09/01/21 11:30:57                | 19760                     | 9.06                  | 8.36          | 1.49          | 89.92                                              | 5.64                   | 0.11                        | 0.87                                       | 7.89         | 0.47                      | 0.85                       | 0.69            | 405.01                                                         | 0.97                                                                         | 12.28                   |
| 09/01/21 11:31:27                | 19790                     | 9.05                  | 8.46          | 1.45          | 89.80                                              | 5.65                   | 0.18                        | 1.00                                       | 8.02         | 0.44                      | 0.86                       | 0.69            | 401.42                                                         | 0.85                                                                         | 12.19                   |
| 09/01/21 11:31:57                | 19820                     | 9.06                  | 8.95          | 1.51          | 90.19                                              | 5.66                   | 0.15                        | 0.95                                       | 8.25         | 0.70                      | 0.79                       | 0.70            | 396.77                                                         | 0.76                                                                         | 12.21                   |
| 09/01/21 11:32:27                | 19850                     | 9.06                  | 8.67          | 1.48          | 90.23                                              | 5.67                   | 0.15                        | 1.07                                       | 8.98         | -0.31                     | 0.80                       | 0.70            | 389.36                                                         | 0.80                                                                         | 12.33                   |
| 09/01/21 11:32:57                | 19880                     | 9.07                  | 9.01          | 1.54          | 90.66                                              | 5.65                   | 0.14                        | 0.93                                       | 8.87         | 0.14                      | 0.80                       | 0.67            | 387.85                                                         | 0.73                                                                         | 12.45                   |
| 09/01/21 11:33:27                | 19910                     | 9.08                  | 10.33         | 1.42          | 90.27                                              | 5.64                   | 0.16                        | 1.12                                       | 9.37         | 0.96                      | 0.77                       | 0.69            | 388.53                                                         | 0.75                                                                         | 12.54                   |
| 09/01/21 11:33:57                | 19940                     | 9.08                  | 8.74          | 1.42          | 91.42                                              | 5.66                   | 0.17                        | 0.95                                       | 8.16         | 0.59                      | 0.92                       | 0.68            | 388.58                                                         | 0.55                                                                         | 12.60                   |
| 09/01/21 11:34:27                | 19970                     | 9.10                  | 9.31          | 1.50          | 90.99                                              | 5.66                   | 0.18                        | 0.96                                       | 8.67         | 0.64                      | 0.91                       | 0.68            | 385.32                                                         | 0.55                                                                         | 12.58                   |
| 09/01/21 11:34:57                | 20000                     | 9.08                  | 9.12          | 1.63          | 90.81                                              | 5.67                   | 0.16                        | 0.93                                       | 8.58         | 0.54                      | 0.88                       | 0.66            | 387.04                                                         | 0.48                                                                         | 12.59                   |
| 09/01/21 11:35:27                | 20030                     | 9.10                  | 9.04          | 1.59          | 90.39                                              | 5.66                   | 0.17                        | 0.97                                       | 8.31         | 0.73                      | 0.84                       | 0.67            | 383.78                                                         | 0.49                                                                         | 12.65                   |
| 09/01/21 11:35:57                | 20060                     | 9.09                  | 9.00          | 1.50          | 89.96                                              | 5.66                   | 0.18                        | 0.97                                       | 8.40         | 0.60                      | 0.80                       | 0.66            | 382.67                                                         | 0.51                                                                         | 12.64                   |
| 09/01/21 11:36:27                | 20090                     | 9.09                  | 8.80          | 1.47          | 90.89                                              | 5.65                   | 0.17                        | 0.98                                       | 8.28         | 0.52                      | 0.83                       | 0.67            | 388.40                                                         | 0.55                                                                         | 12.59                   |
| 09/01/21 11:36:57                | 20120                     | 9.06                  | 8.73          | 1.40          | 91.                                                |                        |                             |                                            |              |                           |                            |                 |                                                                |                                                                              |                         |



Catalytic Combustion Corporation  
September 1, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

**Fuel Data**

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 26.278 | SCFH          |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.73    | in. Hg                       |
| Relative Humidity   | 57       | %                            |
| Ambient Temperature | 93       | °F                           |
| Specific Humidity   | 0.019207 | lb H <sub>2</sub> O / lb air |

**Unit Data**

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 3,598.0 | horsepower |
| Meas. Stack Moisture     | 12.9    | %          |
| Stack Exhaust Flow (M19) | 399,898 | SCFH       |

100% Load, Run - 3-2

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | NOx<br>(ppmvd) | CO<br>(ppmvw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | CO <sub>2</sub><br>(%) | N <sub>2</sub> O<br>(ppmvw) | C <sub>2</sub> H <sub>6</sub> O<br>(ppmvw) | NO<br>(ppmvd) | NO <sub>2</sub><br>(ppmvd) | NH <sub>3</sub><br>(ppmvw) | HCHO<br>(ppmvw) | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> )<br>(ppmvw) | C <sub>2</sub> H <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|-----------------------|----------------|---------------|----------------------------------------------------|------------------------|-----------------------------|--------------------------------------------|---------------|----------------------------|----------------------------|-----------------|----------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------|
| 09/01/21 11:56:27                | 21290                     | 9.19                  | 8.39           | 1.39          | 94.33                                              | 5.66                   | 0.71                        | 0.86                                       | 7.90          | 0.49                       | 7.12                       | 0.53            | 384.79                                                         | 0.66                                                                         | 13.46                   |
| 09/01/21 11:56:57                | 21320                     | 9.19                  | 9.16           | 1.26          | 94.11                                              | 5.67                   | 0.70                        | 0.85                                       | 8.23          | 0.93                       | 8.09                       | 0.53            | 383.51                                                         | 0.61                                                                         | 13.42                   |
| 09/01/21 11:57:27                | 21350                     | 9.20                  | 8.84           | 1.34          | 94.21                                              | 5.70                   | 0.71                        | 0.85                                       | 8.56          | 0.28                       | 8.45                       | 0.53            | 380.88                                                         | 0.52                                                                         | 13.17                   |
| 09/01/21 11:57:57                | 21380                     | 9.20                  | 8.57           | 1.33          | 94.69                                              | 5.70                   | 0.69                        | 0.87                                       | 8.47          | 0.10                       | 8.73                       | 0.55            | 381.37                                                         | 0.53                                                                         | 13.13                   |
| 09/01/21 11:58:27                | 21410                     | 9.20                  | 8.53           | 1.49          | 95.06                                              | 5.71                   | 0.71                        | 0.85                                       | 8.32          | 0.21                       | 8.69                       | 0.53            | 384.53                                                         | 0.53                                                                         | 12.94                   |
| 09/01/21 11:58:57                | 21440                     | 9.21                  | 8.63           | 1.37          | 94.76                                              | 5.70                   | 0.69                        | 0.90                                       | 8.33          | 0.31                       | 9.00                       | 0.51            | 384.68                                                         | 0.51                                                                         | 13.03                   |
| 09/01/21 11:59:27                | 21470                     | 9.21                  | 8.33           | 1.29          | 95.18                                              | 5.72                   | 0.69                        | 0.87                                       | 8.05          | 0.28                       | 9.28                       | 0.52            | 382.22                                                         | 0.53                                                                         | 13.05                   |
| 09/01/21 11:59:57                | 21500                     | 9.19                  | 8.51           | 1.32          | 95.08                                              | 5.72                   | 0.72                        | 0.85                                       | 8.28          | 0.23                       | 9.32                       | 0.52            | 380.93                                                         | 0.48                                                                         | 12.98                   |
| 09/01/21 12:00:27                | 21530                     | 9.21                  | 8.51           | 0.75          | 95.15                                              | 5.50                   | 0.70                        | -0.37                                      | 7.90          | 0.61                       | 13.44                      | 0.37            | 360.69                                                         | 1.59                                                                         | 16.29                   |
| 09/01/21 12:00:57                | 21560                     | 9.19                  | 8.54           | 1.33          | 94.65                                              | 5.70                   | 0.71                        | 0.81                                       | 8.15          | 0.38                       | 11.42                      | 0.53            | 381.65                                                         | 0.59                                                                         | 13.46                   |
| 09/01/21 12:01:27                | 21590                     | 9.19                  | 8.61           | 1.22          | 94.96                                              | 5.69                   | 0.75                        | 0.80                                       | 7.97          | 0.64                       | 11.61                      | 0.53            | 380.56                                                         | 0.67                                                                         | 13.48                   |
| 09/01/21 12:01:57                | 21620                     | 9.16                  | 8.79           | 0.86          | 94.88                                              | 5.61                   | 0.79                        | -0.41                                      | 8.31          | 0.49                       | 13.55                      | 0.36            | 366.56                                                         | 1.24                                                                         | 14.82                   |
| 09/01/21 12:02:27                | 21650                     | 9.18                  | 9.53           | 1.00          | 93.89                                              | 5.71                   | 0.79                        | 0.93                                       | 9.08          | 0.45                       | 12.76                      | 0.55            | 380.90                                                         | 0.30                                                                         | 13.50                   |
| 09/01/21 12:02:57                | 21680                     | 9.19                  | 8.79           | 0.94          | 93.82                                              | 5.65                   | 0.78                        | 0.91                                       | 8.81          | -0.02                      | 13.04                      | 0.53            | 368.61                                                         | 0.42                                                                         | 14.38                   |
| <b>RAW AVERAGE</b>               |                           | <b>9.05</b>           | <b>9.38</b>    | <b>1.90</b>   | <b>93.36</b>                                       | <b>5.73</b>            | <b>1.01</b>                 | <b>0.83</b>                                | <b>8.67</b>   | <b>0.71</b>                | <b>2.31</b>                | <b>0.71</b>     | <b>392.98</b>                                                  | <b>0.37</b>                                                                  | <b>12.89</b>            |

| Bias | Serial Number:  | INST-O2-0026   | INST-NX-0025 | INST-IR-0005 | INST-VC-0004                            | INST-IR-0005    | INST-IR-0005     | INST-IR-0005                    | INST-NX-0025 | INST-NX-0025    | INST-IR-0005    | INST-IR-0005 | INST-IR-0005                                        | INST-IR-0005                                                      |
|------|-----------------|----------------|--------------|--------------|-----------------------------------------|-----------------|------------------|---------------------------------|--------------|-----------------|-----------------|--------------|-----------------------------------------------------|-------------------------------------------------------------------|
|      |                 | O <sub>2</sub> | NOx          | CO           | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> O | NO           | NO <sub>2</sub> | NH <sub>3</sub> | HCHO         | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> ) | C <sub>2</sub> H <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) |
|      |                 | (%)            |              |              | (ppmvw)                                 |                 |                  |                                 |              |                 |                 |              |                                                     |                                                                   |
|      | Initial Zero    | 0.02           |              |              | 0.20                                    |                 |                  |                                 |              |                 |                 |              |                                                     |                                                                   |
|      | Final Zero      | 0.02           |              |              | 0.20                                    |                 |                  |                                 |              |                 |                 |              |                                                     |                                                                   |
|      | Avg. Zero       | 0.02           |              |              | 0.20                                    |                 |                  |                                 |              |                 |                 |              |                                                     |                                                                   |
|      | Initial UpScale | 11.94          |              |              | 300.31                                  |                 |                  |                                 |              |                 |                 |              |                                                     |                                                                   |
|      | Final UpScale   | 11.95          |              |              | 300.00                                  |                 |                  |                                 |              |                 |                 |              |                                                     |                                                                   |
|      | Avg. UpScale    | 11.95          |              |              | 300.16                                  |                 |                  |                                 |              |                 |                 |              |                                                     |                                                                   |
|      | Upscale Cal Gas | 11.96          |              |              | 299.00                                  |                 |                  |                                 |              |                 |                 |              |                                                     |                                                                   |

| EMISSIONS DATA                          | O <sub>2</sub> | NOx    | CO     | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> O | NO     | NO <sub>2</sub> | NH <sub>3</sub> | HCHO   | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> ) | C <sub>2</sub> H <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) | VOC (as C <sub>3</sub> H <sub>8</sub> ) |
|-----------------------------------------|----------------|--------|--------|-----------------------------------------|-----------------|------------------|---------------------------------|--------|-----------------|-----------------|--------|-----------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------|
| Corrected Raw Average (ppm/% dry basis) | 9.06           | 9.38   | 2.18   | 107.19                                  | 6.58            | 1.16             | 0.96                            | 8.67   | 0.71            | 2.65            | 0.82   | 165.42                                              | 0.28                                                              | 0.00                                    |
| Corrected Raw Average (ppm/% wet basis) | 7.89           | 8.17   | 1.90   | 93.36                                   | 5.73            | 1.01             | 0.83                            | 7.55   | 0.61            | 2.31            | 0.71   | 144.09                                              | 0.24                                                              | 0.00                                    |
| Concentration (ppm@ 15%O <sub>2</sub> ) | N/A            | 4.67   | 1.09   | 46.52                                   | 3.28            | 0.58             | 0.48                            | 4.32   | 0.35            | 1.32            | 0.41   | 82.43                                               | 0.14                                                              | 0.00                                    |
| Emission Rate (g/kw*hr)                 | N/A            | 0.0757 | 0.0107 | 0.7210                                  | 508             | 0.0090           | 0.0074                          | 0.0457 | 0.0057          | 0.0079          | 0.0043 | 1.2803                                              | 0.0022                                                            | 0.0000                                  |

Non-Bias Adjusted Averages Include:

Catalytic Combustion Corporation  
September 2, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

Fuel Data

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 26.278 | SCFH          |

Weather Data

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.74    | in. Hg                       |
| Relative Humidity   | 46       | %                            |
| Ambient Temperature | 95       | °F                           |
| Specific Humidity   | 0.016410 | lb H <sub>2</sub> O / lb air |

Unit Data

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 3,598.0 | horsepower |
| Meas. Stack Moisture     | 13.0    | %          |
| Stack Exhaust Flow (M19) | 406,400 | SCFH       |

100% Load, Run - 3-3

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | NOx<br>(ppmw) | CO<br>(ppmw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmw) | CO <sub>2</sub><br>(%) | N <sub>2</sub> O<br>(ppmw) | C <sub>2</sub> H <sub>2</sub> O<br>(ppmw) | NO<br>(ppmvd) | NO <sub>2</sub><br>(ppmvd) | NH <sub>3</sub><br>(ppmw) | HCHO<br>(ppmw) | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> )<br>(ppmw) | C <sub>2</sub> H <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|-----------------------|---------------|--------------|---------------------------------------------------|------------------------|----------------------------|-------------------------------------------|---------------|----------------------------|---------------------------|----------------|---------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------|
| 09/01/21 12:03:27                | 21710                     | 9.20                  | 8.82          | 1.25         | 94.00                                             | 5.72                   | 0.75                       | 0.76                                      | 8.39          | 0.43                       | 12.99                     | 0.51           | 379.09                                                        | 0.56                                                                        | 13.46                   |
| 09/01/21 12:03:57                | 21740                     | 9.18                  | 8.68          | 1.45         | 94.39                                             | 5.75                   | 0.73                       | 0.85                                      | 8.35          | 0.33                       | 12.29                     | 0.55           | 380.60                                                        | 0.45                                                                        | 13.14                   |
| 09/01/21 12:04:27                | 21770                     | 9.19                  | 8.42          | 0.90         | 95.02                                             | 5.68                   | 0.74                       | 0.98                                      | 7.81          | 0.60                       | 12.27                     | 0.57           | 369.55                                                        | 0.34                                                                        | 14.12                   |
| 09/01/21 12:04:57                | 21800                     | 9.19                  | 8.53          | 1.51         | 94.89                                             | 5.74                   | 0.68                       | 0.86                                      | 8.30          | 0.23                       | 11.67                     | 0.52           | 380.73                                                        | 0.51                                                                        | 13.21                   |
| 09/01/21 12:05:27                | 21830                     | 9.19                  | 8.80          | 1.39         | 94.85                                             | 5.75                   | 0.72                       | 0.79                                      | 8.20          | 0.60                       | 10.89                     | 0.53           | 370.24                                                        | 0.40                                                                        | 12.86                   |
| 09/01/21 12:05:57                | 21860                     | 9.21                  | 8.64          | 1.49         | 94.50                                             | 5.75                   | 0.70                       | 0.88                                      | 8.40          | 0.24                       | 10.27                     | 0.52           | 380.22                                                        | 0.46                                                                        | 12.79                   |
| 09/01/21 12:06:27                | 21890                     | 9.21                  | 8.76          | 1.49         | 94.15                                             | 5.74                   | 0.72                       | 0.92                                      | 8.17          | 0.60                       | 10.28                     | 0.54           | 384.31                                                        | 0.47                                                                        | 12.84                   |
| 09/01/21 12:06:57                | 21920                     | 9.23                  | 8.75          | 1.40         | 93.96                                             | 5.74                   | 0.70                       | 0.81                                      | 8.73          | 0.02                       | 10.45                     | 0.55           | 380.65                                                        | 0.45                                                                        | 12.89                   |
| 09/01/21 12:07:27                | 21950                     | 9.23                  | 9.33          | 0.90         | 93.20                                             | 5.63                   | 0.71                       | 0.90                                      | 8.92          | 0.41                       | 11.19                     | 0.55           | 369.54                                                        | 0.54                                                                        | 14.31                   |
| 09/01/21 12:07:57                | 21980                     | 9.24                  | 9.04          | 0.95         | 93.14                                             | 5.68                   | 0.72                       | 0.96                                      | 7.98          | 1.06                       | 11.38                     | 0.57           | 371.13                                                        | 0.34                                                                        | 13.81                   |
| 09/01/21 12:08:27                | 22010                     | 9.24                  | 8.81          | 0.91         | 92.33                                             | 5.70                   | 0.72                       | 0.99                                      | 8.20          | 0.61                       | 11.19                     | 0.53           | 371.09                                                        | 0.27                                                                        | 13.56                   |
| 09/01/21 12:08:57                | 22040                     | 9.24                  | 8.76          | 1.36         | 92.33                                             | 5.70                   | 0.71                       | 0.86                                      | 8.23          | 0.53                       | 10.95                     | 0.52           | 380.94                                                        | 0.54                                                                        | 13.31                   |
| 09/01/21 12:09:27                | 22070                     | 9.26                  | 9.03          | 1.48         | 92.91                                             | 5.71                   | 0.71                       | 0.82                                      | 8.59          | 0.45                       | 10.71                     | 0.55           | 380.08                                                        | 0.51                                                                        | 13.20                   |
| 09/01/21 12:09:57                | 22100                     | 9.24                  | 9.23          | 1.39         | 93.01                                             | 5.72                   | 0.71                       | 0.82                                      | 8.53          | 0.69                       | 10.73                     | 0.53           | 382.54                                                        | 0.51                                                                        | 13.20                   |
| 09/01/21 12:10:27                | 22130                     | 9.24                  | 8.66          | 1.38         | 93.57                                             | 5.72                   | 0.72                       | 0.85                                      | 8.19          | 0.47                       | 10.83                     | 0.54           | 380.95                                                        | 0.55                                                                        | 13.20                   |
| 09/01/21 12:10:57                | 22160                     | 9.24                  | 9.07          | 1.50         | 93.99                                             | 5.71                   | 0.71                       | 0.75                                      | 8.27          | 0.80                       | 11.12                     | 0.55           | 380.52                                                        | 0.47                                                                        | 13.32                   |
| 09/01/21 12:11:27                | 22190                     | 9.24                  | 8.76          | 1.06         | 94.38                                             | 5.54                   | 0.69                       | -0.13                                     | 8.20          | 0.56                       | 13.80                     | 0.40           | 362.95                                                        | 1.39                                                                        | 15.94                   |
| 09/01/21 12:11:57                | 22220                     | 9.24                  | 8.59          | 1.10         | 94.46                                             | 5.68                   | 0.73                       | 0.85                                      | 8.12          | 0.47                       | 12.22                     | 0.53           | 369.62                                                        | 0.22                                                                        | 13.74                   |
| 09/01/21 12:12:27                | 22250                     | 9.24                  | 8.44          | 1.38         | 94.87                                             | 5.71                   | 0.70                       | 0.90                                      | 7.89          | 0.55                       | 11.27                     | 0.50           | 380.67                                                        | 0.56                                                                        | 13.26                   |
| 09/01/21 12:12:57                | 22280                     | 9.24                  | 8.48          | 1.41         | 95.22                                             | 5.70                   | 0.70                       | 0.80                                      | 7.90          | 0.58                       | 10.95                     | 0.56           | 371.17                                                        | 0.47                                                                        | 13.13                   |
| 09/01/21 12:13:27                | 22310                     | 9.24                  | 8.29          | 0.98         | 95.31                                             | 5.63                   | 0.75                       | 0.88                                      | 8.06          | 0.23                       | 11.58                     | 0.56           | 369.15                                                        | 0.45                                                                        | 14.18                   |
| 09/01/21 12:13:57                | 22340                     | 9.21                  | 8.34          | 1.38         | 95.52                                             | 5.71                   | 0.69                       | 0.93                                      | 7.90          | 0.44                       | 11.56                     | 0.54           | 381.76                                                        | 0.55                                                                        | 13.24                   |
| 09/01/21 12:14:27                | 22370                     | 9.21                  | 8.33          | 1.51         | 95.11                                             | 5.72                   | 0.66                       | 0.83                                      | 7.70          | 0.63                       | 11.28                     | 0.52           | 379.37                                                        | 0.47                                                                        | 13.12                   |
| 09/01/21 12:14:57                | 22400                     | 9.22                  | 8.71          | 1.43         | 94.66                                             | 5.72                   | 0.74                       | 0.86                                      | 8.37          | 0.34                       | 10.70                     | 0.55           | 378.82                                                        | 0.53                                                                        | 12.98                   |
| 09/01/21 12:15:27                | 22430                     | 9.21                  | 8.47          | 1.05         | 95.11                                             | 5.56                   | 0.81                       | -0.30                                     | 8.03          | 0.44                       | 11.59                     | 0.37           | 363.41                                                        | 1.33                                                                        | 14.84                   |
| 09/01/21 12:15:57                | 22460                     | 9.23                  | 8.82          | 1.05         | 94.45                                             | 5.69                   | 0.73                       | 0.92                                      | 8.27          | 0.56                       | 11.93                     | 0.54           | 378.92                                                        | 0.29                                                                        | 13.50                   |
| 09/01/21 12:16:27                | 22490                     | 9.22                  | 8.61          | 1.43         | 94.01                                             | 5.70                   | 0.76                       | 0.82                                      | 8.53          | 0.08                       | 11.65                     | 0.53           | 382.00                                                        | 0.53                                                                        | 13.13                   |
| 09/01/21 12:16:57                | 22520                     | 9.24                  | 8.98          | 1.07         | 94.17                                             | 5.62                   | 0.81                       | 0.86                                      | 7.92          | 1.06                       | 13.01                     | 0.51           | 369.32                                                        | 0.11                                                                        | 14.41                   |
| 09/01/21 12:17:27                | 22550                     | 9.24                  | 8.35          | 1.41         | 95.01                                             | 5.68                   | 0.71                       | 0.77                                      | 8.04          | 0.32                       | 12.81                     | 0.53           | 383.23                                                        | 0.60                                                                        | 13.41                   |
| 09/01/21 12:17:57                | 22580                     | 9.24                  | 8.01          | 1.48         | 95.11                                             | 5.69                   | 0.72                       | 0.83                                      | 7.74          | 0.28                       | 12.41                     | 0.47           | 383.22                                                        | 0.56                                                                        | 13.30                   |
| 09/01/21 12:18:27                | 22610                     | 9.22                  | 7.83          | 1.42         | 94.98                                             | 5.69                   | 0.73                       | 0.85                                      | 7.30          | 0.53                       | 11.92                     | 0.54           | 386.66                                                        | 0.60                                                                        | 13.30                   |
| 09/01/21 12:18:57                | 22640                     | 9.21                  | 7.91          | 0.85         | 94.40                                             | 5.57                   | 0.75                       | 0.89                                      | 7.54          | 0.37                       | 13.59                     | 0.51           | 370.07                                                        | 0.29                                                                        | 15.04                   |
| 09/01/21 12:22:57                | 22880                     | 9.22                  | 10.09         | 1.41         | 94.04                                             | 5.71                   | 0.68                       | 0.90                                      | 9.52          | 0.56                       | 10.74                     | 0.52           | 383.50                                                        | 0.68                                                                        | 12.52                   |
| 09/01/21 12:23:27                | 22910                     | 9.21                  | 9.30          | 1.47         | 93.98                                             | 5.74                   | 0.71                       | 0.73                                      | 9.15          | 0.15                       | 11.02                     | 0.52           | 386.84                                                        | 0.40                                                                        | 12.55                   |
| 09/01/21 12:23:57                | 22940                     | 9.22                  | 9.11          | 1.64         | 93.69                                             | 5.74                   | 0.72                       | 0.86                                      | 8.58          | 0.54                       | 11.10                     | 0.49           | 385.22                                                        | 0.46                                                                        | 12.56                   |
| 09/01/21 12:24:27                | 22970                     | 9.22                  | 8.35          | 1.48         | 93.88                                             | 5.76                   | 0.72                       | 0.73                                      | 8.68          | -0.32                      | 10.90                     | 0.53           | 383.27                                                        | 0.44                                                                        | 12.57                   |
| 09/01/21 12:24:57                | 23000                     | 9.21                  | 8.62          | 0.89         | 94.15                                             | 5.60                   | 0.76                       | 0.85                                      | 8.37          | 0.25                       | 12.26                     | 0.48           | 368.19                                                        | 0.29                                                                        | 14.59                   |
| 09/01/21 12:25:27                | 23030                     | 9.21                  | 8.65          | 1.43         | 94.41                                             | 5.69                   | 0.70                       | 0.87                                      | 7.78          | 0.87                       | 12.32                     | 0.51           | 369.70                                                        | 0.54                                                                        | 13.39                   |
| 09/01/21 12:25:57                | 23060                     | 9.21                  | 8.47          | 1.42         | 94.41                                             | 5.73                   | 0.72                       | 0.83                                      | 8.14          | 0.33                       | 11.10                     | 0.52           | 368.24                                                        | 0.43                                                                        | 12.73                   |
| 09/01/21 12:26:27                | 23090                     | 9.21                  | 8.49          | 1.56         | 94.65                                             | 5.72                   | 0.75                       | 0.82                                      | 8.11          | 0.38                       | 11.02                     | 0.51           | 382.43                                                        | 0.48                                                                        | 12.69                   |
| 09/01/21 12:26:57                | 23120                     | 9.21                  | 8.85          | 1.44         | 94.59                                             | 5.71                   | 0.70                       | 0.87                                      | 8.23          | 0.62                       | 11.50                     | 0.53           | 385.57                                                        | 0.59                                                                        | 12.85                   |
| 09/01/21 12:27:27                | 23150                     | 9.21                  | 8.77          | 1.03         | 94.43                                             | 5.65                   | 0.76                       | 0.95                                      | 8.25          | 0.52                       | 12.45                     | 0.54           | 379.50                                                        | 0.37                                                                        | 13.74                   |
| 09/01/21 12:27:57                | 23180                     | 9.21                  | 8.76          | 1.03         | 94.66                                             | 5.65                   | 0.72                       | 0.87                                      | 8.11          | 0.65                       | 12.93                     | 0.53           | 381.47                                                        | 0.32                                                                        | 13.68                   |
| 09/01/21 12:28:27                | 23210                     | 9.22                  | 8.50          | 1.41         | 94.45                                             | 5.69                   | 0.72                       | 0.82                                      | 8.31          | 0.19                       | 11.85                     | 0.53           | 383.29                                                        | 0.59                                                                        | 13.04                   |
| 09/01/21 12:28:57                | 23240                     | 9.22                  | 8.68          | 1.48         | 95.01                                             | 5.69                   | 0.71                       | 0.81                                      | 8.24          | 0.44                       | 11.58                     | 0.53           | 384.86                                                        | 0.58                                                                        | 13.03                   |
| 09/01/21 12:29:27                | 23270                     | 9.22                  | 8.19          | 1.35         | 94.77                                             | 5.70                   | 0.72                       | 0.91                                      | 8.44          | -0.25                      | 11.53                     | 0.49           | 382.18                                                        | 0.53                                                                        | 12.99                   |
| 09/01/21 12:29:57                | 23300                     | 9.23                  | 8.80          | 1.04         | 95.08                                             | 5.58                   | 0.77                       | -0.39                                     | 8.24          | 0.56                       | 12.84                     | 0.37           | 363.85                                                        | 1.27                                                                        | 14.62                   |
| 09/01/21 12:30:27                | 23330                     | 9.22                  | 8.20          | 1.38         | 95.59                                             | 5.68                   | 0.68                       | 0.83                                      | 7.80          | 0.40                       | 11.63                     | 0.54           | 380.69                                                        | 0.46                                                                        | 12.96                   |
| 09/01/21 12:30:57                | 23360                     | 9.24                  | 8.33          | 1.50         | 95.07                                             | 5.70                   | 0.72                       | 0.75                                      | 7.93          | 0.40                       | 11.23                     | 0.51           | 385.14                                                        | 0.47                                                                        | 12.73                   |
| 09/01/21 12:31:27                | 23390                     | 9.22                  | 8.62          | 1.48         | 94.91                                             | 5.70                   | 0.73                       | 0.83                                      | 7.84          | 0.78                       | 11.05                     | 0.53           | 384.18                                                        | 0.44                                                                        | 12.64                   |
| 09/01/21 12:31:57                | 23420                     | 9.22                  | 8.60          | 1.47         | 95.01                                             | 5.69                   | 0.71                       | 0.79                                      | 7.99          | 0.61                       | 11.15                     | 0.54           | 389.72                                                        | 0.53                                                                        | 12.58                   |
| 09/01/21 12:32:27                | 23450                     | 9.22                  | 8.66          | 1.33         | 95.13                                             | 5.68                   | 0.67                       | 0.88                                      | 7.99          | 0.67                       | 11.14                     | 0.53           | 386.42                                                        | 0.67                                                                        | 12.46                   |
| 09/01/21 12:32:57                | 23480                     | 9.20                  | 8.32          | 1.44         | 95.01                                             | 5.69                   | 0.70                       | 0.82                                      | 8.08          | 0.23                       | 10.98                     | 0.56           | 386.39                                                        | 0.62                                                                        | 12.37                   |
| 09/01/21 12:33:27                | 23510                     | 9.22                  | 8.55          | 1.43         | 94.97                                             | 5.68                   | 0.71                       | 0.92                                      | 7.56          | 0.99                       | 11.03                     | 0.57           | 389.28                                                        | 0.65                                                                        | 12.34                   |
| 09/01/21 12:33:57                | 23540                     | 9.22                  | 8.52          | 1.34         | 94.89                                             | 5.68                   | 0.72                       | 0.91                                      | 8.20          | 0.32                       | 11.02                     | 0.55           | 389.00                                                        | 0.71                                                                        | 12.29                   |
| 09/01/21 12:34:27                | 23570                     | 9.22                  | 8.37          | 1.34         | 95.20                                             | 5.69                   | 0.66                       | 0.84                                      | 7.98          | 0.39                       | 10.97                     | 0.53           | 388.62                                                        | 0.61                                                                        | 12.22                   |
| 09/01/21 12:34:57                | 23600                     | 9.22                  | 8.33          | 1.44         | 94.75                                             | 5.69                   | 0.68                       | 0.95                                      | 8.54          | -0.20                      | 10.97                     | 0.54           | 389.14                                                        | 0.68                                                                        | 12.19                   |
| 09/01/21 12:35:27                | 23630                     | 9.23                  | 8.29          | 1.46         | 95.16                                             | 5.71                   | 0.72                       | 0.94                                      | 7.89          | 0.41                       | 10.95                     | 0.55           | 389.44                                                        | 0.69                                                                        | 12.09                   |
| 09/01/21 12:35:57                | 23660                     | 9.21                  | 8.14          | 1.44         | 95.65                                             | 5.72                   | 0.68                       | 0.93                                      | 7.85          | 0.29                       | 10.82                     | 0.51           | 389.83                                                        | 0.60                                                                        | 11.99                   |
| 09/01/21 12:36:27                | 23690                     | 9.21                  | 8.64          | 1.49         | 95.26                                             | 5.72                   | 0.73                       | 0.84                                      | 8.17          | 0.47                       | 11.01                     | 0.50           | 389.48                                                        | 0.72                                                                        | 12.05                   |
| 09/01/21 12:36:57                | 23720                     | 9.21                  | 8.73          | 1.37         | 95.23                                             | 5.71                   | 0.69                       | 0.89                                      | 7.84          | 0.89                       | 11.15                     | 0.53           | 388.48                                                        | 0.67                                                                        | 12.11                   |
| 09/01/21 12:37:27                | 23750                     | 9.21                  | 8.47          | 1.35         | 95.24                                             | 5.71                   | 0.72                       | 0.87                                      |               |                            |                           |                |                                                               |                                                                             |                         |

Catalytic Combustion Corporation  
September 2, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

Fuel Data

|                          |        |               |
|--------------------------|--------|---------------|
| Fuel Fd factor           | 8.632  | SCF exh/MMBtu |
| Fuel Heating Value (HHV) | 999    | Btu/SCF fuel  |
| Engine Fuel Flow         | 26.278 | SCFH          |

Weather Data

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 29.74    | in. Hg                       |
| Relative Humidity   | 46       | %                            |
| Ambient Temperature | 95       | °F                           |
| Specific Humidity   | 0.016410 | lb H <sub>2</sub> O / lb air |

Unit Data

|                          |         |            |
|--------------------------|---------|------------|
| Unit Load                | 3,598.0 | horsepower |
| Meas. Stack Moisture     | 13.0    | %          |
| Stack Exhaust Flow (M19) | 406,400 | SCFH       |

100% Load, Run - 3-3

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | NOx<br>(ppmvw) | CO<br>(ppmvw) | THC (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | CO <sub>2</sub><br>(%) | N <sub>2</sub> O<br>(ppmvw) | C <sub>2</sub> H <sub>2</sub> O<br>(ppmvw) | NO<br>(ppmvw) | NO <sub>2</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) | HCHO<br>(ppmvw) | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> )<br>(ppmvw) | C <sub>2</sub> H <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> )<br>(ppmvw) | H <sub>2</sub> O<br>(%) |
|----------------------------------|---------------------------|-----------------------|----------------|---------------|----------------------------------------------------|------------------------|-----------------------------|--------------------------------------------|---------------|----------------------------|----------------------------|-----------------|----------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------|
| 09/01/21 12:56:57                | 24920                     | 9.27                  | 8.90           | 1.02          | 92.98                                              | 5.58                   | 0.72                        | 0.91                                       | 8.60          | 0.29                       | 14.90                      | 0.55            | 384.09                                                         | 0.61                                                                         | 14.16                   |
| 09/01/21 12:57:27                | 24950                     | 9.27                  | 8.99           | 0.99          | 93.05                                              | 5.64                   | 0.74                        | 0.90                                       | 8.28          | 0.71                       | 14.98                      | 0.54            | 386.67                                                         | 0.38                                                                         | 13.51                   |
| 09/01/21 12:57:57                | 24980                     | 9.25                  | 8.38           | 1.38          | 93.31                                              | 5.64                   | 0.51                        | 0.85                                       | 8.01          | 0.38                       | 14.34                      | 0.53            | 386.40                                                         | 0.61                                                                         | 13.24                   |
| 09/01/21 12:58:27                | 25010                     | 9.25                  | 8.27           | 1.56          | 93.45                                              | 5.64                   | 0.17                        | 0.83                                       | 7.93          | 0.34                       | 11.26                      | 0.59            | 383.02                                                         | 0.62                                                                         | 13.27                   |
| 09/01/21 12:58:57                | 25040                     | 9.26                  | 8.72           | 1.66          | 93.61                                              | 5.62                   | 0.17                        | 0.91                                       | 8.15          | 0.58                       | 8.75                       | 0.66            | 383.84                                                         | 0.67                                                                         | 13.27                   |
| 09/01/21 12:59:27                | 25070                     | 9.25                  | 8.72           | 1.61          | 93.23                                              | 5.63                   | 0.38                        | 0.95                                       | 8.62          | 0.10                       | 7.35                       | 0.65            | 383.56                                                         | 0.61                                                                         | 13.25                   |
| 09/01/21 12:59:57                | 25100                     | 9.26                  | 9.57           | 1.49          | 93.36                                              | 5.63                   | 0.62                        | 0.84                                       | 8.17          | 1.40                       | 6.80                       | 0.58            | 384.97                                                         | 0.59                                                                         | 13.21                   |
| 09/01/21 13:00:27                | 25130                     | 9.26                  | 8.92           | 1.38          | 93.56                                              | 5.63                   | 0.62                        | 0.82                                       | 8.22          | 0.70                       | 7.25                       | 0.57            | 385.54                                                         | 0.63                                                                         | 13.18                   |
| 09/01/21 13:00:57                | 25160                     | 9.26                  | 8.64           | 1.45          | 93.69                                              | 5.63                   | 0.65                        | 0.82                                       | 8.14          | 0.50                       | 7.80                       | 0.56            | 387.60                                                         | 0.59                                                                         | 13.14                   |
| 09/01/21 13:01:27                | 25190                     | 9.25                  | 8.25           | 1.51          | 94.00                                              | 5.65                   | 0.63                        | 0.75                                       | 7.99          | 0.26                       | 8.00                       | 0.52            | 384.73                                                         | 0.61                                                                         | 13.04                   |
| 09/01/21 13:01:57                | 25220                     | 9.26                  | 8.21           | 1.47          | 94.11                                              | 5.65                   | 0.66                        | 0.81                                       | 7.99          | 0.22                       | 8.36                       | 0.55            | 386.38                                                         | 0.68                                                                         | 13.01                   |
| 09/01/21 13:02:27                | 25250                     | 9.25                  | 8.34           | 1.58          | 94.00                                              | 5.66                   | 0.65                        | 0.91                                       | 8.18          | 0.16                       | 9.09                       | 0.54            | 384.14                                                         | 0.56                                                                         | 13.02                   |
| 09/01/21 13:02:57                | 25280                     | 9.24                  | 8.36           | 1.46          | 94.18                                              | 5.66                   | 0.68                        | 0.84                                       | 7.62          | 0.74                       | 9.96                       | 0.50            | 385.19                                                         | 0.67                                                                         | 13.02                   |
| 09/01/21 13:03:27                | 25310                     | 9.24                  | 8.08           | 1.54          | 94.32                                              | 5.67                   | 0.71                        | 0.71                                       | 7.61          | 0.47                       | 10.72                      | 0.56            | 384.31                                                         | 0.57                                                                         | 12.98                   |
| 09/01/21 13:03:57                | 25340                     | 9.25                  | 7.91           | 1.55          | 94.48                                              | 5.66                   | 0.71                        | 0.83                                       | 8.06          | -0.15                      | 11.27                      | 0.54            | 385.28                                                         | 0.56                                                                         | 12.94                   |
| 09/01/21 13:04:27                | 25370                     | 9.23                  | 7.66           | 1.47          | 95.32                                              | 5.67                   | 0.73                        | 0.83                                       | 7.43          | 0.22                       | 11.55                      | 0.50            | 385.02                                                         | 0.59                                                                         | 12.92                   |
| 09/01/21 13:04:57                | 25400                     | 9.24                  | 7.81           | 1.60          | 95.08                                              | 5.68                   | 0.70                        | 0.80                                       | 7.69          | 0.12                       | 11.79                      | 0.54            | 387.14                                                         | 0.57                                                                         | 12.84                   |
| 09/01/21 13:05:27                | 25430                     | 9.23                  | 8.14           | 1.56          | 94.16                                              | 5.69                   | 0.70                        | 0.81                                       | 8.03          | 0.12                       | 11.93                      | 0.52            | 386.98                                                         | 0.58                                                                         | 12.77                   |
| 09/01/21 13:05:57                | 25460                     | 9.22                  | 8.31           | 1.61          | 94.23                                              | 5.70                   | 0.72                        | 0.79                                       | 7.79          | 0.52                       | 12.16                      | 0.55            | 385.55                                                         | 0.53                                                                         | 12.70                   |
| 09/01/21 13:06:27                | 25490                     | 9.23                  | 8.50           | 1.17          | 94.16                                              | 5.60                   | 0.77                        | 0.93                                       | 8.05          | 0.45                       | 13.16                      | 0.57            | 379.72                                                         | 0.50                                                                         | 13.81                   |
| RAW AVERAGE                      |                           | 9.23                  | 8.57           | 1.38          | 94.52                                              | 5.68                   | 0.69                        | 0.82                                       | 8.13          | 0.44                       | 11.60                      | 0.53            | 382.57                                                         | 0.59                                                                         | 13.03                   |

| Serial Number:  | INST-O2-0026 | INST-NX-0025 | INST-IR-0005 | INST-VC-0004 | INST-IR-0005 | INST-IR-0005 | INST-IR-0005 | INST-NX-0025 | INST-NX-0025 | INST-IR-0005 | INST-IR-0005 | INST-IR-0005 | INST-IR-0005 | INST-IR-0005 |
|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|                 |              |              |              |              |              |              |              |              |              |              |              |              |              |              |
| Initial Zero    | 0.02         |              |              | 0.20         |              |              |              |              |              |              |              |              |              |              |
| Final Zero      | 0.02         |              |              | 0.21         |              |              |              |              |              |              |              |              |              |              |
| Avg. Zero       | 0.02         |              |              | 0.21         |              |              |              |              |              |              |              |              |              |              |
| Initial UpScale | 11.95        |              |              | 300.00       |              |              |              |              |              |              |              |              |              |              |
| Final UpScale   | 11.90        |              |              | 299.31       |              |              |              |              |              |              |              |              |              |              |
| Avg. UpScale    | 11.93        |              |              | 299.66       |              |              |              |              |              |              |              |              |              |              |
| Upscale Cal Gas | 11.96        |              |              | 299.00       |              |              |              |              |              |              |              |              |              |              |

| EMISSIONS DATA                          | O <sub>2</sub> | NOx    | CO     | THC (as C <sub>3</sub> H <sub>8</sub> ) | CO <sub>2</sub> | N <sub>2</sub> O | C <sub>2</sub> H <sub>2</sub> O | NO     | NO <sub>2</sub> | NH <sub>3</sub> | HCHO   | CH <sub>4</sub> (as C <sub>2</sub> H <sub>6</sub> ) | C <sub>2</sub> H <sub>4</sub> (as C <sub>3</sub> H <sub>8</sub> ) | VOC (as C <sub>3</sub> H <sub>8</sub> ) |
|-----------------------------------------|----------------|--------|--------|-----------------------------------------|-----------------|------------------|---------------------------------|--------|-----------------|-----------------|--------|-----------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------|
| Corrected Raw Average (ppm/% dry basis) | 9.25           | 9.85   | 1.58   | 108.68                                  | 6.53            | 0.80             | 0.94                            | 9.35   | 0.50            | 13.33           | 0.61   | 161.29                                              | 0.45                                                              | 0.00                                    |
| Corrected Raw Average (ppm/% wet basis) | 8.04           | 8.57   | 1.38   | 94.52                                   | 5.68            | 0.69             | 0.82                            | 8.13   | 0.44            | 11.60           | 0.53   | 140.27                                              | 0.39                                                              | 0.00                                    |
| Concentration (ppm@ 15%O <sub>2</sub> ) | N/A            | 4.99   | 0.80   | 47.86                                   | 3.31            | 0.40             | 0.48                            | 4.12   | 0.90            | 6.75            | 0.31   | 81.68                                               | 0.23                                                              | 0.00                                    |
| Emission Rate (g/hp*hr)                 | N/A            | 0.0808 | 0.0079 | 0.7417                                  | 512             | 0.0062           | 0.0074                          | 0.0500 | 0.0041          | 0.0405          | 0.0033 | 1.2686                                              | 0.0036                                                            | 0.0000                                  |

Non-Bias Adjusted Averages Include:

## **EMISSION DATA RECORDS**

**50% Load**

**PM**

**Reference Method Data**

**METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE**

| Source Information       |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Fuel Type</b>         | Gas, Natural                             |

| Test Information                 |               |                            |         |
|----------------------------------|---------------|----------------------------|---------|
| <b>Project #</b>                 |               | catc-21-houston.tx-start#1 |         |
| <b>Operator</b>                  |               | JLW                        |         |
| <b>Date for Preliminary Run</b>  | (mm/dd/yy)    | 07/28/21                   |         |
| <b>Standard Temperature</b>      |               | 68                         | °F      |
| <b>Standard Pressure</b>         |               | 29.92                      | in Hg   |
| <b>Run Duration</b>              | ≥ 2 min/point | 90                         | minutes |
| <b>Unit Number</b>               |               | 1                          |         |
| <b>Base Run Number</b>           |               | R-1 50%                    |         |
| <b>Number of Ports Available</b> |               | 2                          |         |
| <b>Number of Ports Used</b>      |               | 2                          |         |
| <b>Port Inside Diameter</b>      |               | 4.00                       | in      |
| <b>Stack Shape</b>               |               | Circular                   |         |

| Test Equipment Information             |                    |              |              |              |                     |
|----------------------------------------|--------------------|--------------|--------------|--------------|---------------------|
| Run                                    |                    | 1            | 2            | 3            |                     |
| <b>Test Date</b>                       | (mm/dd/yy)         | 07/29/21     | 07/29/21     | 07/29/21     |                     |
| <b>Load</b>                            |                    | 50%          | 50%          | 50%          | % or w/DB           |
| <b>Fuel F-Factor</b>                   |                    | 8631.70      | 8631.70      | 8631.70      | dscf/MMBtu          |
| <b>Meter Box Number</b>                | from ACS           | samp-cp-0022 | samp-cp-0022 | samp-cp-0022 |                     |
| <b>Meter Calibration Factor</b>        | (Y)                | 0.986        | 0.986        | 0.986        |                     |
| <b>Orifice Meter Coefficient</b>       | (ΔH <sub>@</sub> ) | 1.831        | 1.831        | 1.831        | in H <sub>2</sub> O |
| <b>Non-Console Manometer Used</b>      |                    | No           | No           | No           |                     |
| <b>Pitot Identification</b>            | from ACS           | A6223        | A5708        | A6223        |                     |
| <b>Pitot Tube Coefficient</b>          | (C <sub>p</sub> )  | 0.8215       | 0.8230       | 0.8215       |                     |
| <b>Nozzle Number</b>                   | from ACS           | G-10         | G-10         | G-10         |                     |
| <b>Nozzle Diameter</b>                 | (D <sub>n</sub> )  | 0.311        | 0.311        | 0.311        | in                  |
| <b>Probe Number</b>                    | from ACS           | samp-hp-0014 | samp-hp-0079 | samp-hp-0014 |                     |
| <b>Probe Length</b>                    |                    | 60.0         | 60.0         | 60.0         | in                  |
| <b>(SS, Glass ....) Liner Material</b> | from list          | glass        | glass        | glass        |                     |
| <b>Sample Case / Oven Number</b>       | from ACS           | samp-BH-0018 | samp-BH-0018 | samp-BH-0018 |                     |
| <b>Impinger Case Number</b>            | from ACS           | samp-cc-0011 | samp-cc-0011 | samp-cc-0011 |                     |

| Testing Company Information |                                                   |
|-----------------------------|---------------------------------------------------|
| <b>Company Name</b>         | Air Hygiene International, Inc. (Tulsa, Oklahoma) |
| <b>Address</b>              | 1600 W Tacoma Street                              |
| <b>City, State Zip</b>      | Broken Arrow, Oklahoma 74012                      |
| <b>Project Manager</b>      | Pat McGovern, Jr.                                 |
| <b>Phone Number</b>         | (918) 307-8865                                    |
| <b>Fax Number</b>           | (918) 307-9131                                    |

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# METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR CIRCULAR SOURCES

|                          |                                          |                         |          |
|--------------------------|------------------------------------------|-------------------------|----------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Date</b>             | 07/28/21 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Stack Type</b>       | Circular |
| <b>Operator</b>          | JLW                                      | <b>Ports Available</b>  | 2        |
| <b>Project #</b>         | catc-21-houston.tx-start#1               | <b>Ports Used</b>       | 2        |
| <b>Stack Size</b>        | Large (>24 inch diameter)                | <b>Port ID (inches)</b> | 4.00     |

| Circular Stack or Duct Diameter       |              |       |                 |
|---------------------------------------|--------------|-------|-----------------|
| <b>Distance to Far Wall of Stack</b>  | ( $L_{fw}$ ) | 32.00 | in              |
| <b>Distance to Near Wall of Stack</b> | ( $L_{nw}$ ) | 0.125 | in              |
| <b>Diameter of Stack</b>              | ( $D$ )      | 31.88 | in              |
| <b>Area of Stack</b>                  | ( $A_s$ )    | 5.54  | ft <sup>2</sup> |

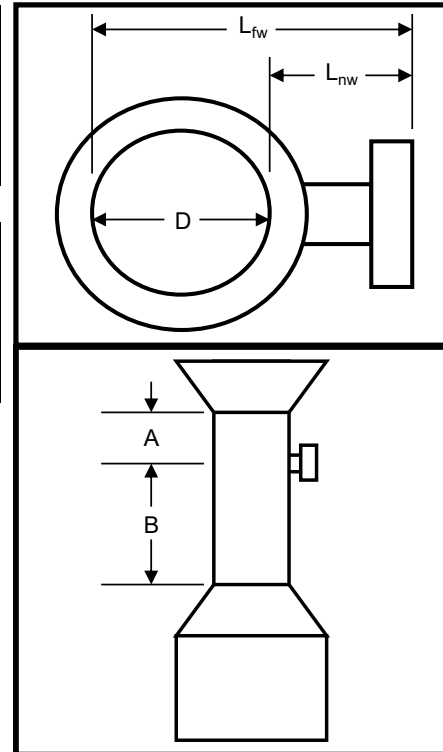
| Distance from Port to Disturbances |           |       |           |
|------------------------------------|-----------|-------|-----------|
| <b>Distance Upstream</b>           | ( $A$ )   | 16.00 | in        |
| <b>Diameters Upstream</b>          | ( $A_D$ ) | 0.50  | diameters |
| <b>Distance Downstream</b>         | ( $B$ )   | 64.00 | in        |
| <b>Diameters Downstream</b>        | ( $B_D$ ) | 2.01  | diameters |

| Number of Traverse Points Required |             |                                                |                      |
|------------------------------------|-------------|------------------------------------------------|----------------------|
| Diameters to Flow Disturbance      |             | Minimum Number of <sup>1</sup> Traverse Points |                      |
| Down Stream                        | Up Stream   | Particulate Points                             | Velocity Points      |
| 2.00-4.99                          | 0.50-1.24   | 24                                             | 16                   |
| 5.00-5.99                          | 1.25-1.49   | 20                                             | 16                   |
| 6.00-6.99                          | 1.50-1.74   | 16                                             | 12                   |
| 7.00-7.99                          | 1.75-1.99   | 12                                             | 12                   |
| $\geq 8.00$                        | $\geq 2.00$ | 8 or 12 <sup>2</sup>                           | 8 or 12 <sup>2</sup> |
| <b>Upstream Spec</b>               |             | 24                                             | 16                   |
| <b>Downstream Spec</b>             |             | 24                                             | 16                   |
| <b>Traverse Pts Required</b>       |             | 24                                             | 16                   |

<sup>1</sup> Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

<sup>2</sup> 8 for Circular Stacks 12 to 24 inches  
12 for Circular Stacks over 24 inches

| Location of Traverse Points in Circular Stacks |                                                                  |      |      |      |      |      |      |      |      |
|------------------------------------------------|------------------------------------------------------------------|------|------|------|------|------|------|------|------|
| Traverse Point                                 | (Fraction of Stack Dimension from Inside Wall to Traverse Point) |      |      |      |      |      |      |      |      |
| Number                                         | 2                                                                | 4    | 6    | 8    | 10   | 12   | 14   | 16   | 18   |
| 1                                              | .146                                                             | .067 | .044 | .032 | .026 | .021 | .018 | .016 | .014 |
| 2                                              | .854                                                             | .250 | .146 | .105 | .082 | .067 | .057 | .049 | .044 |
| 3                                              |                                                                  | .750 | .296 | .194 | .146 | .118 | .099 | .085 | .075 |
| 4                                              |                                                                  | .933 | .704 | .323 | .226 | .177 | .146 | .125 | .109 |
| 5                                              |                                                                  |      | .854 | .677 | .342 | .250 | .201 | .169 | .146 |
| 6                                              |                                                                  |      | .956 | .806 | .658 | .356 | .269 | .220 | .188 |
| 7                                              |                                                                  |      |      | .895 | .774 | .644 | .366 | .283 | .236 |
| 8                                              |                                                                  |      |      | .968 | .854 | .750 | .634 | .375 | .296 |
| 9                                              |                                                                  |      |      |      | .918 | .823 | .731 | .625 | .382 |
| 10                                             |                                                                  |      |      |      | .974 | .882 | .799 | .717 | .618 |
| 11                                             |                                                                  |      |      |      |      | .933 | .854 | .780 | .704 |
| 12                                             |                                                                  |      |      |      |      | .979 | .901 | .831 | .764 |



| Number of Traverse Points Used |                 |    |                 |
|--------------------------------|-----------------|----|-----------------|
| 2                              | <b>Ports by</b> | 12 | <b>Across</b>   |
| 24                             | <b>Pts Used</b> | 24 | <b>Required</b> |

Adjust Sample Points Out of Boundary Layer

| Traverse Point Locations |                            |                           |                                     |
|--------------------------|----------------------------|---------------------------|-------------------------------------|
| Traverse Point Number    | Fraction of Stack Diameter | Distance from Inside Wall | Distance Including Reference Length |
|                          |                            | in                        | in                                  |
| 1                        | 0.021                      | 5/8                       | 6/8                                 |
| 2                        | 0.067                      | 2 1/8                     | 2 2/8                               |
| 3                        | 0.118                      | 3 6/8                     | 3 7/8                               |
| 4                        | 0.177                      | 5 5/8                     | 5 6/8                               |
| 5                        | 0.250                      | 8                         | 8 1/8                               |
| 6                        | 0.356                      | 11 3/8                    | 11 4/8                              |
| 7                        | 0.644                      | 20 4/8                    | 20 5/8                              |
| 8                        | 0.750                      | 23 7/8                    | 24                                  |
| 9                        | 0.823                      | 26 2/8                    | 26 3/8                              |
| 10                       | 0.882                      | 28 1/8                    | 28 2/8                              |
| 11                       | 0.933                      | 29 6/8                    | 29 7/8                              |
| 12                       | 0.979                      | 31 2/8                    | 31 3/8                              |

## METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

|                             |              |                             |       |
|-----------------------------|--------------|-----------------------------|-------|
| <b>Preliminary Run Date</b> | 07/28/21     |                             |       |
| <b>Stack Type</b>           | Circular     |                             |       |
| <b>Ports Available</b>      | 2            |                             |       |
| <b>Thermocouple ID</b>      | samp-hp-0014 |                             |       |
| <b>Pitot Coefficient</b>    | 0.8300       | <b>Pitot Identification</b> | A6904 |

| Velocity Traverse Data |  |
|------------------------|--|
|------------------------|--|

|            |            |
|------------|------------|
| Run Number | R-1 50%-V1 |
|------------|------------|

|                 |       |              |       |            |
|-----------------|-------|--------------|-------|------------|
| <b>Run Time</b> | 08:46 | <b>Start</b> | 08:59 | <b>End</b> |
|-----------------|-------|--------------|-------|------------|

| Traverse | Velocity | Null | Zero Deg | Stack | Local |
|----------|----------|------|----------|-------|-------|
|----------|----------|------|----------|-------|-------|

| Point | Head | Angle | Pressure | Temp | Velocity |
|-------|------|-------|----------|------|----------|
|-------|------|-------|----------|------|----------|

|  | $(\Delta p)$ | $(N_a)$ | $(0^0_a)$ | $(t_s)$ | $(v_{s(l)})$ |
|--|--------------|---------|-----------|---------|--------------|
|  | 1.110        | 1       | 1.110     | 25      | 5%           |

|            | in H <sub>2</sub> O | deg | in H <sub>2</sub> O | °F  | ft/sec |
|------------|---------------------|-----|---------------------|-----|--------|
| $\Delta 1$ | 0.15                | 0   | 0.00                | 872 | 34.80  |

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| A-1 | 0.15 | 0 | 0.00 | 873 | 34.80 |
| A-2 | 0.17 | 5 | 0.03 | 896 | 37.36 |

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| A-2 | 0.17 | 9 | 0.00 | 930 | 37.50 |
| A-3 | 0.17 | 0 | 0.00 | 923 | 37.73 |

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| A-4 | 0.15 | 0 | 0.00 | 929 | 35.52 |
|-----|------|---|------|-----|-------|

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| A-5 | 0.17 | 5 | 0.03 | 930 | 37.83 |
|-----|------|---|------|-----|-------|

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| A-6 | 0.18 | 5 | 0.02 | 932 | 38.95 |
|-----|------|---|------|-----|-------|

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| A-7 | 0.19 | 0 | 0.00 | 928 | 39.96 |
|-----|------|---|------|-----|-------|

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| A-8 | 0.18 | 0 | 0.00 | 930 | 38.92 |
|-----|------|---|------|-----|-------|

|      |      |   |      |     |       |
|------|------|---|------|-----|-------|
| A-9  | 0.19 | 0 | 0.00 | 933 | 40.03 |
| A-10 | 0.19 | 0 | 0.00 | 933 | 40.03 |

|      |      |   |      |     |       |
|------|------|---|------|-----|-------|
| A-10 | 0.18 | 5 | 0.04 | 933 | 38.97 |
| A-11 | 0.18 | 6 | 0.03 | 888 | 38.97 |

|      |      |   |      |     |       |
|------|------|---|------|-----|-------|
| A-11 | 0.18 | 0 | 0.00 | 933 | 38.97 |
| A-12 | 0.17 | 0 | 0.00 | 933 | 37.87 |

|      |      |   |      |     |       |
|------|------|---|------|-----|-------|
| A-12 | 0.17 | 0 | 0.00 | 933 | 37.87 |
| B-1  | 0.15 | 0 | 0.00 | 933 | 35.57 |

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| B-2 | 0.15 | 0 | 0.00 | 933 | 35.57 |
|-----|------|---|------|-----|-------|

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| B-3 | 0.16 | 5 | 0.03 | 933 | 36.74 |
|-----|------|---|------|-----|-------|

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| B-4 | 0.17 | 5 | 0.03 | 933 | 37.87 |
|-----|------|---|------|-----|-------|

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| B-5 | 0.18 | 0 | 0.00 | 933 | 38.97 |
|-----|------|---|------|-----|-------|

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| B-6 | 0.18 | 0 | 0.00 | 933 | 38.97 |
|-----|------|---|------|-----|-------|

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| B-7 | 0.18 | 0 | 0.00 | 933 | 38.97 |
|-----|------|---|------|-----|-------|

|     |      |   |      |     |       |
|-----|------|---|------|-----|-------|
| B-8 | 0.17 | 0 | 0.00 | 933 | 37.87 |
| B-9 | 0.17 | 0 | 0.00 | 933 | 37.87 |

|      |      |   |      |     |       |
|------|------|---|------|-----|-------|
| B-9  | 0.17 | 0 | 0.00 | 933 | 37.87 |
| B-10 | 0.17 | 0 | 0.00 | 933 | 37.87 |

|      |      |   |      |     |       |
|------|------|---|------|-----|-------|
| B-10 | 0.17 | 0 | 0.00 | 933 | 37.87 |
| B-11 | 0.16 | 0 | 0.00 | 933 | 36.74 |

|      |      |   |      |     |       |
|------|------|---|------|-----|-------|
| B-11 | 0.10 | 0 | 0.00 | 933 | 36.74 |
| B-12 | 0.16 | 0 | 0.00 | 933 | 36.74 |

| DATE | STATE | CITY | STREET | ZIP | COUNTY |
|------|-------|------|--------|-----|--------|
|      |       |      |        |     |        |

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|         |      |   |     |
|---------|------|---|-----|
| Average | 0.17 | 1 | 928 |
|---------|------|---|-----|

|                                     |                              |
|-------------------------------------|------------------------------|
| 0.41                                | = Square roots of $\Delta p$ |
| Standard deviation of null angles = | 2.2                          |

**METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER**

|                          |                                          |                             |               |                         |       |
|--------------------------|------------------------------------------|-----------------------------|---------------|-------------------------|-------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Preliminary Run Date</b> | 07/28/21      |                         |       |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Operator</b>             | JLW           |                         |       |
| <b>Project #</b>         | catc-21-houston.tx-start#1               | <b># of Ports Used</b>      | 1 (gas probe) |                         |       |
| <b>Fuel Type</b>         | Gas, Natural                             | <b>Min. Fuel Factor</b>     | 1.600         | <b>Max. Fuel Factor</b> | 1.836 |

| Gas Analysis Data           |                             |                            |                 |                            |                             |                               |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------|----------------------------|-----------------------------|-------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | R-1 50%-1                   |                            | <b>Date</b>     | 07/29/21                   | <b>Run Start Time</b>       | 09:34                         | <b>Run Stop Time</b> | 11:24                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>CO Conc.</b> | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b> | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCO)         | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (Fo)avg                       | (%EA)avg             |                             |
| hh:mm                       | %                           | %                          | ppm             | %                          | lb/lb-mole                  |                               | %                    |                             |
| 01:50                       | 6.71                        | 8.67                       | 6.03            | 84.6                       | 29.42                       | 1.822                         | 63.4                 | YES                         |

| Gas Analysis Data           |                             |                            |                 |                            |                             |                               |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------|----------------------------|-----------------------------|-------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | R-1 50%-2                   |                            | <b>Date</b>     | 07/29/21                   | <b>Run Start Time</b>       | 12:05                         | <b>Run Stop Time</b> | 13:59                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>CO Conc.</b> | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b> | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCO)         | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (Fo)avg                       | (%EA)avg             |                             |
| hh:mm                       | %                           | %                          | ppm             | %                          | lb/lb-mole                  |                               | %                    |                             |
| 01:54                       | 6.69                        | 8.74                       | 5.97            | 84.6                       | 29.42                       | 1.817                         | 64.4                 | YES                         |

| Gas Analysis Data           |                             |                            |                 |                            |                             |                               |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------|----------------------------|-----------------------------|-------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | R-1 50%-3                   |                            | <b>Date</b>     | 07/29/21                   | <b>Run Start Time</b>       | 14:23                         | <b>Run Stop Time</b> | 15:58                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>CO Conc.</b> | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b> | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCO)         | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (Fo)avg                       | (%EA)avg             |                             |
| hh:mm                       | %                           | %                          | ppm             | %                          | lb/lb-mole                  |                               | %                    |                             |
| 01:35                       | 6.75                        | 8.79                       | 6.40            | 84.5                       | 29.43                       | 1.793                         | 65.1                 | YES                         |



**METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES**

|                          |                                          |                             |          |
|--------------------------|------------------------------------------|-----------------------------|----------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Preliminary Run Date</b> | 07/28/21 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Operator</b>             | JLW      |
| <b>Project #</b>         | catc-21-houston.tx-start#1               | <b>Ports Used</b>           | 2        |

| Scale Daily Calibration |          |                 |               |                   |                  |
|-------------------------|----------|-----------------|---------------|-------------------|------------------|
| <b>Scale Number</b>     | Extra    | <b>Standard</b> | <b>Result</b> | <b>Difference</b> | <b>Pass/Fail</b> |
| <b>Date</b>             |          | (g)             | (g)           | (g)               | (± 0.5 g)        |
| <b>Preliminary Date</b> | 07/28/21 | 500             | 499.5         | -0.5              | Pass             |
| <b>Test Day 1</b>       | 07/29/21 | 500             | 500.5         | 0.5               | Pass             |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | R-1 50%-1                           |                   | <b>Date</b>       | 07/29/21                      | <b>Start Time</b>            | 09:34                  | <b>Stop Time</b>  | 11:24               |
| <b>Meter Box Number</b>      | samp-cp-0022                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.986             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 36.989            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 29.87             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 906               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.07              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 87                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 0.52              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | Dry                                 |                   | DI Water          | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 456.80            | 612.90            | 720.10                        | 856.20                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 350.70            | 612.50            | 708.90                        | 847.80                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 106.1             | 0.4               | 11.2                          | 8.4                          |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>t</sub> )                   | 126.10            | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 5.946                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 35.190            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 14.45             | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 14.45                  | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | R-1 50%-2                           |                   | <b>Date</b>       | 07/29/21                      | <b>Start Time</b>            | 12:05                  | <b>Stop Time</b>  | 13:59               |
| <b>Meter Box Number</b>      | samp-cp-0022                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.986             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 37.647            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 29.90             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 905               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.07              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 95                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 0.53              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | Dry                                 |                   | DI Water          | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 473.40            | 601.90            | 721.10                        | 823.40                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 357.60            | 600.50            | 720.50                        | 816.50                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 115.8             | 1.4               | 0.6                           | 6.9                          |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>t</sub> )                   | 124.70            | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 5.880                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 35.360            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 14.26             | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 14.26                  | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | R-1 50%-3                           |                   | <b>Date</b>       | 07/29/21                      | <b>Start Time</b>            | 14:23                  | <b>Stop Time</b>  | 15:58               |
| <b>Meter Box Number</b>      | samp-cp-0022                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.986             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 37.385            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 29.85             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 923               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.07              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 94                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 0.53              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | Dry                                 |                   | DI Water          | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 463.70            | 614.80            | 722.80                        | 863.20                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 351.30            | 614.60            | 720.10                        | 856.20                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 112.4             | 0.2               | 2.7                           | 7.0                          |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>t</sub> )                   | 122.30            | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 5.766                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 35.098            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 14.11             | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 14.11                  | %                 |                     |

METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient / ID                            | (C <sub>p</sub> )                   | 0.8215 | A6223               |
| Average Stack Temp                                | (T <sub>s</sub> )                   | 906.0  | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 87.0   |                     |
| Orifice Meter Coefficient                         | (ΔH(Θ))                             | 1.831  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.41   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>w</sub> )                   | 14.45  | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.42  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.75   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 | 3.05   |                     |

| Sampling Equipment        |                    |        |    |
|---------------------------|--------------------|--------|----|
| Meter Box Number          | samp-cp-0022       |        |    |
| Meter Cal Factor          | (Y)                | 0.986  |    |
| Nozzle Number             | G-10               |        |    |
| Average Nozzle Diameter   | (D <sub>no</sub> ) | 0.3113 | in |
| Suggested Nozzle Diameter | (D <sub>n</sub> )  | 0.3148 | in |
| Probe Number              | samp-hp-0014       |        | in |
| Probe Length              | 60                 |        | in |
| Liner Material            | glass              |        |    |
| Sample Case / Oven Number | samp-BH-0018       |        |    |
| Impinging Case Number     | samp-cc-0011       |        |    |

| Weights | lmp 1 | lmp 2 | lmp 3 | lmp 4 | lmp 5 | lmp 6 | lmp 7 | lmp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 350.7 | 612.5 | 708.9 | 847.8 |       |       |       |       |
| Post    | 456.8 | 612.9 | 720.1 | 856.2 |       |       |       |       |

| Pressures               |                  |       |                     |
|-------------------------|------------------|-------|---------------------|
| Barometric Pressure     | ( $P_b$ )        | 29.87 | in Hg               |
| Stack Static Pressure   | ( $P_{static}$ ) | 0.07  | in H <sub>2</sub> O |
| Absolute Stack Pressure | ( $P_s$ )        | 29.88 | in Hg               |
| Absolute Meter Pressure | ( $P_m$ )        | 30.00 | in Hg               |

| Identification Nos. |                   | samp-cp-0022 | samp-cp-0022                            | samp-cp-0022        |                                       |                                      | samp-hp-0014                 | samp-hp-0014          | samp-BH-0018           | samp-cc-0011               |                    |                              | samp-cp-0022                       |                                      | samp-cp-0022 |                                     |                                        |                                           |                               |                                            |  |
|---------------------|-------------------|--------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-----------------------|------------------------|----------------------------|--------------------|------------------------------|------------------------------------|--------------------------------------|--------------|-------------------------------------|----------------------------------------|-------------------------------------------|-------------------------------|--------------------------------------------|--|
| Traverse Point #    | Sampling Time (Θ) | Timer Time   | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Probe Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (≤68°F) | Cond. Temp (≤85°F) | CPM Filter Temp (76.5±8.5°F) | Meter Inlet Temp (t <sub>m</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum  | Square Root ΔP (Δp <sup>1/2</sup> ) | Local Stack Velocity (V <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m,Std</sub> ) | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m,Std</sub> ) |  |
|                     | min               | hh:mm:ss     | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                    | °F                     | °F                         | °F                 | °F                           | °F                                 | °F                                   | in Hg        | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                      | %                             | dscf                                       |  |
| A-1                 | 0.0               | 00:00:00     | 59.000                                  | 0.15                | 0.457                                 | 0.45                                 | 900                          | 250                   | 249                    | 62                         | 70                 | 81                           | 81                                 | 81                                   | 1.0          | 0.39                                | 34.83                                  | 1.318                                     | 96.0                          | 31.623                                     |  |
| A-2                 | 3.8               | 00:03:45     | 60.370                                  | 0.18                | 0.549                                 | 0.54                                 | 905                          | 250                   | 249                    | 60                         | 73                 | 81                           | 81                                 | 81                                   | 1.0          | 0.42                                | 38.22                                  | 2.789                                     | 97.1                          | 33.473                                     |  |
| A-3                 | 7.5               | 00:07:30     | 61.900                                  | 0.17                | 0.518                                 | 0.51                                 | 906                          | 250                   | 249                    | 60                         | 72                 | 80                           | 81                                 | 81                                   | 1.0          | 0.41                                | 37.16                                  | 4.213                                     | 97.3                          | 33.704                                     |  |
| A-4                 | 11.3              | 00:11:15     | 63.380                                  | 0.15                | 0.457                                 | 0.45                                 | 905                          | 250                   | 250                    | 60                         | 74                 | 80                           | 82                                 | 82                                   | 1.0          | 0.39                                | 34.89                                  | 5.567                                     | 97.6                          | 33.400                                     |  |
| A-5                 | 15.0              | 00:15:00     | 64.790                                  | 0.17                | 0.518                                 | 0.51                                 | 910                          | 250                   | 251                    | 58                         | 52                 | 80                           | 82                                 | 82                                   | 1.0          | 0.41                                | 37.21                                  | 7.016                                     | 98.0                          | 33.679                                     |  |
| A-6                 | 18.8              | 00:18:45     | 66.300                                  | 0.20                | 0.610                                 | 0.60                                 | 912                          | 250                   | 250                    | 58                         | 50                 | 80                           | 83                                 | 83                                   | 1.0          | 0.45                                | 40.39                                  | 8.617                                     | 98.7                          | 34.469                                     |  |
| A-7                 | 22.5              | 00:22:30     | 67.970                                  | 0.19                | 0.579                                 | 0.57                                 | 908                          | 250                   | 249                    | 57                         | 50                 | 79                           | 83                                 | 83                                   | 1.0          | 0.44                                | 39.31                                  | 10.122                                    | 98.5                          | 34.704                                     |  |
| A-8                 | 26.3              | 00:26:15     | 69.540                                  | 0.18                | 0.549                                 | 0.54                                 | 911                          | 250                   | 249                    | 57                         | 51                 | 79                           | 84                                 | 84                                   | 1.0          | 0.42                                | 38.30                                  | 11.615                                    | 98.7                          | 34.844                                     |  |
| A-9                 | 30.0              | 00:30:00     | 71.100                                  | 0.19                | 0.579                                 | 0.57                                 | 911                          | 250                   | 252                    | 58                         | 52                 | 79                           | 85                                 | 85                                   | 1.0          | 0.44                                | 39.35                                  | 13.152                                    | 98.8                          | 35.072                                     |  |
| A-10                | 33.8              | 00:33:45     | 72.710                                  | 0.19                | 0.579                                 | 0.57                                 | 912                          | 250                   | 251                    | 58                         | 52                 | 79                           | 86                                 | 86                                   | 1.0          | 0.44                                | 39.37                                  | 14.696                                    | 99.0                          | 35.271                                     |  |
| A-11                | 37.5              | 00:37:30     | 74.330                                  | 0.18                | 0.549                                 | 0.54                                 | 910                          | 250                   | 249                    | 58                         | 54                 | 80                           | 87                                 | 87                                   | 1.0          | 0.42                                | 38.29                                  | 16.238                                    | 99.3                          | 35.427                                     |  |
| A-12                | 41.3              | 00:41:15     | 75.950                                  | 0.17                | 0.518                                 | 0.51                                 | 908                          | 250                   | 249                    | 57                         | 55                 | 79                           | 87                                 | 87                                   | 1.0          | 0.41                                | 37.18                                  | 17.636                                    | 99.1                          | 35.272                                     |  |
| B-1                 | 45.0              | 00:45:00     | 77.420                                  | 0.15                | 0.457                                 | 0.45                                 | 891                          | 250                   | 249                    | 66                         | 61                 | 81                           | 89                                 | 89                                   | 1.0          | 0.39                                | 34.71                                  | 19.020                                    | 99.2                          | 35.113                                     |  |
| B-2                 | 48.8              | 00:48:45     | 78.880                                  | 0.16                | 0.488                                 | 0.48                                 | 902                          | 250                   | 249                    | 62                         | 60                 | 79                           | 89                                 | 89                                   | 1.0          | 0.40                                | 35.99                                  | 20.404                                    | 99.1                          | 34.978                                     |  |
| B-3                 | 52.5              | 00:52:30     | 80.340                                  | 0.16                | 0.488                                 | 0.48                                 | 906                          | 250                   | 249                    | 62                         | 71                 | 79                           | 89                                 | 89                                   | 1.0          | 0.40                                | 36.05                                  | 21.806                                    | 99.1                          | 34.890                                     |  |
| B-4                 | 56.3              | 00:56:15     | 81.820                                  | 0.17                | 0.518                                 | 0.51                                 | 908                          | 250                   | 249                    | 60                         | 71                 | 80                           | 89                                 | 89                                   | 1.0          | 0.41                                | 37.18                                  | 23.285                                    | 99.2                          | 34.928                                     |  |
| B-5                 | 60.0              | 01:00:00     | 83.380                                  | 0.18                | 0.549                                 | 0.54                                 | 908                          | 252                   | 250                    | 60                         | 74                 | 80                           | 89                                 | 89                                   | 1.0          | 0.42                                | 38.26                                  | 24.679                                    | 98.9                          | 34.840                                     |  |
| B-6                 | 63.8              | 01:03:45     | 84.850                                  | 0.18                | 0.549                                 | 0.54                                 | 906                          | 248                   | 248                    | 60                         | 74                 | 79                           | 90                                 | 90                                   | 1.0          | 0.42                                | 38.23                                  | 26.325                                    | 99.5                          | 35.100                                     |  |
| B-7                 | 67.5              | 01:07:30     | 86.590                                  | 0.18                | 0.549                                 | 0.54                                 | 910                          | 251                   | 250                    | 62                         | 75                 | 80                           | 91                                 | 91                                   | 1.0          | 0.42                                | 38.29                                  | 27.798                                    | 99.5                          | 35.114                                     |  |
| B-8                 | 71.3              | 01:11:15     | 88.150                                  | 0.17                | 0.518                                 | 0.51                                 | 905                          | 249                   | 251                    | 64                         | 77                 | 81                           | 91                                 | 91                                   | 1.0          | 0.41                                | 37.14                                  | 29.215                                    | 99.4                          | 35.058                                     |  |
| B-9                 | 75.0              | 01:15:00     | 89.650                                  | 0.17                | 0.518                                 | 0.51                                 | 902                          | 250                   | 252                    | 64                         | 77                 | 81                           | 91                                 | 91                                   | 1.0          | 0.41                                | 37.10                                  | 30.632                                    | 99.3                          | 35.008                                     |  |
| B-10                | 78.8              | 01:18:45     | 91.150                                  | 0.17                | 0.518                                 | 0.51                                 | 905                          | 248                   | 251                    | 62                         | 75                 | 80                           | 92                                 | 92                                   | 1.0          | 0.41                                | 37.14                                  | 32.197                                    | 99.6                          | 35.124                                     |  |
| B-11                | 82.5              | 01:22:30     | 92.810                                  | 0.16                | 0.488                                 | 0.48                                 | 903                          | 250                   | 250                    | 62                         | 75                 | 80                           | 93                                 | 93                                   | 1.0          | 0.40                                | 36.01                                  | 33.589                                    | 99.6                          | 35.050                                     |  |
| B-12                | 86.3              | 01:26:15     | 94.290                                  | 0.16                | 0.488                                 | 0.48                                 | 900                          | 250                   | 249                    | 62                         | 75                 | 79                           | 93                                 | 93                                   | 1.0          | 0.40                                | 35.97                                  | 35.188                                    | 100.2                         | 35.188                                     |  |
| Last Pt             | 90.0              | 01:30:00     | 95.989                                  |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                    |                                      |              |                                     |                                        |                                           |                               |                                            |  |
| Final Val           | 90.0              | 01:30:00     | 95.989                                  |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                    | Max Vac                              | 1.0          |                                     | Final Values                           | 35.188                                    | 100.2                         |                                            |  |
| Average Values      |                   |              |                                         | 0.17                |                                       | 0.52                                 | 906                          | 250                   | 250                    | 60                         | 65                 | 80                           | 87                                 | 87                                   |              | 0.41                                | 37.36                                  |                                           |                               |                                            |  |
|                     |                   |              |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    |                              | 87                                 |                                      |              |                                     |                                        |                                           |                               |                                            |  |

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METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                                          |
|-------------------|------------------------------------------|
| Plant Name        | Stewart and Stevenson Integration Center |
| Sampling Location | Caterpillar G3520 TALE                   |
| Project #         | catc-21-houston.tx-start#1               |

|            |           |
|------------|-----------|
| Date       | 07/29/21  |
| Operator   | JLW       |
| Run Number | R-1 50%-2 |

|          |               |
|----------|---------------|
| Filter # | 0652          |
|          | R-1 50%-2-CPM |

| Leak Checks |       |          | [change]              | [level]             | [time]                                     |
|-------------|-------|----------|-----------------------|---------------------|--------------------------------------------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                | in Hg for 60.0 sec [≥60]                   |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                | in Hg for 60.0 sec [≥60]                   |
| PASS        | Pitot | Pre (+)  | 0.00                  | in H <sub>2</sub> O | 7.0 in H <sub>2</sub> O for 15.0 sec [≥15] |
|             |       | Pre (-)  | 0.00                  | in H <sub>2</sub> O | 5.0 in H <sub>2</sub> O for 15.0 sec [≥15] |
|             |       | Post (+) | 0.00                  | in H <sub>2</sub> O | 6.0 in H <sub>2</sub> O for 15.0 sec [≥15] |
|             |       | Post (-) | 0.00                  | in H <sub>2</sub> O | 4.0 in H <sub>2</sub> O for 15.0 sec [≥15] |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | samp-cp-0022       |           |
| Meter Cal Factor          | (Y)                | 0.986     |
| Nozzle Number             | G-10               |           |
| Average Nozzle Diameter   | (D <sub>na</sub> ) | 0.3113 in |
| Suggested Nozzle Diameter | (D <sub>m</sub> )  | 0.2255 in |
| Probe Number              | samp-hp-0079       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | glass              |           |
| Sample Case / Oven Number | samp-BH-0018       |           |
| Impinger Case Number      | samp-cc-0011       |           |

| Nozzle Measurements |       | ID: G-10 |       |      |
|---------------------|-------|----------|-------|------|
| Pre                 | 0.311 | 0.312    | 0.311 | PASS |
| Post                | 0.311 | 0.312    | 0.311 | PASS |

| Barometer ID |
|--------------|
| SAMP-WE-0014 |
| Scale ID     |
| Extra        |

| Run Time |       |           |
|----------|-------|-----------|
| Start    | 12:05 | End 13:59 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 357.6 | 600.5 | 720.5 | 816.5 |       |       |       |       |
| Post    | 473.4 | 601.9 | 721.1 | 823.4 |       |       |       |       |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient / ID                            | (C <sub>p</sub> )                   | 0.8230 | A5708               |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 904.8  | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 94.6   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.831  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.42   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 14.26  | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.42  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.39   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 | 3.12   |                     |

| Pressures               |                        |                          |
|-------------------------|------------------------|--------------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 29.90 in Hg              |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.07 in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 29.91 in Hg              |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 30.03 in Hg              |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Identification Nos. |                   | samp-cp-0022 | samp-cp-0022                            | samp-cp-0022        |                                       |                                      | samp-hp-0079                 | samp-hp-0079          | samp-BH-0018           | samp-cc-0011               |                    |                              | samp-cp-0022                        |                                      | samp-cp-0022 |                                                            |                                                     |                                                      |                               |                                                       |  |  |
|---------------------|-------------------|--------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-----------------------|------------------------|----------------------------|--------------------|------------------------------|-------------------------------------|--------------------------------------|--------------|------------------------------------------------------------|-----------------------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|--|--|
| Traverse Point #    | Sampling Time (Θ) | Timer Time   | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Probe Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (≤68°F) | Cond. Temp (≤85°F) | CPM Filter Temp (76.5±8.5°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum  | Square Root ΔP (Δp <sup>1/2</sup> ) √(in H <sub>2</sub> O) | Local Stack Velocity (V <sub>s</sub> ) <sub>i</sub> | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |  |  |
|                     | min               | hh:mm:ss     | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                    | °F                     | °F                         | °F                 | °F                           | °F                                  | °F                                   | in Hg        |                                                            | f/sec                                               | dscf                                                 | %                             | dscf                                                  |  |  |
| A-1                 | 0.0               | 00:00:00     | 96.035                                  | 0.17                | 0.530                                 | 0.52                                 | 910                          | 248                   | 250                    | 53                         | 50                 | 70                           | 92                                  | 92                                   | 2.0          | 0.41                                                       | 37.24                                               | 1.430                                                | 97.8                          | 34.313                                                |  |  |
| A-2                 | 3.8               | 00:03:45     | 97.550                                  | 0.16                | 0.499                                 | 0.49                                 | 908                          | 250                   | 249                    | 53                         | 51                 | 70                           | 92                                  | 92                                   | 2.0          | 0.40                                                       | 36.11                                               | 2.845                                                | 98.7                          | 34.142                                                |  |  |
| A-3                 | 7.5               | 00:07:30     | 99.050                                  | 0.16                | 0.499                                 | 0.49                                 | 908                          | 251                   | 250                    | 55                         | 49                 | 71                           | 92                                  | 92                                   | 2.0          | 0.40                                                       | 36.11                                               | 4.261                                                | 99.0                          | 34.085                                                |  |  |
| A-4                 | 11.3              | 00:11:15     | 100.550                                 | 0.17                | 0.530                                 | 0.53                                 | 910                          | 250                   | 250                    | 55                         | 50                 | 71                           | 93                                  | 93                                   | 2.0          | 0.41                                                       | 37.24                                               | 5.730                                                | 99.4                          | 34.381                                                |  |  |
| A-5                 | 15.0              | 00:15:00     | 102.110                                 | 0.18                | 0.561                                 | 0.56                                 | 909                          | 249                   | 251                    | 56                         | 52                 | 73                           | 93                                  | 93                                   | 2.0          | 0.42                                                       | 38.31                                               | 7.256                                                | 99.8                          | 34.831                                                |  |  |
| A-6                 | 18.8              | 00:18:45     | 103.730                                 | 0.19                | 0.592                                 | 0.60                                 | 912                          | 250                   | 251                    | 56                         | 52                 | 73                           | 93                                  | 93                                   | 2.0          | 0.44                                                       | 39.40                                               | 8.830                                                | 100.2                         | 35.319                                                |  |  |
| A-7                 | 22.5              | 00:22:30     | 105.400                                 | 0.18                | 0.561                                 | 0.56                                 | 908                          | 249                   | 249                    | 57                         | 52                 | 73                           | 94                                  | 94                                   | 2.0          | 0.42                                                       | 38.30                                               | 10.316                                               | 100.0                         | 35.368                                                |  |  |
| A-8                 | 26.3              | 00:26:15     | 106.980                                 | 0.17                | 0.530                                 | 0.52                                 | 905                          | 250                   | 249                    | 57                         | 53                 | 74                           | 94                                  | 94                                   | 2.0          | 0.41                                                       | 37.18                                               | 11.773                                               | 99.9                          | 35.319                                                |  |  |
| A-9                 | 30.0              | 00:30:00     | 108.530                                 | 0.17                | 0.530                                 | 0.52                                 | 903                          | 251                   | 250                    | 57                         | 53                 | 74                           | 94                                  | 94                                   | 2.0          | 0.41                                                       | 37.15                                               | 13.221                                               | 99.8                          | 35.256                                                |  |  |
| A-10                | 33.8              | 00:33:45     | 110.070                                 | 0.16                | 0.499                                 | 0.49                                 | 903                          | 250                   | 249                    | 58                         | 55                 | 75                           | 95                                  | 95                                   | 2.0          | 0.40                                                       | 36.04                                               | 14.620                                               | 99.6                          | 35.087                                                |  |  |
| A-11                | 37.5              | 00:37:30     | 111.560                                 | 0.16                | 0.499                                 | 0.49                                 | 903                          | 249                   | 252                    | 57                         | 56                 | 75                           | 95                                  | 95                                   | 2.0          | 0.40                                                       | 36.04                                               | 16.065                                               | 99.8                          | 35.051                                                |  |  |
| A-12                | 41.3              | 00:41:15     | 113.100                                 | 0.16                | 0.499                                 | 0.49                                 | 903                          | 250                   | 250                    | 57                         | 56                 | 75                           | 95                                  | 95                                   | 2.0          | 0.40                                                       | 36.04                                               | 17.465                                               | 99.7                          | 34.930                                                |  |  |
| B-1                 | 45.0              | 00:45:00     | 114.592                                 | 0.16                | 0.499                                 | 0.49                                 | 903                          | 249                   | 249                    | 65                         | 52                 | 73                           | 95                                  | 95                                   | 2.0          | 0.40                                                       | 36.04                                               | 18.862                                               | 99.6                          | 34.822                                                |  |  |
| B-2                 | 48.8              | 00:48:45     | 116.080                                 | 0.17                | 0.530                                 | 0.52                                 | 899                          | 250                   | 251                    | 56                         | 53                 | 73                           | 95                                  | 95                                   | 2.0          | 0.41                                                       | 37.10                                               | 20.326                                               | 99.6                          | 34.845                                                |  |  |
| B-3                 | 52.5              | 00:52:30     | 117.640                                 | 0.17                | 0.530                                 | 0.52                                 | 900                          | 251                   | 250                    | 56                         | 53                 | 73                           | 95                                  | 95                                   | 2.0          | 0.41                                                       | 37.11                                               | 21.753                                               | 99.4                          | 34.804                                                |  |  |
| B-4                 | 56.3              | 00:56:15     | 119.160                                 | 0.16                | 0.499                                 | 0.49                                 | 902                          | 251                   | 250                    | 56                         | 53                 | 74                           | 96                                  | 96                                   | 2.0          | 0.40                                                       | 36.03                                               | 23.214                                               | 99.7                          | 34.821                                                |  |  |
| B-5                 | 60.0              | 01:00:00     | 120.720                                 | 0.17                | 0.530                                 | 0.52                                 | 904                          | 250                   | 252                    | 56                         | 53                 | 74                           | 96                                  | 96                                   | 2.0          | 0.41                                                       | 37.16                                               | 24.666                                               | 99.6                          | 34.823                                                |  |  |
| B-6                 | 63.8              | 01:03:45     | 122.270                                 | 0.19                | 0.592                                 | 0.58                                 | 904                          | 250                   | 250                    | 56                         | 54                 | 75                           | 96                                  | 96                                   | 2.0          | 0.44                                                       | 39.29                                               | 26.212                                               | 99.6                          | 34.950                                                |  |  |
| B-7                 | 67.5              | 01:07:30     | 123.920                                 | 0.18                | 0.561                                 | 0.55                                 | 902                          | 251                   | 251                    | 56                         | 54                 | 75                           | 96                                  | 96                                   | 2.0          | 0.42                                                       | 38.21                                               | 27.740                                               | 99.7                          | 35.040                                                |  |  |
| B-8                 | 71.3              | 01:11:15     | 125.550                                 | 0.18                | 0.561                                 | 0.55                                 | 904                          | 250                   | 249                    | 57                         | 56                 | 76                           | 96                                  | 96                                   | 2.0          | 0.42                                                       | 38.24                                               | 29.276                                               | 99.8                          | 35.132                                                |  |  |
| B-9                 | 75.0              | 01:15:00     | 127.190                                 | 0.19                | 0.592                                 | 0.58                                 | 906                          | 250                   | 250                    | 57                         | 56                 | 76                           | 96                                  | 96                                   | 2.0          | 0.44                                                       | 39.32                                               | 30.851                                               | 99.9                          | 35.258                                                |  |  |
| B-10                | 78.8              | 01:18:45     | 128.870                                 | 0.19                | 0.592                                 | 0.58                                 | 906                          | 249                   | 250                    | 57                         | 56                 | 76                           | 96                                  | 96                                   | 2.0          | 0.44                                                       | 39.32                                               | 32.425                                               | 100.0                         | 35.373                                                |  |  |
| B-11                | 82.5              | 01:22:30     | 130.550                                 | 0.18                | 0.561                                 | 0.55                                 | 904                          | 251                   | 250                    | 57                         | 56                 | 76                           | 96                                  | 96                                   | 2.0          | 0.42                                                       | 38.24                                               | 33.933                                               | 100.0                         | 35.409                                                |  |  |
| B-12                | 86.3              | 01:26:15     | 132.160                                 | 0.17                | 0.530                                 | 0.52                                 | 900                          | 250                   | 250                    | 57                         | 56                 | 76                           | 96                                  | 96                                   | 2.0          | 0.41                                                       | 37.11                                               | 35.359                                               | 99.9                          | 35.359                                                |  |  |
| Last Pt             | 90.0              | 01:30:00     | 133.682                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |              |                                                            |                                                     |                                                      |                               |                                                       |  |  |
| Final Val           | 90.0              | 01:30:00     | 133.682                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      | Max Vac      | 2.0                                                        | Final Values                                        | 35.359                                               | 99.9                          |                                                       |  |  |
| Average Values      |                   |              |                                         | 0.17                |                                       | 0.53                                 | 905                          | 250                   | 250                    | 57                         | 53                 | 74                           | 95                                  | 95                                   |              | 0.42                                                       | 37.43                                               |                                                      |                               |                                                       |  |  |
|                     |                   |              |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    |                              | 95                                  |                                      |              |                                                            |                                                     |                                                      |                               |                                                       |  |  |

Notes: PAUSED 14:39 in

METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                                          |
|-------------------|------------------------------------------|
| Plant Name        | Stewart and Stevenson Integration Center |
| Sampling Location | Caterpillar G3520 TALE                   |
| Project #         | catc-21-houston.tx-start#1               |

|            |           |
|------------|-----------|
| Date       | 07/29/21  |
| Operator   | JLW       |
| Run Number | R-1 50%-3 |

|          |               |
|----------|---------------|
| Filter # | 0722          |
|          | R-1 50%-3-CPM |

| Leak Checks |          | [change] |                       | [level] |                         | [time] |           |
|-------------|----------|----------|-----------------------|---------|-------------------------|--------|-----------|
| Train       | Pre      | 0.000    | ft <sup>3</sup> /min@ | 15.0    | in Hg for               | 60.0   | sec [≥60] |
| PASS        | Post     | 0.000    | ft <sup>3</sup> /min@ | 15.0    | in Hg for               | 60.0   | sec [≥60] |
| Pitot       | Pre (+)  | 0.00     | in H <sub>2</sub> O   | 6.0     | in H <sub>2</sub> O for | 15.0   | sec [≥15] |
|             | Pre (-)  | 0.00     | in H <sub>2</sub> O   | 6.0     | in H <sub>2</sub> O for | 15.0   | sec [≥15] |
|             | Post (+) | 0.00     | in H <sub>2</sub> O   | 7.0     | in H <sub>2</sub> O for | 15.0   | sec [≥15] |
|             | Post (-) | 0.00     | in H <sub>2</sub> O   | 5.0     | in H <sub>2</sub> O for | 15.0   | sec [≥15] |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | samp-cp-0022       |           |
| Meter Cal Factor          | (Y)                | 0.986     |
| Nozzle Number             | G-10               |           |
| Average Nozzle Diameter   | (D <sub>na</sub> ) | 0.3113 in |
| Suggested Nozzle Diameter | (D <sub>m</sub> )  | 0.2273 in |
| Probe Number              | samp-hp-0014       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | glass              |           |
| Sample Case / Oven Number | samp-BH-0018       |           |
| Impinger Case Number      | samp-cc-0011       |           |

| Nozzle Measurements |       | ID: G-10 |      |
|---------------------|-------|----------|------|
| Pre                 | 0.312 | 0.311    | PASS |
| Post                | 0.312 | 0.311    | PASS |

| Barometer ID |  |
|--------------|--|
| SAMP-WE-0014 |  |
| Scale ID     |  |
| Extra        |  |

| Run Time |       |
|----------|-------|
| Start    | 14:23 |
| End      | 15:58 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 351.3 | 614.6 | 720.1 | 856.2 |       |       |       |       |
| Post    | 463.7 | 614.8 | 722.8 | 863.2 |       |       |       |       |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient / ID                            | (C <sub>p</sub> )                   | 0.8215 | A6223               |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 922.7  | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 94.0   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.831  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.41   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 14.11  | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.43  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.39   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 | 3.07   |                     |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 29.85 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.07  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 29.86 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 29.98 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Identification Nos. |                   | samp-cp-0022 | samp-cp-0022                            | samp-cp-0022        |                                       |                                      | samp-hp-0014                 | samp-hp-0014          | samp-BH-0018           | samp-cc-0011               |                    |                              | samp-cp-0022                        |                                      | samp-cp-0022 |                                                            |                                        |                                                      |                               |                                                       |  |
|---------------------|-------------------|--------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-----------------------|------------------------|----------------------------|--------------------|------------------------------|-------------------------------------|--------------------------------------|--------------|------------------------------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|--|
| Traverse Point #    | Sampling Time (Θ) | Timer Time   | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Probe Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (≤68°F) | Cond. Temp (≤85°F) | CPM Filter Temp (76.5±8.5°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum  | Square Root ΔP (Δp <sup>1/2</sup> ) √(in H <sub>2</sub> O) | Local Stack Velocity (V <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |  |
|                     | min               | hh:mm:ss     | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                    | °F                     | °F                         | °F                 | °F                           | °F                                  | °F                                   | in Hg        |                                                            | f/sec                                  | dscf                                                 | %                             | dscf                                                  |  |
| A-1                 | 0.0               | 00:00:00     | 133.977                                 | 0.15                | 0.461                                 | 0.47                                 | 926                          | 248                   | 250                    | 59                         | 53                 | 79                           | 92                                  | 92                                   | 2.0          | 0.39                                                       | 35.14                                  | 1.406                                                | 103.1                         | 33.754                                                |  |
| A-2                 | 3.8               | 00:03:45     | 135.470                                 | 0.16                | 0.491                                 | 0.50                                 | 928                          | 250                   | 249                    | 59                         | 53                 | 79                           | 92                                  | 92                                   | 2.0          | 0.40                                                       | 36.32                                  | 2.801                                                | 101.1                         | 33.609                                                |  |
| A-3                 | 7.5               | 00:07:30     | 136.950                                 | 0.16                | 0.491                                 | 0.50                                 | 925                          | 251                   | 250                    | 59                         | 53                 | 79                           | 92                                  | 92                                   | 2.0          | 0.40                                                       | 36.28                                  | 4.261                                                | 102.0                         | 34.087                                                |  |
| A-4                 | 11.3              | 00:11:15     | 138.500                                 | 0.17                | 0.522                                 | 0.53                                 | 927                          | 250                   | 250                    | 57                         | 56                 | 80                           | 92                                  | 92                                   | 2.0          | 0.41                                                       | 37.42                                  | 5.655                                                | 100.5                         | 33.932                                                |  |
| A-5                 | 15.0              | 00:15:00     | 139.980                                 | 0.18                | 0.553                                 | 0.56                                 | 925                          | 251                   | 249                    | 58                         | 57                 | 80                           | 92                                  | 92                                   | 2.0          | 0.42                                                       | 38.48                                  | 7.172                                                | 100.7                         | 34.427                                                |  |
| A-6                 | 18.8              | 00:18:45     | 141.590                                 | 0.18                | 0.553                                 | 0.56                                 | 923                          | 250                   | 250                    | 58                         | 57                 | 80                           | 92                                  | 92                                   | 2.0          | 0.42                                                       | 38.45                                  | 8.708                                                | 101.1                         | 34.832                                                |  |
| A-7                 | 22.5              | 00:22:30     | 143.220                                 | 0.18                | 0.553                                 | 0.56                                 | 922                          | 251                   | 249                    | 57                         | 55                 | 81                           | 93                                  | 93                                   | 2.0          | 0.42                                                       | 38.44                                  | 10.194                                               | 100.8                         | 34.951                                                |  |
| A-8                 | 26.3              | 00:26:15     | 144.800                                 | 0.17                | 0.522                                 | 0.53                                 | 923                          | 250                   | 250                    | 57                         | 55                 | 81                           | 93                                  | 93                                   | 2.0          | 0.41                                                       | 37.37                                  | 11.680                                               | 101.0                         | 35.040                                                |  |
| A-9                 | 30.0              | 00:30:00     | 146.380                                 | 0.17                | 0.522                                 | 0.53                                 | 925                          | 249                   | 251                    | 57                         | 55                 | 81                           | 93                                  | 93                                   | 2.0          | 0.41                                                       | 37.39                                  | 13.138                                               | 100.9                         | 35.034                                                |  |
| A-10                | 33.8              | 00:33:45     | 147.930                                 | 0.17                | 0.522                                 | 0.53                                 | 922                          | 250                   | 250                    | 58                         | 56                 | 80                           | 94                                  | 94                                   | 2.0          | 0.41                                                       | 37.35                                  | 14.612                                               | 101.0                         | 35.068                                                |  |
| A-11                | 37.5              | 00:37:30     | 149.500                                 | 0.15                | 0.461                                 | 0.47                                 | 924                          | 251                   | 249                    | 58                         | 57                 | 80                           | 94                                  | 94                                   | 2.0          | 0.39                                                       | 35.11                                  | 15.963                                               | 100.8                         | 34.829                                                |  |
| A-12                | 41.3              | 00:41:15     | 150.940                                 | 0.16                | 0.491                                 | 0.50                                 | 922                          | 250                   | 250                    | 58                         | 57                 | 79                           | 94                                  | 94                                   | 2.0          | 0.40                                                       | 36.24                                  | 17.409                                               | 100.9                         | 34.818                                                |  |
| B-1                 | 45.0              | 00:45:00     | 152.480                                 | 0.16                | 0.491                                 | 0.50                                 | 918                          | 249                   | 252                    | 60                         | 59                 | 81                           | 94                                  | 94                                   | 2.0          | 0.40                                                       | 36.18                                  | 18.845                                               | 101.0                         | 34.791                                                |  |
| B-2                 | 48.8              | 00:48:45     | 154.010                                 | 0.16                | 0.491                                 | 0.50                                 | 924                          | 249                   | 250                    | 59                         | 58                 | 81                           | 94                                  | 94                                   | 2.0          | 0.40                                                       | 36.26                                  | 20.262                                               | 101.0                         | 34.735                                                |  |
| B-3                 | 52.5              | 00:52:30     | 155.520                                 | 0.17                | 0.522                                 | 0.53                                 | 922                          | 250                   | 249                    | 58                         | 57                 | 80                           | 94                                  | 94                                   | 2.0          | 0.41                                                       | 37.35                                  | 21.727                                               | 101.0                         | 34.763                                                |  |
| B-4                 | 56.3              | 00:56:15     | 157.080                                 | 0.17                | 0.522                                 | 0.53                                 | 919                          | 248                   | 249                    | 58                         | 57                 | 80                           | 95                                  | 95                                   | 2.0          | 0.41                                                       | 37.31                                  | 23.161                                               | 100.8                         | 34.741                                                |  |
| B-5                 | 60.0              | 01:00:00     | 158.610                                 | 0.18                | 0.553                                 | 0.56                                 | 922                          | 249                   | 251                    | 56                         | 55                 | 78                           | 95                                  | 95                                   | 2.0          | 0.42                                                       | 38.44                                  | 24.697                                               | 100.9                         | 34.867                                                |  |
| B-6                 | 63.8              | 01:03:45     | 160.250                                 | 0.19                | 0.584                                 | 0.59                                 | 922                          | 250                   | 250                    | 56                         | 55                 | 78                           | 95                                  | 95                                   | 2.0          | 0.44                                                       | 39.49                                  | 26.244                                               | 100.9                         | 34.992                                                |  |
| B-7                 | 67.5              | 01:07:30     | 161.900                                 | 0.18                | 0.553                                 | 0.56                                 | 924                          | 251                   | 253                    | 56                         | 56                 | 78                           | 95                                  | 95                                   | 2.0          | 0.42                                                       | 38.46                                  | 27.724                                               | 100.8                         | 35.020                                                |  |
| B-8                 | 71.3              | 01:11:15     | 163.480                                 | 0.18                | 0.553                                 | 0.56                                 | 923                          | 249                   | 247                    | 56                         | 58                 | 79                           | 96                                  | 96                                   | 2.0          | 0.42                                                       | 38.45                                  | 29.193                                               | 100.7                         | 35.032                                                |  |
| B-9                 | 75.0              | 01:15:00     | 165.050                                 | 0.19                | 0.584                                 | 0.59                                 | 922                          | 248                   | 248                    | 56                         | 58                 | 79                           | 96                                  | 96                                   | 2.0          | 0.44                                                       | 39.49                                  | 30.709                                               | 100.6                         | 35.096                                                |  |
| B-10                | 78.8              | 01:18:45     | 166.670                                 | 0.18                | 0.553                                 | 0.56                                 | 922                          | 250                   | 249                    | 57                         | 60                 | 80                           | 96                                  | 96                                   | 2.0          | 0.42                                                       | 38.44                                  | 32.168                                               | 100.4                         | 35.092                                                |  |
| B-11                | 82.5              | 01:22:30     | 168.230                                 | 0.18                | 0.553                                 | 0.56                                 | 920                          | 249                   | 250                    | 57                         | 60                 | 80                           | 96                                  | 96                                   | 2.0          | 0.42                                                       | 38.41                                  | 33.665                                               | 100.4                         | 35.128                                                |  |
| B-12                | 86.3              | 01:26:15     | 169.830                                 | 0.17                | 0.522                                 | 0.53                                 | 915                          | 251                   | 250                    | 57                         | 60                 | 80                           | 96                                  | 96                                   | 2.0          | 0.41                                                       | 37.26                                  | 35.098                                               | 100.3                         | 35.098                                                |  |
| Last Pt             | 90.0              | 01:30:00     | 171.362                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |              |                                                            |                                        |                                                      |                               |                                                       |  |
| Final Val           | 90.0              | 01:30:00     | 171.362                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |              |                                                            |                                        |                                                      |                               |                                                       |  |
| Average Values      |                   |              |                                         | 0.17                |                                       | 0.53                                 | 923                          | 250                   | 250                    | 58                         | 57                 | 80                           | 94                                  | 94                                   | Max Vac 2.0  | Final Values 0.41 37.48                                    |                                        | 35.098                                               | 100.3                         |                                                       |  |
|                     |                   |              |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    |                              | 94                                  |                                      |              |                                                            |                                        |                                                      |                               |                                                       |  |

Notes:

# AIR HYGIENE



## PM (EPA METHOD 5) DATA SHEET

Project Code: catc-21-houston.tx-start#1

### Site Info.

Plant Name: \_\_\_\_\_

Sampling Location: \_\_\_\_\_

Unit #: \_\_\_\_\_

Date: 7.29.21

### Console Info.

Console: \_\_\_\_\_

samp-cp-0022

Meter Calibration Factor

0.986

Orifice Meter Coefficient

1.831

## PM RUNS

|                |                                      |                   |              |              |              |            |            |            |
|----------------|--------------------------------------|-------------------|--------------|--------------|--------------|------------|------------|------------|
| Run#: <u>1</u> | Load: <u>50%</u> normal              | Box#: <u>5310</u> |              |              |              |            |            |            |
|                |                                      | Impinger 1        | Impinger 2   | Impinger 3   | Impinger 4   | Impinger 5 | Impinger 6 | Impinger 7 |
|                |                                      | (g)               | (g)          | (g)          | (g)          |            |            |            |
| Contents       |                                      | Dry               | Di Water     | Dry          | Sil Gel      |            |            |            |
| Final Value    | (V <sub>f</sub> ), (W <sub>f</sub> ) | <u>456.8</u>      | <u>612.9</u> | <u>720.1</u> | <u>856.2</u> |            |            |            |
| Initial Value  | (V <sub>i</sub> ), (W <sub>i</sub> ) | <u>350.7</u>      | <u>700.9</u> | <u>700.9</u> | <u>847.8</u> |            |            |            |
| Filter #       | <u>00713</u>                         | Probe #           |              | Probe (in.)  |              |            |            |            |
| Pitot #        |                                      | Nozzle #          |              | Nozzle Meas  |              |            |            |            |

CPM - 5736

EXIT - 8471

COND. - 3006

|                |                                      |                           |              |              |              |            |            |            |
|----------------|--------------------------------------|---------------------------|--------------|--------------|--------------|------------|------------|------------|
| Run#: <u>2</u> | Load: <u>50%</u> normal              | Box#: <u>samp-cp-0011</u> |              |              |              |            |            |            |
|                |                                      | Impinger 1                | Impinger 2   | Impinger 3   | Impinger 4   | Impinger 5 | Impinger 6 | Impinger 7 |
|                |                                      | (g)                       | (g)          | (g)          | (g)          |            |            |            |
| Contents       |                                      | Dry                       | Di Water     | Dry          | Sil Gel      |            |            |            |
| Final Value    | (V <sub>f</sub> ), (W <sub>f</sub> ) | <u>473.4</u>              | <u>601.9</u> | <u>721.1</u> | <u>823.4</u> |            |            |            |
| Initial Value  | (V <sub>i</sub> ), (W <sub>i</sub> ) | <u>357.6</u>              | <u>600.5</u> | <u>720.5</u> | <u>816.5</u> |            |            |            |
| Filter #       | <u>0652</u>                          | Probe #                   |              | Probe (in.)  |              |            |            |            |
| Pitot #        |                                      | Nozzle #                  |              | Nozzle Meas  |              |            |            |            |

CPM - 1004

EXIT - 8609

COND. - 2917

|                |                                      |              |              |              |              |            |            |            |
|----------------|--------------------------------------|--------------|--------------|--------------|--------------|------------|------------|------------|
| Run#: <u>3</u> | Load: <u>50%</u> normal              | Box#: _____  |              |              |              |            |            |            |
|                |                                      | Impinger 1   | Impinger 2   | Impinger 3   | Impinger 4   | Impinger 5 | Impinger 6 | Impinger 7 |
|                |                                      | (g)          | (g)          | (g)          | (g)          |            |            |            |
| Contents       |                                      | Dry          | Di Water     | Dry          | Sil Gel      |            |            |            |
| Final Value    | (V <sub>f</sub> ), (W <sub>f</sub> ) | <u>463.7</u> | <u>614.8</u> | <u>722.8</u> | <u>863.2</u> |            |            |            |
| Initial Value  | (V <sub>i</sub> ), (W <sub>i</sub> ) | <u>351.3</u> | <u>614.6</u> | <u>720.1</u> | <u>856.2</u> |            |            |            |
| Filter #       | <u>0722</u>                          | Probe #      |              | Probe (in.)  |              |            |            |            |
| Pitot #        |                                      | Nozzle #     |              | Nozzle Meas  |              |            |            |            |

|               |                                      |             |            |             |            |            |            |            |
|---------------|--------------------------------------|-------------|------------|-------------|------------|------------|------------|------------|
| Run#: _____   | Load: _____ normal                   | Box#: _____ |            |             |            |            |            |            |
|               |                                      | Impinger 1  | Impinger 2 | Impinger 3  | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 |
|               |                                      | (g)         | (g)        | (g)         | (g)        |            |            |            |
| Contents      |                                      | Dry         | Di Water   | Dry         | Sil Gel    |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) |             |            |             |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) |             |            |             |            |            |            |            |
| Filter #      |                                      | Probe #     |            | Probe (in.) |            |            |            |            |
| Pitot #       |                                      | Nozzle #    |            | Nozzle Meas |            |            |            |            |

Signature

*[Handwritten Signature]*

## **EMISSION DATA RECORDS**

**75% Load**

**PM**

**Reference Method Data**

**METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE**

| Source Information       |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Fuel Type</b>         | Gas, Natural                             |

| Test Information                 |               |                            |         |
|----------------------------------|---------------|----------------------------|---------|
| <b>Project #</b>                 |               | catc-21-houston.tx-start#1 |         |
| <b>Operator</b>                  |               | JLW                        |         |
| <b>Date for Preliminary Run</b>  | (mm/dd/yy)    | 07/28/21                   |         |
| <b>Standard Temperature</b>      |               | 68                         | °F      |
| <b>Standard Pressure</b>         |               | 29.92                      | in Hg   |
| <b>Run Duration</b>              | ≥ 2 min/point | 90                         | minutes |
| <b>Unit Number</b>               |               | 1                          |         |
| <b>Base Run Number</b>           |               | R-1 75%                    |         |
| <b>Number of Ports Available</b> |               | 2                          |         |
| <b>Number of Ports Used</b>      |               | 2                          |         |
| <b>Port Inside Diameter</b>      |               | 4.00                       | in      |
| <b>Stack Shape</b>               |               | Circular                   |         |

| Test Equipment Information             |                    |              |              |              |                     |
|----------------------------------------|--------------------|--------------|--------------|--------------|---------------------|
| <b>Run</b>                             |                    | <b>1</b>     | <b>2</b>     | <b>3</b>     |                     |
| <b>Test Date</b>                       | (mm/dd/yy)         | 07/30/21     | 07/30/21     | 07/30/21     |                     |
| <b>Load</b>                            |                    | 75%          | 75%          | 75%          | % or w/DB           |
| <b>Fuel F-Factor</b>                   |                    | 8632.09      | 8632.09      | 8632.09      | dscf/MMBtu          |
| <b>Meter Box Number</b>                | from ACS           | samp-cp-0022 | samp-cp-0022 | samp-cp-0022 |                     |
| <b>Meter Calibration Factor</b>        | (Y)                | 0.986        | 0.986        | 0.986        |                     |
| <b>Orifice Meter Coefficient</b>       | (ΔH <sub>@</sub> ) | 1.831        | 1.831        | 1.831        | in H <sub>2</sub> O |
| <b>Non-Console Manometer Used</b>      |                    | No           | No           | No           |                     |
| <b>Pitot Identification</b>            | from ACS           | A5708        | A5708        | A5708        |                     |
| <b>Pitot Tube Coefficient</b>          | (C <sub>p</sub> )  | 0.8230       | 0.8230       | 0.8230       |                     |
| <b>Nozzle Number</b>                   | from ACS           | G-10         | G-10         | G-10         |                     |
| <b>Nozzle Diameter</b>                 | (D <sub>n</sub> )  | 0.311        | 0.311        | 0.311        | in                  |
| <b>Probe Number</b>                    | from ACS           | samp-hp-0079 | samp-hp-0079 | samp-hp-0079 |                     |
| <b>Probe Length</b>                    |                    | 60.0         | 60.0         | 60.0         | in                  |
| <b>(SS, Glass ....) Liner Material</b> | from list          | glass        | glass        | glass        |                     |
| <b>Sample Case / Oven Number</b>       | from ACS           | samp-BH-0018 | samp-BH-0018 | samp-BH-0018 |                     |
| <b>Impinger Case Number</b>            | from ACS           | samp-cc-0011 | samp-cc-0011 | samp-cc-0011 |                     |

| Testing Company Information |                                                   |
|-----------------------------|---------------------------------------------------|
| <b>Company Name</b>         | Air Hygiene International, Inc. (Tulsa, Oklahoma) |
| <b>Address</b>              | 1600 W Tacoma Street                              |
| <b>City, State Zip</b>      | Broken Arrow, Oklahoma 74012                      |
| <b>Project Manager</b>      | Pat McGovern, Jr.                                 |
| <b>Phone Number</b>         | (918) 307-8865                                    |
| <b>Fax Number</b>           | (918) 307-9131                                    |

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# METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR CIRCULAR SOURCES

|                          |                                          |                         |          |
|--------------------------|------------------------------------------|-------------------------|----------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Date</b>             | 07/28/21 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Stack Type</b>       | Circular |
| <b>Operator</b>          | JLW                                      | <b>Ports Available</b>  | 2        |
| <b>Project #</b>         | catc-21-houston.tx-start#1               | <b>Ports Used</b>       | 2        |
| <b>Stack Size</b>        | Large (>24 inch diameter)                | <b>Port ID (inches)</b> | 4.00     |

| Circular Stack or Duct Diameter       |              |       |                 |
|---------------------------------------|--------------|-------|-----------------|
| <b>Distance to Far Wall of Stack</b>  | ( $L_{fw}$ ) | 32.00 | in              |
| <b>Distance to Near Wall of Stack</b> | ( $L_{nw}$ ) | 0.13  | in              |
| <b>Diameter of Stack</b>              | ( $D$ )      | 31.88 | in              |
| <b>Area of Stack</b>                  | ( $A_s$ )    | 5.54  | ft <sup>2</sup> |

| Distance from Port to Disturbances |           |       |           |
|------------------------------------|-----------|-------|-----------|
| <b>Distance Upstream</b>           | ( $A$ )   | 16.00 | in        |
| <b>Diameters Upstream</b>          | ( $A_D$ ) | 0.50  | diameters |
| <b>Distance Downstream</b>         | ( $B$ )   | 64.00 | in        |
| <b>Diameters Downstream</b>        | ( $B_D$ ) | 2.01  | diameters |

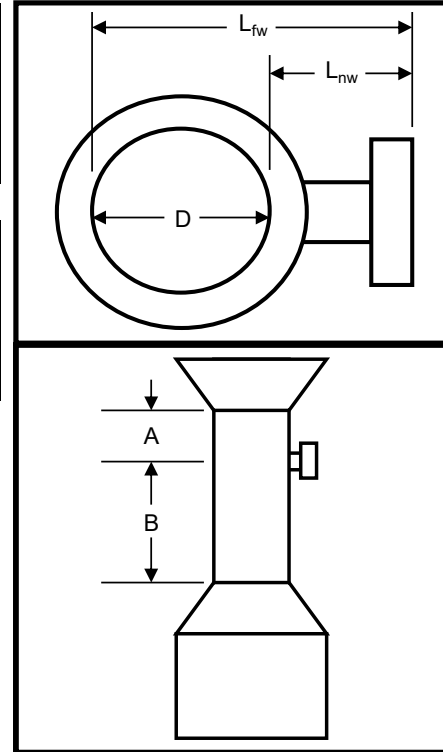
| Number of Traverse Points Required |             |                                                |                      |
|------------------------------------|-------------|------------------------------------------------|----------------------|
| Diameters to Flow Disturbance      |             | Minimum Number of <sup>1</sup> Traverse Points |                      |
| Down Stream                        | Up Stream   | Particulate Points                             | Velocity Points      |
| 2.00-4.99                          | 0.50-1.24   | 24                                             | 16                   |
| 5.00-5.99                          | 1.25-1.49   | 20                                             | 16                   |
| 6.00-6.99                          | 1.50-1.74   | 16                                             | 12                   |
| 7.00-7.99                          | 1.75-1.99   | 12                                             | 12                   |
| $\geq 8.00$                        | $\geq 2.00$ | 8 or 12 <sup>2</sup>                           | 8 or 12 <sup>2</sup> |
| <b>Upstream Spec</b>               |             | 24                                             | 16                   |
| <b>Downstream Spec</b>             |             | 24                                             | 16                   |
| <b>Traverse Pts Required</b>       |             | 24                                             | 16                   |

<sup>1</sup> Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

<sup>2</sup> 8 for Circular Stacks 12 to 24 inches  
12 for Circular Stacks over 24 inches

- ☒ Method 1 Trav
- ☐ 12 Point PM Trav (M201a ONLY)
- ☐ Velocity

| Location of Traverse Points in Circular Stacks |                                                                  |      |      |      |      |      |      |      |      |
|------------------------------------------------|------------------------------------------------------------------|------|------|------|------|------|------|------|------|
| Traverse Point                                 | (Fraction of Stack Dimension from Inside Wall to Traverse Point) |      |      |      |      |      |      |      |      |
| Number                                         | 2                                                                | 4    | 6    | 8    | 10   | 12   | 14   | 16   | 18   |
| 1                                              | .146                                                             | .067 | .044 | .032 | .026 | .021 | .018 | .016 | .014 |
| 2                                              | .854                                                             | .250 | .146 | .105 | .082 | .067 | .057 | .049 | .044 |
| 3                                              |                                                                  | .750 | .296 | .194 | .146 | .118 | .099 | .085 | .075 |
| 4                                              |                                                                  | .933 | .704 | .323 | .226 | .177 | .146 | .125 | .109 |
| 5                                              |                                                                  |      | .854 | .677 | .342 | .250 | .201 | .169 | .146 |
| 6                                              |                                                                  |      | .956 | .806 | .658 | .356 | .269 | .220 | .188 |
| 7                                              |                                                                  |      |      | .895 | .774 | .644 | .366 | .283 | .236 |
| 8                                              |                                                                  |      |      | .968 | .854 | .750 | .634 | .375 | .296 |
| 9                                              |                                                                  |      |      |      | .918 | .823 | .731 | .625 | .382 |
| 10                                             |                                                                  |      |      |      | .974 | .882 | .799 | .717 | .618 |
| 11                                             |                                                                  |      |      |      |      | .933 | .854 | .780 | .704 |
| 12                                             |                                                                  |      |      |      |      | .979 | .901 | .831 | .764 |



| Number of Traverse Points Used |                 |    |                 |
|--------------------------------|-----------------|----|-----------------|
| 2                              | <b>Ports by</b> | 12 | <b>Across</b>   |
| 24                             | <b>Pts Used</b> | 24 | <b>Required</b> |

Adjust Sample Points Out of Boundary Layer

| Traverse Point Locations |                            |                           |                                     |
|--------------------------|----------------------------|---------------------------|-------------------------------------|
| Traverse Point Number    | Fraction of Stack Diameter | Distance from Inside Wall | Distance Including Reference Length |
|                          |                            | in                        | in                                  |
| 1                        | 0.021                      | 5/8                       | 6/8                                 |
| 2                        | 0.067                      | 2 1/8                     | 2 2/8                               |
| 3                        | 0.118                      | 3 6/8                     | 3 7/8                               |
| 4                        | 0.177                      | 5 5/8                     | 5 6/8                               |
| 5                        | 0.250                      | 8                         | 8 1/8                               |
| 6                        | 0.356                      | 11 3/8                    | 11 4/8                              |
| 7                        | 0.644                      | 20 4/8                    | 20 5/8                              |
| 8                        | 0.750                      | 23 7/8                    | 24                                  |
| 9                        | 0.823                      | 26 2/8                    | 26 3/8                              |
| 10                       | 0.882                      | 28 1/8                    | 28 2/8                              |
| 11                       | 0.933                      | 29 6/8                    | 29 7/8                              |
| 12                       | 0.979                      | 31 2/8                    | 31 3/8                              |



## METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

|                          |                                          |                |   |                 |
|--------------------------|------------------------------------------|----------------|---|-----------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |                |   |                 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |                |   |                 |
| <b>Operator</b>          | JLW                                      |                |   |                 |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |                |   |                 |
| <b>Pitot Leak Check</b>  | x                                        | <b>PreTest</b> | x | <b>PostTest</b> |

| Stack Dimensions  |                   |       |                 |
|-------------------|-------------------|-------|-----------------|
| Area of Stack     | (A <sub>s</sub> ) | 5.54  | ft <sup>2</sup> |
| Diameter of Stack | (D)               | 31.88 | in              |

| Pressures                      |                  |       |                     |
|--------------------------------|------------------|-------|---------------------|
| <b>Barometric Pressure</b>     | ( $P_b$ )        | 29.89 | in Hg               |
| <b>Static Pressure</b>         | ( $P_{static}$ ) | 0.21  | in H <sub>2</sub> O |
| <b>Absolute Stack Pressure</b> | ( $P_s$ )        | 29.91 | in Hg               |

| Stack Gas Composition         |                       |       |            |
|-------------------------------|-----------------------|-------|------------|
| Composition Data:             | Estimated Composition |       |            |
| Carbon Dioxide Concentration  | (%CO <sub>2</sub> )   | 5.80  | %vd        |
| Oxygen Concentration          | (%O <sub>2</sub> )    | 8.80  | %vd        |
| Carbon Monoxide Concentration | (ppmCO)               | 5.00  | ppmvd      |
| Nitrogen Concentration        | (%N <sub>2</sub> )    | 85.40 | %vd        |
| Stack Moisture Content        | (B <sub>WS</sub> )    | 14.00 | %          |
| Stack Dry Molecular Weight    | (M <sub>d</sub> )     | 29.28 | lb/lb-mole |
| Stack Wet Molecular Weight    | (M <sub>w</sub> )     | 27.70 | lb/lb-mole |

| Results                     |              |         |          |
|-----------------------------|--------------|---------|----------|
| Avg Stack Gas Velocity      | ( $V_s$ )    | 52.84   | ft/sec   |
| Avg Stack Dry Std Flow Rate | ( $Q_{sd}$ ) | 363,978 | dscf/hr  |
| Avg Stack Dry Std Flow Rate | ( $Q_{sd}$ ) | 6,066   | dscf/min |
| Avg Stack Wet Flow Rate     | ( $Q_{sw}$ ) | 17,569  | acf/min  |
| Avg Stack Wet Std Flow Rate | ( $Q_{sw}$ ) | 423,231 | ascf/hr  |

**40 CFR 60, Method 2G, Section 8.11.1 (but applies to all Method 2 type static pressure measurements):**

If a Type S probe is used for this measurement, position the probe at or between any traverse point(s) and rotate the probe until a null differential pressure reading is obtained. Disconnect the tubing from one of the pressure ports; read and record the  $\Delta P$ . For pressure devices with one-directional scales, if a deflection in the positive direction is noted with the negative side disconnected, then the static pressure is positive. Likewise, if a deflection in the positive direction is noted with the positive side disconnected, then the static pressure is negative.

**Stack Cross Section Schematic**

|                             |              |                             |       |
|-----------------------------|--------------|-----------------------------|-------|
| <b>Preliminary Run Date</b> | 07/28/21     |                             |       |
| <b>Stack Type</b>           | Circular     |                             |       |
| <b>Ports Available</b>      | 2            |                             |       |
| <b>Thermocouple ID</b>      | samp-hp-0079 |                             |       |
| <b>Pitot Coefficient</b>    | 0.8215       | <b>Pitot Identification</b> | A6223 |

[illegible]

**METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER**

|                          |                                          |                             |               |                         |       |
|--------------------------|------------------------------------------|-----------------------------|---------------|-------------------------|-------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Preliminary Run Date</b> | 07/28/21      |                         |       |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Operator</b>             | JLW           |                         |       |
| <b>Project #</b>         | catc-21-houston.tx-start#1               | <b># of Ports Used</b>      | 1 (gas probe) |                         |       |
| <b>Fuel Type</b>         | Gas, Natural                             | <b>Min. Fuel Factor</b>     | 1.600         | <b>Max. Fuel Factor</b> | 1.836 |

| Gas Analysis Data           |                             |                            |                 |                            |                             |                               |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------|----------------------------|-----------------------------|-------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | R-1 75%-1                   |                            | <b>Date</b>     | 07/30/21                   | <b>Run Start Time</b>       | 08:08                         | <b>Run Stop Time</b> | 09:42                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>CO Conc.</b> | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b> | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCO)         | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (Fo)avg                       | (%EA)avg             |                             |
| hh:mm                       | %                           | %                          | ppm             | %                          | lb/lb-mole                  |                               | %                    |                             |
| 01:34                       | 6.57                        | 8.95                       | 3.23            | 84.5                       | 29.41                       | 1.819                         | 67.1                 | YES                         |

| Gas Analysis Data           |                             |                            |                 |                            |                             |                               |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------|----------------------------|-----------------------------|-------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | R-1 75%-2                   |                            | <b>Date</b>     | 07/30/21                   | <b>Run Start Time</b>       | 13:17                         | <b>Run Stop Time</b> | 14:56                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>CO Conc.</b> | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b> | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCO)         | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (Fo)avg                       | (%EA)avg             |                             |
| hh:mm                       | %                           | %                          | ppm             | %                          | lb/lb-mole                  |                               | %                    |                             |
| 01:39                       | 6.55                        | 8.96                       | 4.20            | 84.5                       | 29.41                       | 1.823                         | 67.1                 | YES                         |

| Gas Analysis Data           |                             |                            |                 |                            |                             |                               |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------|----------------------------|-----------------------------|-------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | R-1 75%-3                   |                            | <b>Date</b>     | 07/30/21                   | <b>Run Start Time</b>       | 15:25                         | <b>Run Stop Time</b> | 17:01                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>CO Conc.</b> | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b> | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCO)         | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (Fo)avg                       | (%EA)avg             |                             |
| hh:mm                       | %                           | %                          | ppm             | %                          | lb/lb-mole                  |                               | %                    |                             |
| 01:36                       | 6.66                        | 8.94                       | 3.59            | 84.4                       | 29.42                       | 1.796                         | 66.9                 | YES                         |

**METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES**

|                          |                                          |                             |          |
|--------------------------|------------------------------------------|-----------------------------|----------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Preliminary Run Date</b> | 07/28/21 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Operator</b>             | JLW      |
| <b>Project #</b>         | catc-21-houston.tx-start#1               | <b>Ports Used</b>           | 2        |

| Scale Daily Calibration |          |                 |               |                   |                  |
|-------------------------|----------|-----------------|---------------|-------------------|------------------|
| <b>Scale Number</b>     | Extra    | <b>Standard</b> | <b>Result</b> | <b>Difference</b> | <b>Pass/Fail</b> |
| <b>Date</b>             |          | (g)             | (g)           | (g)               | (± 0.5 g)        |
| <b>Preliminary Date</b> | 07/28/21 | 500             | 499.5         | -0.5              | Pass             |
| <b>Test Day 1</b>       | 07/30/21 | 500             | 499.5         | -0.5              | Pass             |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | R-1 75%-1                           |                   | <b>Date</b>       | 07/30/21                      | <b>Start Time</b>            | 08:08                  | <b>Stop Time</b>  | 09:42               |
| <b>Meter Box Number</b>      | samp-cp-0022                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.986             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 52.714            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 29.89             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 912               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.21              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 82                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.14              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | Dry                                 |                   | DI Water          | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 524.30            | 605.50            | 724.50                        | 832.60                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 360.00            | 604.30            | 721.10                        | 823.40                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 164.3             | 1.2               | 3.4                           | 9.2                          |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>t</sub> )                   | 178.10            | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 8.397                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 50.693            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 14.21             | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 14.21                  | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | R-1 75%-2                           |                   | <b>Date</b>       | 07/30/21                      | <b>Start Time</b>            | 13:17                  | <b>Stop Time</b>  | 14:56               |
| <b>Meter Box Number</b>      | samp-cp-0022                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.986             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.576            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 29.90             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 909               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.21              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 92                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.09              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | Dry                                 |                   | DI Water          | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 505.30            | 615.70            | 730.50                        | 872.90                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 351.70            | 615.10            | 722.80                        | 863.20                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 153.6             | 0.6               | 7.7                           | 9.7                          |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>t</sub> )                   | 171.60            | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 8.091                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 50.619            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 13.78             | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 13.78                  | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | R-1 75%-3                           |                   | <b>Date</b>       | 07/30/21                      | <b>Start Time</b>            | 15:25                  | <b>Stop Time</b>  | 17:01               |
| <b>Meter Box Number</b>      | samp-cp-0022                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.986             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.946            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 29.86             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 910               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.21              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 95                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.12              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | Dry                                 |                   | DI Water          | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 516.00            | 603.50            | 726.60                        | 834.40                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 359.80            | 604.60            | 724.50                        | 823.30                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 156.2             | -1.1              | 2.1                           | 11.1                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>t</sub> )                   | 168.30            | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 7.935                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 50.659            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 13.54             | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 13.54                  | %                 |                     |

METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                                          |
|-------------------|------------------------------------------|
| Plant Name        | Stewart and Stevenson Integration Center |
| Sampling Location | Caterpillar G3520 TALE                   |
| Project #         | catc-21-houston.tx-start#1               |

|            |           |
|------------|-----------|
| Date       | 07/30/21  |
| Operator   | JLW       |
| Run Number | R-1 75%-1 |

|          |               |
|----------|---------------|
| Filter # | 0523          |
|          | R-1 75%-1-CPM |

| Leak Checks |          | [change] |                       | [level] |                         | [time] |           |
|-------------|----------|----------|-----------------------|---------|-------------------------|--------|-----------|
| Train       | Pre      | 0.000    | ft <sup>3</sup> /min@ | 15.0    | in Hg for               | 60.0   | sec [≥60] |
| PASS        | Post     | 0.000    | ft <sup>3</sup> /min@ | 15.0    | in Hg for               | 60.0   | sec [≥60] |
| Pitot       | Pre (+)  | 0.00     | in H <sub>2</sub> O   | 6.0     | in H <sub>2</sub> O for | 15.0   | sec [≥15] |
|             | Pre (-)  | 0.00     | in H <sub>2</sub> O   | 7.0     | in H <sub>2</sub> O for | 15.0   | sec [≥15] |
|             | Post (+) | 0.00     | in H <sub>2</sub> O   | 5.0     | in H <sub>2</sub> O for | 15.0   | sec [≥15] |
|             | Post (-) | 0.00     | in H <sub>2</sub> O   | 6.0     | in H <sub>2</sub> O for | 15.0   | sec [≥15] |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | samp-cp-0022       |           |
| Meter Cal Factor          | (Y)                | 0.986     |
| Nozzle Number             | G-10               |           |
| Average Nozzle Diameter   | (D <sub>na</sub> ) | 0.3113 in |
| Suggested Nozzle Diameter | (D <sub>m</sub> )  | 0.2888 in |
| Probe Number              | samp-hp-0079       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | glass              |           |
| Sample Case / Oven Number | samp-BH-0018       |           |
| Impinger Case Number      | samp-cc-0011       |           |

| Nozzle Measurements |       | ID: G-10 |      |
|---------------------|-------|----------|------|
| Pre                 | 0.312 | 0.311    | PASS |
| Post                | 0.312 | 0.311    | PASS |

| Barometer ID |  |
|--------------|--|
| SAMP-WE-0014 |  |
| Scale ID     |  |
| Extra        |  |

| Run Time |       |
|----------|-------|
| Start    | 08:08 |
| End      | 09:42 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 360.0 | 604.3 | 721.1 | 823.4 |       |       |       |       |
| Post    | 524.3 | 605.5 | 724.5 | 832.6 |       |       |       |       |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient / ID                            | (C <sub>p</sub> )                   | 0.8230 | A5708               |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 911.5  | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 82.3   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.831  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.60   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 14.21  | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.41  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.75   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 | 3.04   |                     |

| Pressures               |                        |                          |
|-------------------------|------------------------|--------------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 29.89 in Hg              |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.21 in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 29.91 in Hg              |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 30.02 in Hg              |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Identification Nos. |                   |            | samp-cp-0022                            | samp-cp-0022        | samp-cp-0022                          |                                      |                              |                       | samp-hp-0079           | samp-hp-0079               | samp-BH-0018       | samp-cc-0011                 | 2917                                | 1004                                 | samp-cp-0022 | samp-cp-0022                        |                                        |                                                      |                               |                                                       |  |  |
|---------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-----------------------|------------------------|----------------------------|--------------------|------------------------------|-------------------------------------|--------------------------------------|--------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|--|--|
| Traverse Point #    | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Probe Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (≤68°F) | Cond. Temp (≤85°F) | CPM Filter Temp (76.5±8.5°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum  | Square Root ΔP (Δp <sup>1/2</sup> ) | Local Stack Velocity (V <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |  |  |
|                     | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                    | °F                     | °F                         | °F                 | °F                           | °F                                  | °F                                   | in Hg        | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |  |  |
| A-1                 | 0.0               | 00:00:00   | 171.591                                 | 0.40                | 1.215                                 | 1.30                                 | 884                          | 250                   | 250                    | 60                         | 64                 | 83                           | 74                                  | 74                                   | 3.0          | 0.63                                | 56.59                                  | 2.324                                                | 102.6                         | 55.786                                                |  |  |
| A-2                 | 3.8               | 00:03:45   | 173.970                                 | 0.39                | 1.185                                 | 1.20                                 | 911                          | 248                   | 248                    | 60                         | 66                 | 82                           | 74                                  | 74                                   | 3.0          | 0.62                                | 56.44                                  | 4.542                                                | 101.4                         | 54.502                                                |  |  |
| A-3                 | 7.5               | 00:07:30   | 176.240                                 | 0.39                | 1.185                                 | 1.20                                 | 912                          | 248                   | 247                    | 62                         | 65                 | 81                           | 74                                  | 74                                   | 3.0          | 0.62                                | 56.46                                  | 6.769                                                | 101.1                         | 54.152                                                |  |  |
| A-4                 | 11.3              | 00:11:15   | 178.520                                 | 0.41                | 1.245                                 | 1.30                                 | 912                          | 250                   | 249                    | 63                         | 66                 | 81                           | 75                                  | 75                                   | 3.0          | 0.64                                | 57.89                                  | 9.070                                                | 101.2                         | 54.423                                                |  |  |
| A-5                 | 15.0              | 00:15:00   | 180.880                                 | 0.41                | 1.245                                 | 1.30                                 | 914                          | 250                   | 250                    | 63                         | 68                 | 81                           | 76                                  | 76                                   | 3.0          | 0.64                                | 57.93                                  | 11.397                                               | 101.4                         | 54.705                                                |  |  |
| A-6                 | 18.8              | 00:18:45   | 183.270                                 | 0.40                | 1.215                                 | 1.30                                 | 911                          | 250                   | 250                    | 64                         | 71                 | 82                           | 77                                  | 77                                   | 3.0          | 0.63                                | 57.16                                  | 13.651                                               | 101.3                         | 54.604                                                |  |  |
| A-7                 | 22.5              | 00:22:30   | 185.590                                 | 0.40                | 1.215                                 | 1.30                                 | 911                          | 250                   | 250                    | 62                         | 72                 | 83                           | 78                                  | 78                                   | 3.0          | 0.63                                | 57.16                                  | 15.940                                               | 101.4                         | 54.651                                                |  |  |
| A-8                 | 26.3              | 00:26:15   | 187.950                                 | 0.39                | 1.185                                 | 1.20                                 | 912                          | 248                   | 250                    | 62                         | 53                 | 80                           | 79                                  | 79                                   | 3.0          | 0.62                                | 56.46                                  | 18.146                                               | 101.2                         | 54.439                                                |  |  |
| A-9                 | 30.0              | 00:30:00   | 190.230                                 | 0.37                | 1.124                                 | 1.20                                 | 910                          | 249                   | 249                    | 62                         | 50                 | 79                           | 80                                  | 80                                   | 3.0          | 0.61                                | 54.95                                  | 20.349                                               | 101.3                         | 54.263                                                |  |  |
| A-10                | 33.8              | 00:33:45   | 192.510                                 | 0.37                | 1.124                                 | 1.20                                 | 912                          | 250                   | 250                    | 62                         | 50                 | 78                           | 81                                  | 81                                   | 3.0          | 0.61                                | 54.99                                  | 22.537                                               | 101.3                         | 54.090                                                |  |  |
| A-11                | 37.5              | 00:37:30   | 194.780                                 | 0.36                | 1.094                                 | 1.20                                 | 910                          | 249                   | 249                    | 63                         | 51                 | 79                           | 82                                  | 82                                   | 3.0          | 0.60                                | 54.20                                  | 24.684                                               | 101.2                         | 53.855                                                |  |  |
| A-12                | 41.3              | 00:41:15   | 197.010                                 | 0.35                | 1.063                                 | 1.10                                 | 909                          | 250                   | 250                    | 63                         | 53                 | 79                           | 83                                  | 83                                   | 3.0          | 0.59                                | 53.43                                  | 26.756                                               | 101.0                         | 53.512                                                |  |  |
| B-1                 | 45.0              | 00:45:00   | 199.168                                 | 0.30                | 0.911                                 | 0.96                                 | 915                          | 250                   | 251                    | 59                         | 42                 | 84                           | 84                                  | 84                                   | 3.0          | 0.55                                | 49.57                                  | 28.751                                               | 101.2                         | 53.079                                                |  |  |
| B-2                 | 48.8              | 00:48:45   | 201.250                                 | 0.27                | 0.820                                 | 0.86                                 | 917                          | 248                   | 250                    | 60                         | 42                 | 83                           | 84                                  | 84                                   | 3.0          | 0.52                                | 47.06                                  | 30.591                                               | 101.1                         | 52.441                                                |  |  |
| B-3                 | 52.5              | 00:52:30   | 203.170                                 | 0.28                | 0.851                                 | 0.90                                 | 915                          | 250                   | 249                    | 61                         | 43                 | 82                           | 85                                  | 85                                   | 3.0          | 0.53                                | 47.89                                  | 32.494                                               | 101.1                         | 51.990                                                |  |  |
| B-4                 | 56.3              | 00:56:15   | 205.160                                 | 0.29                | 0.881                                 | 0.93                                 | 915                          | 249                   | 251                    | 61                         | 44                 | 82                           | 85                                  | 85                                   | 3.0          | 0.54                                | 48.74                                  | 34.426                                               | 101.1                         | 51.639                                                |  |  |
| B-5                 | 60.0              | 01:00:00   | 207.180                                 | 0.32                | 0.972                                 | 1.00                                 | 914                          | 250                   | 250                    | 61                         | 46                 | 82                           | 86                                  | 86                                   | 3.0          | 0.57                                | 51.18                                  | 36.431                                               | 101.1                         | 51.432                                                |  |  |
| B-6                 | 63.8              | 01:03:45   | 209.280                                 | 0.33                | 1.002                                 | 1.10                                 | 913                          | 250                   | 251                    | 61                         | 48                 | 82                           | 87                                  | 87                                   | 3.0          | 0.57                                | 51.95                                  | 38.462                                               | 101.0                         | 51.283                                                |  |  |
| B-7                 | 67.5              | 01:07:30   | 211.410                                 | 0.35                | 1.063                                 | 1.10                                 | 913                          | 250                   | 249                    | 60                         | 47                 | 82                           | 87                                  | 87                                   | 3.0          | 0.59                                | 53.50                                  | 40.493                                               | 100.8                         | 51.149                                                |  |  |
| B-8                 | 71.3              | 01:11:15   | 213.540                                 | 0.35                | 1.063                                 | 1.10                                 | 916                          | 249                   | 251                    | 61                         | 49                 | 82                           | 88                                  | 88                                   | 3.0          | 0.59                                | 53.56                                  | 42.520                                               | 100.6                         | 51.023                                                |  |  |
| B-9                 | 75.0              | 01:15:00   | 215.670                                 | 0.35                | 1.063                                 | 1.10                                 | 917                          | 249                   | 250                    | 61                         | 50                 | 83                           | 89                                  | 89                                   | 3.0          | 0.59                                | 53.58                                  | 44.533                                               | 100.4                         | 50.895                                                |  |  |
| B-10                | 78.8              | 01:18:45   | 217.790                                 | 0.37                | 1.124                                 | 1.20                                 | 915                          | 250                   | 250                    | 61                         | 51                 | 83                           | 89                                  | 89                                   | 3.0          | 0.61                                | 55.05                                  | 46.614                                               | 100.2                         | 50.852                                                |  |  |
| B-11                | 82.5              | 01:22:30   | 219.980                                 | 0.36                | 1.094                                 | 1.20                                 | 911                          | 248                   | 251                    | 61                         | 53                 | 83                           | 89                                  | 89                                   | 3.0          | 0.60                                | 54.22                                  | 48.676                                               | 100.1                         | 50.792                                                |  |  |
| B-12                | 86.3              | 01:26:15   | 222.150                                 | 0.34                | 1.033                                 | 1.10                                 | 908                          | 250                   | 250                    | 61                         | 54                 | 83                           | 90                                  | 90                                   | 3.0          | 0.58                                | 52.64                                  | 50.719                                               | 100.0                         | 50.719                                                |  |  |
| Last Pt             | 90.0              | 01:30:00   | 224.305                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |              |                                     |                                        |                                                      |                               |                                                       |  |  |
| Final Val           | 90.0              | 01:30:00   | 224.305                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      | Max Vac      | 3.0                                 | Final Values                           | 50.719                                               | 100.0                         |                                                       |  |  |
| Average Values      |                   |            |                                         |                     | 0.36                                  |                                      | 1.14                         | 912                   | 249                    | 250                        | 61                 | 54                           | 82                                  | 82                                   | 82           |                                     | 0.60                                   | 53.86                                                |                               |                                                       |  |  |
|                     |                   |            |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    |                              | 82                                  |                                      |              |                                     |                                        |                                                      |                               |                                                       |  |  |

Notes:

METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |  |                                          |  |  |  |  |  |            |  |           |  |               |  |
|-------------------|--|------------------------------------------|--|--|--|--|--|------------|--|-----------|--|---------------|--|
| Plant Name        |  | Stewart and Stevenson Integration Center |  |  |  |  |  | Date       |  | 07/30/21  |  | Filter #      |  |
| Sampling Location |  | Caterpillar G3520 TALE                   |  |  |  |  |  | Operator   |  | JLW       |  | 0916          |  |
| Project #         |  | catc-21-houston.tx-start#1               |  |  |  |  |  | Run Number |  | R-1 75%-2 |  | R-1 75%-2-CPM |  |

|             |          |       |                       |      |                         |      |           |                           |                    |                    |  |  |  |  |  |  |  |  |  |
|-------------|----------|-------|-----------------------|------|-------------------------|------|-----------|---------------------------|--------------------|--------------------|--|--|--|--|--|--|--|--|--|
| Leak Checks |          |       |                       |      |                         |      |           |                           |                    | Sampling Equipment |  |  |  |  |  |  |  |  |  |
| [change]    |          |       |                       |      | [level]                 |      |           |                           |                    | [time]             |  |  |  |  |  |  |  |  |  |
| Train       | Pre      | 0.000 | ft <sup>3</sup> /min@ | 15.0 | in Hg for               | 60.0 | sec [≥60] | Meter Box Number          | samp-cp-0022       |                    |  |  |  |  |  |  |  |  |  |
| PASS        | Post     | 0.000 | ft <sup>3</sup> /min@ | 15.0 | in Hg for               | 60.0 | sec [≥60] | Meter Cal Factor          | (Y)                | 0.986              |  |  |  |  |  |  |  |  |  |
| Pitot       | Pre (+)  | 0.00  | in H <sub>2</sub> O   | 6.0  | in H <sub>2</sub> O for | 15.0 | sec [≥15] | Nozzle Number             | G-10               |                    |  |  |  |  |  |  |  |  |  |
| PASS        | Pre (-)  | 0.00  | in H <sub>2</sub> O   | 5.0  | in H <sub>2</sub> O for | 15.0 | sec [≥15] | Average Nozzle Diameter   | (D <sub>na</sub> ) | 0.3113 in          |  |  |  |  |  |  |  |  |  |
|             | Post (+) | 0.00  | in H <sub>2</sub> O   | 7.0  | in H <sub>2</sub> O for | 15.0 | sec [≥15] | Suggested Nozzle Diameter | (D <sub>m</sub> )  | 0.2482 in          |  |  |  |  |  |  |  |  |  |
|             | Post (-) | 0.00  | in H <sub>2</sub> O   | 6.0  | in H <sub>2</sub> O for | 15.0 | sec [≥15] | Probe Number              | samp-hp-0079 in    |                    |  |  |  |  |  |  |  |  |  |
|             |          |       |                       |      |                         |      |           | Probe Length              | 60 in              |                    |  |  |  |  |  |  |  |  |  |
|             |          |       |                       |      |                         |      |           | Liner Material            | glass              |                    |  |  |  |  |  |  |  |  |  |
|             |          |       |                       |      |                         |      |           | Sample Case / Oven Number | samp-BH-0018       |                    |  |  |  |  |  |  |  |  |  |
|             |          |       |                       |      |                         |      |           | Impinger Case Number      | samp-cc-0011       |                    |  |  |  |  |  |  |  |  |  |

|                     |       |       |       |      |              |  |  |  |  |              |  |  |  |  |
|---------------------|-------|-------|-------|------|--------------|--|--|--|--|--------------|--|--|--|--|
| Nozzle Measurements |       |       |       |      | ID: G-10     |  |  |  |  | Barometer ID |  |  |  |  |
| Pre                 | 0.311 | 0.312 | 0.311 | PASS | SAMP-WE-0014 |  |  |  |  |              |  |  |  |  |
| Post                | 0.311 | 0.312 | 0.311 | PASS | Scale ID     |  |  |  |  |              |  |  |  |  |
|                     |       |       |       |      | Extra        |  |  |  |  |              |  |  |  |  |

|          |       |     |       |         |       |       |       |       |       |       |       |       |       |       |       |
|----------|-------|-----|-------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Run Time |       |     |       | Weights |       |       |       | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
| Start    | 13:17 | End | 14:56 | Pre     | 351.7 | 615.1 | 722.8 | 863.2 |       |       |       |       |       |       |       |
|          |       |     |       | Post    | 505.3 | 615.7 | 730.5 | 872.9 |       |       |       |       |       |       |       |

|                                                   |                                     |        |                     |  |  |  |  |
|---------------------------------------------------|-------------------------------------|--------|---------------------|--|--|--|--|
| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |  |  |  |  |
| Pitot Coefficient / ID                            | (C <sub>p</sub> )                   | 0.8230 | A5708               |  |  |  |  |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 908.8  | °F                  |  |  |  |  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 92.1   |                     |  |  |  |  |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.831  | in H <sub>2</sub> O |  |  |  |  |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.59   | in H <sub>2</sub> O |  |  |  |  |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 13.78  | %                   |  |  |  |  |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.41  | lb/lb-mole          |  |  |  |  |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.56   | acfm                |  |  |  |  |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 | 3.12   |                     |  |  |  |  |

|                         |                        |       |                     |  |  |  |  |
|-------------------------|------------------------|-------|---------------------|--|--|--|--|
| Pressures               |                        |       |                     |  |  |  |  |
| Barometric Pressure     | (P <sub>b</sub> )      | 29.90 | in Hg               |  |  |  |  |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.21  | in H <sub>2</sub> O |  |  |  |  |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 29.92 | in Hg               |  |  |  |  |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 30.03 | in Hg               |  |  |  |  |

|              |  |  |  |  |  |    |
|--------------|--|--|--|--|--|----|
| Wash Volumes |  |  |  |  |  | ml |
|              |  |  |  |  |  | ml |

|                     |                   |              |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |              |                                     |                                        |                                                      |                               |                                                       |
|---------------------|-------------------|--------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-----------------------|------------------------|----------------------------|--------------------|------------------------------|-------------------------------------|--------------------------------------|--------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
| Identification Nos. |                   | samp-cp-0022 | samp-cp-0022                            | samp-cp-0022        |                                       |                                      | samp-hp-0079                 | samp-hp-0079          | samp-BH-0018           | samp-cc-0011               | 3006               | 8471                         | samp-cp-0022                        | samp-cp-0022                         | samp-cp-0022 |                                     |                                        |                                                      |                               |                                                       |
| Traverse Point #    | Sampling Time (Θ) | Timer Time   | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Probe Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (≤68°F) | Cond. Temp (≤85°F) | CPM Filter Temp (76.5±8.5°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum  | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (V <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|                     | min               | hh:mm:ss     | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                    | °F                     | °F                         | °F                 | °F                           | °F                                  | °F                                   | in Hg        | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1                 | 0.0               | 00:00:00     | 224.575                                 | 0.28                | 0.875                                 | 0.86                                 | 896                          | 250                   | 249                    | 66                         | 65                 | 72                           | 85                                  | 85                                   | 2.0          | 0.53                                | 47.51                                  | 1.822                                                | 96.1                          | 43.737                                                |
| A-2                 | 3.8               | 00:03:45     | 226.480                                 | 0.27                | 0.844                                 | 0.82                                 | 904                          | 247                   | 250                    | 65                         | 56                 | 74                           | 86                                  | 86                                   | 2.0          | 0.52                                | 46.79                                  | 3.636                                                | 96.9                          | 43.637                                                |
| A-3                 | 7.5               | 00:07:30     | 228.380                                 | 0.28                | 0.875                                 | 0.86                                 | 908                          | 249                   | 251                    | 65                         | 55                 | 74                           | 86                                  | 86                                   | 2.0          | 0.53                                | 47.72                                  | 5.508                                                | 97.7                          | 44.064                                                |
| A-4                 | 11.3              | 00:11:15     | 230.340                                 | 0.29                | 0.906                                 | 0.89                                 | 911                          | 249                   | 252                    | 64                         | 55                 | 74                           | 87                                  | 87                                   | 2.0          | 0.54                                | 48.62                                  | 7.405                                                | 98.0                          | 44.429                                                |
| A-5                 | 15.0              | 00:15:00     | 232.330                                 | 0.31                | 0.969                                 | 0.95                                 | 911                          | 249                   | 250                    | 64                         | 57                 | 74                           | 88                                  | 88                                   | 2.0          | 0.56                                | 50.27                                  | 9.384                                                | 98.4                          | 45.044                                                |
| A-6                 | 18.8              | 00:18:45     | 234.410                                 | 0.32                | 1.000                                 | 0.98                                 | 914                          | 250                   | 250                    | 65                         | 60                 | 73                           | 88                                  | 88                                   | 2.0          | 0.57                                | 51.13                                  | 11.354                                               | 98.3                          | 45.417                                                |
| A-7                 | 22.5              | 00:22:30     | 236.480                                 | 0.35                | 1.093                                 | 1.10                                 | 912                          | 251                   | 249                    | 65                         | 62                 | 74                           | 89                                  | 89                                   | 2.0          | 0.59                                | 53.43                                  | 13.445                                               | 98.4                          | 46.096                                                |
| A-8                 | 26.3              | 00:26:15     | 238.680                                 | 0.35                | 1.093                                 | 1.10                                 | 912                          | 250                   | 250                    | 64                         | 63                 | 74                           | 90                                  | 90                                   | 2.0          | 0.59                                | 53.43                                  | 15.541                                               | 98.6                          | 46.622                                                |
| A-9                 | 30.0              | 00:30:00     | 240.890                                 | 0.36                | 1.125                                 | 1.10                                 | 912                          | 250                   | 251                    | 64                         | 60                 | 75                           | 91                                  | 91                                   | 2.0          | 0.60                                | 54.19                                  | 17.624                                               | 98.4                          | 46.996                                                |
| A-10                | 33.8              | 00:33:45     | 243.090                                 | 0.37                | 1.156                                 | 1.10                                 | 911                          | 250                   | 249                    | 63                         | 60                 | 75                           | 92                                  | 92                                   | 2.0          | 0.61                                | 54.92                                  | 19.712                                               | 98.2                          | 47.309                                                |
| A-11                | 37.5              | 00:37:30     | 245.300                                 | 0.36                | 1.125                                 | 1.10                                 | 911                          | 250                   | 250                    | 63                         | 60                 | 75                           | 92                                  | 92                                   | 2.0          | 0.60                                | 54.17                                  | 21.857                                               | 98.4                          | 47.689                                                |
| A-12                | 41.3              | 00:41:15     | 247.570                                 | 0.34                | 1.062                                 | 1.00                                 | 910                          | 250                   | 251                    | 63                         | 60                 | 75                           | 93                                  | 93                                   | 2.0          | 0.58                                | 52.62                                  | 23.891                                               | 98.4                          | 47.782                                                |
| B-1                 | 45.0              | 00:45:00     | 249.726                                 | 0.40                | 1.250                                 | 1.20                                 | 893                          | 248                   | 250                    | 55                         | 63                 | 78                           | 93                                  | 93                                   | 2.0          | 0.63                                | 56.72                                  | 26.103                                               | 98.3                          | 48.189                                                |
| B-2                 | 48.8              | 00:48:45     | 252.070                                 | 0.40                | 1.250                                 | 1.20                                 | 899                          | 251                   | 250                    | 59                         | 63                 | 78                           | 93                                  | 93                                   | 2.0          | 0.63                                | 56.85                                  | 28.320                                               | 98.3                          | 48.548                                                |
| B-3                 | 52.5              | 00:52:30     | 254.420                                 | 0.39                | 1.218                                 | 1.20                                 | 905                          | 250                   | 249                    | 59                         | 65                 | 79                           | 94                                  | 94                                   | 2.0          | 0.62                                | 56.26                                  | 30.552                                               | 98.4                          | 48.883                                                |
| B-4                 | 56.3              | 00:56:15     | 256.790                                 | 0.40                | 1.250                                 | 1.20                                 | 909                          | 250                   | 250                    | 60                         | 65                 | 79                           | 94                                  | 94                                   | 2.0          | 0.63                                | 57.06                                  | 32.831                                               | 98.6                          | 49.247                                                |
| B-5                 | 60.0              | 01:00:00     | 259.210                                 | 0.41                | 1.281                                 | 1.30                                 | 911                          | 249                   | 249                    | 60                         | 66                 | 78                           | 95                                  | 95                                   | 2.0          | 0.64                                | 57.81                                  | 35.201                                               | 98.9                          | 49.696                                                |
| B-6                 | 63.8              | 01:03:45     | 261.730                                 | 0.40                | 1.250                                 | 1.20                                 | 912                          | 251                   | 250                    | 60                         | 66                 | 78                           | 95                                  | 95                                   | 2.0          | 0.63                                | 57.12                                  | 37.505                                               | 99.1                          | 50.006                                                |
| B-7                 | 67.5              | 01:07:30     | 264.180                                 | 0.39                | 1.218                                 | 1.20                                 | 912                          | 249                   | 249                    | 58                         | 66                 | 78                           | 96                                  | 96                                   | 2.0          | 0.62                                | 56.40                                  | 39.804                                               | 99.4                          | 50.279                                                |
| B-8                 | 71.3              | 01:11:15     | 266.630                                 | 0.39                | 1.218                                 | 1.20                                 | 915                          | 249                   | 250                    | 58                         | 65                 | 77                           | 96                                  | 96                                   | 2.0          | 0.62                                | 56.46                                  | 42.085                                               | 99.6                          | 50.501                                                |
| B-9                 | 75.0              | 01:15:00     | 269.060                                 | 0.38                | 1.187                                 | 1.20                                 | 912                          | 249                   | 251                    | 58                         | 66                 | 78                           | 97                                  | 97                                   | 2.0          | 0.62                                | 55.67                                  | 44.352                                               | 99.8                          | 50.687                                                |
| B-10                | 78.8              | 01:18:45     | 271.480                                 | 0.37                | 1.156                                 | 1.10                                 | 911                          | 250                   | 251                    | 58                         | 67                 | 78                           | 97                                  | 97                                   | 2.0          | 0.61                                | 54.92                                  | 46.468                                               | 99.7                          | 50.693                                                |
| B-11                | 82.5              | 01:22:30     | 273.740                                 | 0.35                | 1.093                                 | 1.10                                 | 911                          | 250                   | 249                    | 58                         | 67                 | 78                           | 97                                  | 97                                   | 2.0          | 0.59                                | 53.41                                  | 48.519                                               | 99.6                          | 50.629                                                |
| B-12                | 86.3              | 01:26:15     | 275.930                                 | 0.35                | 1.093                                 | 1.10                                 | 909                          | 250                   | 251                    | 58                         | 67                 | 78                           | 97                                  | 97                                   | 2.0          | 0.59                                | 53.37                                  | 50.599                                               | 99.5                          | 50.599                                                |
| Last Pt             | 90.0              | 01:30:00     | 278.151                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |              |                                     |                                        |                                                      |                               |                                                       |
| Final Val           | 90.0              | 01:30:00     | 278.151                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      | Max Vac      | 2.0                                 | Final Values                           | 50.599                                               | 99.5                          |                                                       |
| Average Values      |                   |              |                                         | 0.35                |                                       | 1.09                                 | 909                          | 250                   | 250                    | 61                         | 62                 | 76                           | 92                                  | 92                                   |              | 0.59                                | 53.62                                  |                                                      |                               |                                                       |
|                     |                   |              |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    |                              | 92                                  |                                      |              |                                     |                                        |                                                      |                               |                                                       |

Notes:

METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                                          |
|-------------------|------------------------------------------|
| Plant Name        | Stewart and Stevenson Integration Center |
| Sampling Location | Caterpillar G3520 TALE                   |
| Project #         | catc-21-houston.tx-start#1               |

|            |           |
|------------|-----------|
| Date       | 07/30/21  |
| Operator   | JLW       |
| Run Number | R-1 75%-3 |

|          |               |
|----------|---------------|
| Filter # | 0917          |
|          | R-1 75%-3-CPM |

| Leak Checks |          | [change] | [level]  | [time] |            |      |           |
|-------------|----------|----------|----------|--------|------------|------|-----------|
| Train       | Pre      | 0.000    | ft³/min@ | 15.0   | in Hg for  | 60.0 | sec [≥60] |
| PASS        | Post     | 0.000    | ft³/min@ | 15.0   | in Hg for  | 60.0 | sec [≥60] |
| Pitot       | Pre (+)  | 0.00     | in H₂O   | 6.0    | in H₂O for | 15.0 | sec [≥15] |
|             | Pre (-)  | 0.00     | in H₂O   | 7.0    | in H₂O for | 15.0 | sec [≥15] |
|             | Post (+) | 0.00     | in H₂O   | 5.0    | in H₂O for | 15.0 | sec [≥15] |
|             | Post (-) | 0.00     | in H₂O   | 6.0    | in H₂O for | 15.0 | sec [≥15] |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | samp-cp-0022       |           |
| Meter Cal Factor          | (Y)                | 0.986     |
| Nozzle Number             | G-10               |           |
| Average Nozzle Diameter   | (D <sub>na</sub> ) | 0.3113 in |
| Suggested Nozzle Diameter | (D <sub>m</sub> )  | 0.2474 in |
| Probe Number              | samp-hp-0079       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | glass              |           |
| Sample Case / Oven Number | samp-BH-0018       |           |
| Impinger Case Number      | samp-cc-0011       |           |

| Nozzle Measurements |       | ID: G-10 |      |
|---------------------|-------|----------|------|
| Pre                 | 0.311 | 0.312    | PASS |
| Post                | 0.311 | 0.312    | PASS |

| Barometer ID |  |
|--------------|--|
| SAMP-WE-0014 |  |
| Scale ID     |  |
| Extra        |  |

| Run Time |       |
|----------|-------|
| Start    | 15:25 |
| End      | 17:01 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 359.8 | 604.6 | 724.5 | 823.3 |       |       |       |       |
| Post    | 516.0 | 603.5 | 726.6 | 834.4 |       |       |       |       |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient / ID                            | (C <sub>p</sub> )                   | 0.8230 | A5708               |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 910.2  | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 94.8   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.831  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.60   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 13.54  | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.42  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.56   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 | 3.15   |                     |

| Pressures               |                        |                          |
|-------------------------|------------------------|--------------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 29.86 in Hg              |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.21 in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 29.88 in Hg              |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 29.99 in Hg              |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Identification Nos. |                   | samp-cp-0022 | samp-cp-0022                            | samp-cp-0022        |                                       |                                      | samp-hp-0079                 | samp-hp-0079          | samp-BH-0018           | samp-cc-0011               | 2917               | 1004                         | samp-cp-0022                        | samp-cp-0022                         |             |                                                            |                                        |                                                      |                               |                                                       |
|---------------------|-------------------|--------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-----------------------|------------------------|----------------------------|--------------------|------------------------------|-------------------------------------|--------------------------------------|-------------|------------------------------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
| Traverse Point #    | Sampling Time (Θ) | Timer Time   | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Probe Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (≤68°F) | Cond. Temp (≤85°F) | CPM Filter Temp (76.5±8.5°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (Δp <sup>1/2</sup> ) √(in H <sub>2</sub> O) | Local Stack Velocity (V <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|                     | min               | hh:mm:ss     | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                    | °F                     | °F                         | °F                 | °F                           | °F                                  | °F                                   | in Hg       |                                                            | f/sec                                  | dscf                                                 | %                             | dscf                                                  |
| A-1                 | 0.0               | 00:00:00     | 278.408                                 | 0.38                | 1.197                                 | 1.20                                 | 909                          | 249                   | 252                    | 64                         | 60                 | 81                           | 91                                  | 91                                   | 3.0         | 0.62                                                       | 55.61                                  | 2.253                                                | 102.3                         | 54.066                                                |
| A-2                 | 3.8               | 00:03:45     | 280.790                                 | 0.39                | 1.229                                 | 1.20                                 | 911                          | 250                   | 252                    | 64                         | 60                 | 80                           | 91                                  | 91                                   | 3.0         | 0.62                                                       | 56.38                                  | 4.418                                                | 99.8                          | 53.022                                                |
| A-3                 | 7.5               | 00:07:30     | 283.080                                 | 0.39                | 1.229                                 | 1.20                                 | 912                          | 248                   | 250                    | 63                         | 61                 | 79                           | 91                                  | 91                                   | 3.0         | 0.62                                                       | 56.40                                  | 6.688                                                | 100.5                         | 53.506                                                |
| A-4                 | 11.3              | 00:11:15     | 285.480                                 | 0.41                | 1.292                                 | 1.30                                 | 914                          | 250                   | 252                    | 63                         | 61                 | 78                           | 91                                  | 91                                   | 3.0         | 0.64                                                       | 57.87                                  | 8.864                                                | 99.3                          | 53.184                                                |
| A-5                 | 15.0              | 00:15:00     | 287.780                                 | 0.41                | 1.292                                 | 1.30                                 | 913                          | 250                   | 249                    | 62                         | 62                 | 78                           | 92                                  | 92                                   | 3.0         | 0.64                                                       | 57.85                                  | 11.262                                               | 100.5                         | 54.059                                                |
| A-6                 | 18.8              | 00:18:45     | 290.320                                 | 0.40                | 1.260                                 | 1.30                                 | 915                          | 249                   | 252                    | 62                         | 64                 | 78                           | 93                                  | 93                                   | 3.0         | 0.63                                                       | 57.18                                  | 13.694                                               | 101.8                         | 54.776                                                |
| A-7                 | 22.5              | 00:22:30     | 292.900                                 | 0.39                | 1.229                                 | 1.20                                 | 914                          | 251                   | 250                    | 62                         | 64                 | 78                           | 93                                  | 93                                   | 3.0         | 0.62                                                       | 56.44                                  | 15.880                                               | 101.3                         | 54.447                                                |
| A-8                 | 26.3              | 00:26:15     | 295.220                                 | 0.38                | 1.197                                 | 1.20                                 | 912                          | 248                   | 251                    | 62                         | 65                 | 78                           | 94                                  | 94                                   | 3.0         | 0.62                                                       | 55.67                                  | 18.044                                               | 101.0                         | 54.131                                                |
| A-9                 | 30.0              | 00:30:00     | 297.520                                 | 0.38                | 1.197                                 | 1.20                                 | 912                          | 249                   | 249                    | 63                         | 65                 | 79                           | 94                                  | 94                                   | 3.0         | 0.62                                                       | 55.67                                  | 20.217                                               | 100.7                         | 53.911                                                |
| A-10                | 33.8              | 00:33:45     | 299.830                                 | 0.37                | 1.166                                 | 1.20                                 | 913                          | 250                   | 250                    | 63                         | 65                 | 79                           | 95                                  | 95                                   | 3.0         | 0.61                                                       | 54.95                                  | 22.442                                               | 100.9                         | 53.860                                                |
| A-11                | 37.5              | 00:37:30     | 302.200                                 | 0.36                | 1.134                                 | 1.10                                 | 911                          | 249                   | 252                    | 63                         | 66                 | 80                           | 95                                  | 95                                   | 3.0         | 0.60                                                       | 54.16                                  | 24.544                                               | 100.7                         | 53.551                                                |
| A-12                | 41.3              | 00:41:15     | 304.440                                 | 0.35                | 1.103                                 | 1.10                                 | 909                          | 250                   | 250                    | 64                         | 67                 | 80                           | 96                                  | 96                                   | 3.0         | 0.59                                                       | 53.37                                  | 26.650                                               | 100.6                         | 53.300                                                |
| B-1                 | 45.0              | 00:45:00     | 306.687                                 | 0.30                | 0.945                                 | 0.94                                 | 895                          | 250                   | 250                    | 65                         | 68                 | 79                           | 95                                  | 95                                   | 3.0         | 0.55                                                       | 49.16                                  | 28.595                                               | 100.5                         | 52.791                                                |
| B-2                 | 48.8              | 00:48:45     | 308.760                                 | 0.28                | 0.882                                 | 0.88                                 | 905                          | 249                   | 250                    | 65                         | 68                 | 79                           | 95                                  | 95                                   | 3.0         | 0.53                                                       | 47.66                                  | 30.471                                               | 100.4                         | 52.237                                                |
| B-3                 | 52.5              | 00:52:30     | 310.760                                 | 0.29                | 0.914                                 | 0.91                                 | 908                          | 249                   | 249                    | 64                         | 67                 | 79                           | 95                                  | 95                                   | 3.0         | 0.54                                                       | 48.56                                  | 32.376                                               | 100.3                         | 51.802                                                |
| B-4                 | 56.3              | 00:56:15     | 312.790                                 | 0.30                | 0.945                                 | 0.94                                 | 911                          | 249                   | 250                    | 64                         | 67                 | 79                           | 96                                  | 96                                   | 3.0         | 0.55                                                       | 49.44                                  | 34.296                                               | 100.2                         | 51.444                                                |
| B-5                 | 60.0              | 01:00:00     | 314.840                                 | 0.32                | 1.008                                 | 1.00                                 | 910                          | 250                   | 252                    | 64                         | 67                 | 79                           | 96                                  | 96                                   | 3.0         | 0.57                                                       | 51.05                                  | 36.301                                               | 100.2                         | 51.248                                                |
| B-6                 | 63.8              | 01:03:45     | 316.980                                 | 0.33                | 1.040                                 | 1.00                                 | 912                          | 248                   | 250                    | 65                         | 68                 | 80                           | 97                                  | 97                                   | 3.0         | 0.57                                                       | 51.88                                  | 38.311                                               | 100.1                         | 51.082                                                |
| B-7                 | 67.5              | 01:07:30     | 319.130                                 | 0.35                | 1.103                                 | 1.10                                 | 912                          | 248                   | 250                    | 65                         | 68                 | 80                           | 97                                  | 97                                   | 3.0         | 0.59                                                       | 53.43                                  | 40.350                                               | 99.9                          | 50.969                                                |
| B-8                 | 71.3              | 01:11:15     | 321.310                                 | 0.35                | 1.103                                 | 1.10                                 | 911                          | 249                   | 252                    | 65                         | 68                 | 80                           | 97                                  | 97                                   | 3.0         | 0.59                                                       | 53.41                                  | 42.352                                               | 99.6                          | 50.822                                                |
| B-9                 | 75.0              | 01:15:00     | 323.450                                 | 0.35                | 1.103                                 | 1.10                                 | 911                          | 248                   | 249                    | 65                         | 67                 | 79                           | 97                                  | 97                                   | 3.0         | 0.59                                                       | 53.41                                  | 44.494                                               | 99.7                          | 50.850                                                |
| B-10                | 78.8              | 01:18:45     | 325.740                                 | 0.36                | 1.134                                 | 1.10                                 | 910                          | 250                   | 251                    | 66                         | 67                 | 79                           | 98                                  | 98                                   | 3.0         | 0.60                                                       | 54.14                                  | 46.529                                               | 99.5                          | 50.759                                                |
| B-11                | 82.5              | 01:22:30     | 327.920                                 | 0.36                | 1.134                                 | 1.10                                 | 909                          | 251                   | 250                    | 66                         | 67                 | 79                           | 98                                  | 98                                   | 3.0         | 0.60                                                       | 54.12                                  | 48.602                                               | 99.4                          | 50.715                                                |
| B-12                | 86.3              | 01:26:15     | 330.140                                 | 0.34                | 1.071                                 | 1.10                                 | 905                          | 249                   | 250                    | 66                         | 67                 | 79                           | 98                                  | 98                                   | 3.0         | 0.58                                                       | 52.52                                  | 50.669                                               | 99.4                          | 50.669                                                |
| Last Pt             | 90.0              | 01:30:00     | 332.354                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |             |                                                            |                                        |                                                      |                               |                                                       |
| Final Val           | 90.0              | 01:30:00     | 332.354                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      | Max Vac     | 3.0                                                        | Final Values                           | 50.669                                               | 99.4                          |                                                       |
| Average Values      |                   |              |                                         | 0.36                |                                       | 1.12                                 | 910                          | 249                   | 251                    | 64                         | 65                 | 79                           | 95                                  | 95                                   |             | 0.60                                                       | 53.76                                  |                                                      |                               |                                                       |
|                     |                   |              |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    |                              | 95                                  |                                      |             |                                                            |                                        |                                                      |                               |                                                       |

Notes:

# AIR HYGIENE

## PM (EPA METHOD 5) DATA SHEET



Project Code: catc-21-houston.tx-start#1

**Site Info.**

Plant Name: \_\_\_\_\_  
 Sampling Location: \_\_\_\_\_  
 Unit #: \_\_\_\_\_  
 Date: 7.30.21

**Console Info.**

Console: \_\_\_\_\_  
 Meter Calibration Factor: 0.986  
 Orifice Meter Coefficient: 1.831

samp-cp-0022

## PM RUNS

|                |                                      |                         |              |              |              |                           |            |            |
|----------------|--------------------------------------|-------------------------|--------------|--------------|--------------|---------------------------|------------|------------|
| Run#: <u>1</u> |                                      | Load: <u>75%</u> normal |              |              |              | Box#: <u>Samp-cp-0011</u> |            |            |
|                |                                      | Impinger 1              | Impinger 2   | Impinger 3   | Impinger 4   | Impinger 5                | Impinger 6 | Impinger 7 |
|                |                                      | (g)                     | (g)          | (g)          | (g)          |                           |            |            |
| Contents       |                                      | Dry                     | Di Water     | Dry          | Sil Gel      |                           |            |            |
| Final Value    | (V <sub>f</sub> ), (W <sub>f</sub> ) | <u>524.3</u>            | <u>605.5</u> | <u>724.5</u> | <u>823.4</u> | <u>832.6</u>              |            |            |
| Initial Value  | (V <sub>i</sub> ), (W <sub>i</sub> ) | <u>360.0</u>            | <u>604.3</u> | <u>721.1</u> | <u>823.4</u> |                           |            |            |
| Filter #       | <u>0523</u>                          | Probe #                 |              | Probe (in.)  |              |                           |            |            |
| Pitot #        |                                      | Nozzle #                |              | Nozzle Meas  |              |                           |            |            |

|                |                                      |                         |              |              |              |            |            |            |
|----------------|--------------------------------------|-------------------------|--------------|--------------|--------------|------------|------------|------------|
| Run#: <u>2</u> |                                      | Load: <u>75%</u> normal |              |              |              | Box#:      |            |            |
|                |                                      | Impinger 1              | Impinger 2   | Impinger 3   | Impinger 4   | Impinger 5 | Impinger 6 | Impinger 7 |
|                |                                      | (g)                     | (g)          | (g)          | (g)          |            |            |            |
| Contents       |                                      | Dry                     | Di Water     | Dry          | Sil Gel      |            |            |            |
| Final Value    | (V <sub>f</sub> ), (W <sub>f</sub> ) | <u>505.3</u>            | <u>615.7</u> | <u>730.5</u> | <u>872.9</u> |            |            |            |
| Initial Value  | (V <sub>i</sub> ), (W <sub>i</sub> ) | <u>351.7</u>            | <u>615.1</u> | <u>722.8</u> | <u>863.2</u> |            |            |            |
| Filter #       | <u>0916</u>                          | Probe #                 |              | Probe (in.)  |              |            |            |            |
| Pitot #        |                                      | Nozzle #                |              | Nozzle Meas  |              |            |            |            |

|                |                                      |              |              |              |              |            |            |            |
|----------------|--------------------------------------|--------------|--------------|--------------|--------------|------------|------------|------------|
| Run#: <u>3</u> |                                      | Load: normal |              |              |              | Box#:      |            |            |
|                |                                      | Impinger 1   | Impinger 2   | Impinger 3   | Impinger 4   | Impinger 5 | Impinger 6 | Impinger 7 |
|                |                                      | (g)          | (g)          | (g)          | (g)          |            |            |            |
| Contents       |                                      | Dry          | Di Water     | Dry          | Sil Gel      |            |            |            |
| Final Value    | (V <sub>f</sub> ), (W <sub>f</sub> ) | <u>516.0</u> | <u>603.5</u> | <u>726.6</u> | <u>834.4</u> |            |            |            |
| Initial Value  | (V <sub>i</sub> ), (W <sub>i</sub> ) | <u>359.8</u> | <u>604.6</u> | <u>724.5</u> | <u>823.3</u> |            |            |            |
| Filter #       | <u>0917</u>                          | Probe #      |              | Probe (in.)  |              |            |            |            |
| Pitot #        |                                      | Nozzle #     |              | Nozzle Meas  |              |            |            |            |

|               |                                      |              |            |             |            |            |            |            |
|---------------|--------------------------------------|--------------|------------|-------------|------------|------------|------------|------------|
| Run#:         |                                      | Load: normal |            |             |            | Box#:      |            |            |
|               |                                      | Impinger 1   | Impinger 2 | Impinger 3  | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 |
|               |                                      | (g)          | (g)        | (g)         | (g)        |            |            |            |
| Contents      |                                      | Dry          | Di Water   | Dry         | Sil Gel    |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) |              |            |             |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) |              |            |             |            |            |            |            |
| Filter #      |                                      | Probe #      |            | Probe (in.) |            |            |            |            |
| Pitot #       |                                      | Nozzle #     |            | Nozzle Meas |            |            |            |            |

Signature

## **EMISSION DATA RECORDS**

**100% Load**

**PM**

**Reference Method Data**



**METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE**

| Source Information       |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Fuel Type</b>         | Gas, Natural                             |

| Test Information                 |               |                            |         |
|----------------------------------|---------------|----------------------------|---------|
| <b>Project #</b>                 |               | catc-21-houston.tx-start#1 |         |
| <b>Operator</b>                  |               | TP                         |         |
| <b>Date for Preliminary Run</b>  | (mm/dd/yy)    | 08/31/21                   |         |
| <b>Standard Temperature</b>      |               | 68                         | °F      |
| <b>Standard Pressure</b>         |               | 29.92                      | in Hg   |
| <b>Run Duration</b>              | ≥ 2 min/point | 90                         | minutes |
| <b>Unit Number</b>               |               | 1                          |         |
| <b>Base Run Number</b>           |               | R-1 100%                   |         |
| <b>Number of Ports Available</b> |               | 2                          |         |
| <b>Number of Ports Used</b>      |               | 2                          |         |
| <b>Port Inside Diameter</b>      |               | 4.00                       | in      |
| <b>Stack Shape</b>               |               | Circular                   |         |

| Test Equipment Information             |                    |              |              |              |                     |
|----------------------------------------|--------------------|--------------|--------------|--------------|---------------------|
| Run                                    |                    | 1            | 2            | 3            |                     |
| <b>Test Date</b>                       | (mm/dd/yy)         | 08/31/21     | 08/31/21     | 08/31/21     |                     |
| <b>Load</b>                            |                    | 100%         | 100%         | 100%         | % or w/DB           |
| <b>Fuel F-Factor</b>                   |                    | 8631.42      | 8631.42      | 8631.42      | dscf/MMBtu          |
| <b>Meter Box Number</b>                | from ACS           | samp-cp-0021 | samp-cp-0021 | samp-cp-0021 |                     |
| <b>Meter Calibration Factor</b>        | (Y)                | 0.970        | 0.970        | 0.970        |                     |
| <b>Orifice Meter Coefficient</b>       | (ΔH <sub>@</sub> ) | 1.812        | 1.812        | 1.812        | in H <sub>2</sub> O |
| <b>Non-Console Manometer Used</b>      |                    | No           | No           | No           |                     |
| <b>Pitot Identification</b>            | from ACS           | A5708        | A5708        | A5708        |                     |
| <b>Pitot Tube Coefficient</b>          | (C <sub>p</sub> )  | 0.8230       | 0.8230       | 0.8230       |                     |
| <b>Nozzle Number</b>                   | from ACS           | H-10         | H-10         | H-10         |                     |
| <b>Nozzle Diameter</b>                 | (D <sub>n</sub> )  | 0.293        | 0.293        | 0.293        | in                  |
| <b>Probe Number</b>                    | from ACS           | samp-hp-0079 | samp-hp-0079 | samp-hp-0079 |                     |
| <b>Probe Length</b>                    |                    | 60.0         | 60.0         | 60.0         | in                  |
| <b>(SS, Glass ....) Liner Material</b> | from list          | glass        | glass        | glass        |                     |
| <b>Sample Case / Oven Number</b>       | from ACS           | samp-BH-0036 | samp-BH-0036 | samp-BH-0036 |                     |
| <b>Impinger Case Number</b>            | from ACS           | samp-cc-0009 | samp-cc-0009 | samp-cc-0009 |                     |

| Testing Company Information |                                                   |
|-----------------------------|---------------------------------------------------|
| <b>Company Name</b>         | Air Hygiene International, Inc. (Tulsa, Oklahoma) |
| <b>Address</b>              | 1600 W Tacoma Street                              |
| <b>City, State Zip</b>      | Broken Arrow, Oklahoma 74012                      |
| <b>Project Manager</b>      | Matt McBride                                      |
| <b>Phone Number</b>         | (918) 307-8865                                    |
| <b>Fax Number</b>           | (918) 307-9131                                    |

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# METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR CIRCULAR SOURCES

|                          |                                          |                         |          |
|--------------------------|------------------------------------------|-------------------------|----------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Date</b>             | 08/31/21 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Stack Type</b>       | Circular |
| <b>Operator</b>          | TP                                       | <b>Ports Available</b>  | 2        |
| <b>Project #</b>         | catc-21-houston.tx-start#1               | <b>Ports Used</b>       | 2        |
| <b>Stack Size</b>        | Large (>24 inch diameter)                | <b>Port ID (inches)</b> | 4.00     |

| Circular Stack or Duct Diameter       |              |       |                 |
|---------------------------------------|--------------|-------|-----------------|
| <b>Distance to Far Wall of Stack</b>  | ( $L_{fw}$ ) | 32.00 | in              |
| <b>Distance to Near Wall of Stack</b> | ( $L_{nw}$ ) | 0.125 | in              |
| <b>Diameter of Stack</b>              | ( $D$ )      | 31.88 | in              |
| <b>Area of Stack</b>                  | ( $A_s$ )    | 5.54  | ft <sup>2</sup> |

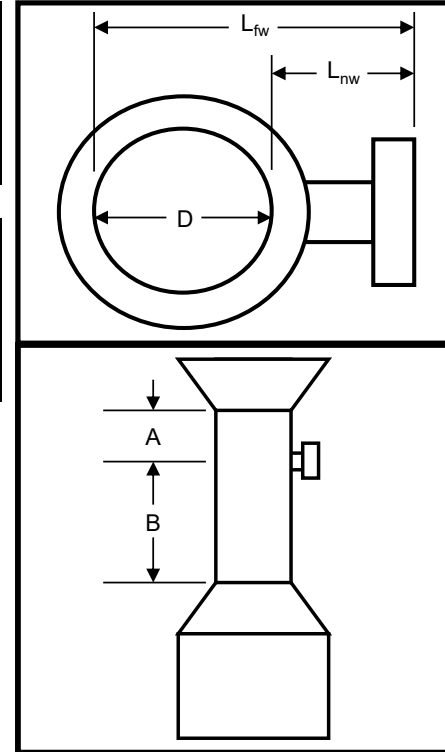
| Distance from Port to Disturbances |           |       |           |
|------------------------------------|-----------|-------|-----------|
| <b>Distance Upstream</b>           | ( $A$ )   | 16.00 | in        |
| <b>Diameters Upstream</b>          | ( $A_D$ ) | 0.50  | diameters |
| <b>Distance Downstream</b>         | ( $B$ )   | 64.00 | in        |
| <b>Diameters Downstream</b>        | ( $B_D$ ) | 2.01  | diameters |

| Number of Traverse Points Required |             |                                                |                      |
|------------------------------------|-------------|------------------------------------------------|----------------------|
| Diameters to Flow Disturbance      |             | Minimum Number of <sup>1</sup> Traverse Points |                      |
| Down Stream                        | Up Stream   | Particulate Points                             | Velocity Points      |
| 2.00-4.99                          | 0.50-1.24   | 24                                             | 16                   |
| 5.00-5.99                          | 1.25-1.49   | 20                                             | 16                   |
| 6.00-6.99                          | 1.50-1.74   | 16                                             | 12                   |
| 7.00-7.99                          | 1.75-1.99   | 12                                             | 12                   |
| $\geq 8.00$                        | $\geq 2.00$ | 8 or 12 <sup>2</sup>                           | 8 or 12 <sup>2</sup> |
| <b>Upstream Spec</b>               |             | 24                                             | 16                   |
| <b>Downstream Spec</b>             |             | 24                                             | 16                   |
| <b>Traverse Pts Required</b>       |             | 24                                             | 16                   |

<sup>1</sup> Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

<sup>2</sup> 8 for Circular Stacks 12 to 24 inches  
12 for Circular Stacks over 24 inches

| Location of Traverse Points in Circular Stacks |                                                                  |      |      |      |      |      |      |      |      |
|------------------------------------------------|------------------------------------------------------------------|------|------|------|------|------|------|------|------|
| Traverse Point                                 | (Fraction of Stack Dimension from Inside Wall to Traverse Point) |      |      |      |      |      |      |      |      |
| Number                                         | 2                                                                | 4    | 6    | 8    | 10   | 12   | 14   | 16   | 18   |
| 1                                              | .146                                                             | .067 | .044 | .032 | .026 | .021 | .018 | .016 | .014 |
| 2                                              | .854                                                             | .250 | .146 | .105 | .082 | .067 | .057 | .049 | .044 |
| 3                                              |                                                                  | .750 | .296 | .194 | .146 | .118 | .099 | .085 | .075 |
| 4                                              |                                                                  | .933 | .704 | .323 | .226 | .177 | .146 | .125 | .109 |
| 5                                              |                                                                  |      | .854 | .677 | .342 | .250 | .201 | .169 | .146 |
| 6                                              |                                                                  |      | .956 | .806 | .658 | .356 | .269 | .220 | .188 |
| 7                                              |                                                                  |      |      | .895 | .774 | .644 | .366 | .283 | .236 |
| 8                                              |                                                                  |      |      | .968 | .854 | .750 | .634 | .375 | .296 |
| 9                                              |                                                                  |      |      |      | .918 | .823 | .731 | .625 | .382 |
| 10                                             |                                                                  |      |      |      | .974 | .882 | .799 | .717 | .618 |
| 11                                             |                                                                  |      |      |      |      | .933 | .854 | .780 | .704 |
| 12                                             |                                                                  |      |      |      |      | .979 | .901 | .831 | .764 |



| Number of Traverse Points Used |                 |    |                 |
|--------------------------------|-----------------|----|-----------------|
| 2                              | <b>Ports by</b> | 12 | <b>Across</b>   |
| 24                             | <b>Pts Used</b> | 24 | <b>Required</b> |

Adjust Sample Points Out of Boundary Layer

| Traverse Point Locations |                            |                           |                                     |
|--------------------------|----------------------------|---------------------------|-------------------------------------|
| Traverse Point Number    | Fraction of Stack Diameter | Distance from Inside Wall | Distance Including Reference Length |
|                          |                            | in                        | in                                  |
| 1                        | 0.021                      | 5/8                       | 6/8                                 |
| 2                        | 0.067                      | 2 1/8                     | 2 2/8                               |
| 3                        | 0.118                      | 3 6/8                     | 3 7/8                               |
| 4                        | 0.177                      | 5 5/8                     | 5 6/8                               |
| 5                        | 0.250                      | 8                         | 8 1/8                               |
| 6                        | 0.356                      | 11 3/8                    | 11 4/8                              |
| 7                        | 0.644                      | 20 4/8                    | 20 5/8                              |
| 8                        | 0.750                      | 23 7/8                    | 24                                  |
| 9                        | 0.823                      | 26 2/8                    | 26 3/8                              |
| 10                       | 0.882                      | 28 1/8                    | 28 2/8                              |
| 11                       | 0.933                      | 29 6/8                    | 29 7/8                              |
| 12                       | 0.979                      | 31 2/8                    | 31 3/8                              |

## METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

|                          |                                          |                |   |                 |
|--------------------------|------------------------------------------|----------------|---|-----------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |                |   |                 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |                |   |                 |
| <b>Operator</b>          | TP                                       |                |   |                 |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |                |   |                 |
| <b>Pitot Leak Check</b>  | x                                        | <b>PreTest</b> | x | <b>PostTest</b> |

|                             |              |                             |       |
|-----------------------------|--------------|-----------------------------|-------|
| <b>Preliminary Run Date</b> | 08/31/21     |                             |       |
| <b>Stack Type</b>           | Circular     |                             |       |
| <b>Ports Available</b>      | 2            |                             |       |
| <b>Thermocouple ID</b>      | samp-hp-0079 |                             |       |
| <b>Pitot Coefficient</b>    | 0.8300       | <b>Pitot Identification</b> | A6904 |

| Stack Dimensions  |                   |       |                 |
|-------------------|-------------------|-------|-----------------|
| Area of Stack     | (A <sub>s</sub> ) | 5.54  | ft <sup>2</sup> |
| Diameter of Stack | (D)               | 31.88 | in              |

| Pressures                      |                  |       |                     |
|--------------------------------|------------------|-------|---------------------|
| <b>Barometric Pressure</b>     | ( $P_b$ )        | 29.69 | in Hg               |
| <b>Static Pressure</b>         | ( $P_{static}$ ) | -0.36 | in H <sub>2</sub> O |
| <b>Absolute Stack Pressure</b> | ( $P_s$ )        | 29.66 | in Hg               |

| Stack Gas Composition         |                       |       |            |
|-------------------------------|-----------------------|-------|------------|
| Composition Data:             | Estimated Composition |       |            |
| Carbon Dioxide Concentration  | (%CO <sub>2</sub> )   | 6.66  | %vd        |
| Oxygen Concentration          | (%O <sub>2</sub> )    | 8.94  | %vd        |
| Carbon Monoxide Concentration | (ppmCO)               | 3.59  | ppmvd      |
| Nitrogen Concentration        | (%N <sub>2</sub> )    | 84.40 | %vd        |
| Stack Moisture Content        | (B <sub>ws</sub> )    | 14.00 | %          |
| Stack Dry Molecular Weight    | (M <sub>d</sub> )     | 29.42 | lb/lb-mole |
| Stack Wet Molecular Weight    | (M <sub>w</sub> )     | 27.82 | lb/lb-mole |

| Results                     |              |         |          |
|-----------------------------|--------------|---------|----------|
| Avg Stack Gas Velocity      | ( $v_s$ )    | 62.17   | ft/sec   |
| Avg Stack Dry Std Flow Rate | ( $Q_{sd}$ ) | 418,383 | dscf/hr  |
| Avg Stack Dry Std Flow Rate | ( $Q_{sd}$ ) | 6,973   | dscf/min |
| Avg Stack Wet Flow Rate     | ( $Q_{sw}$ ) | 20,670  | acf/min  |
| Avg Stack Wet Std Flow Rate | ( $Q_{sw}$ ) | 486,492 | ascf/hr  |

**40 CFR 60, Method 2G, Section 8.11.1 (but applies to all Method 2 type static pressure measurements):**  
If a Type S probe is used for this measurement, position the probe at or between any traverse point(s) and rotate the probe until a null differential pressure reading is obtained. Disconnect the tubing from one of the pressure ports; read and record the  $\Delta P$ . For pressure devices with one-directional scales, if a deflection in the positive direction is noted with the negative side disconnected, then the static pressure is positive. Likewise, if a deflection in the positive direction is noted with the positive side disconnected, then the static pressure is negative.

**Stack Cross Section Schematic**

[illegible]

**METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER**

|                          |                                          |                             |               |                         |       |
|--------------------------|------------------------------------------|-----------------------------|---------------|-------------------------|-------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Preliminary Run Date</b> | 08/31/21      |                         |       |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Operator</b>             | TP            |                         |       |
| <b>Project #</b>         | catc-21-houston.tx-start#1               | <b># of Ports Used</b>      | 1 (gas probe) |                         |       |
| <b>Fuel Type</b>         | Gas, Natural                             | <b>Min. Fuel Factor</b>     | 1.600         | <b>Max. Fuel Factor</b> | 1.836 |

| Gas Analysis Data           |                             |                            |                 |                            |                             |                               |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------|----------------------------|-----------------------------|-------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | R-1 100%-1                  |                            | <b>Date</b>     | 08/31/21                   | <b>Run Start Time</b>       | 09:36                         | <b>Run Stop Time</b> | 11:17                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>CO Conc.</b> | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b> | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCO)         | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (Fo)avg                       | (%EA)avg             |                             |
| hh:mm                       | %                           | %                          | ppm             | %                          | lb/lb-mole                  |                               | %                    |                             |
| 01:41                       | 6.81                        | 8.64                       | 4.36            | 84.6                       | 29.44                       | 1.800                         | 63.1                 | YES                         |

| Gas Analysis Data           |                             |                            |                 |                            |                             |                               |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------|----------------------------|-----------------------------|-------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | R-1 100%-2                  |                            | <b>Date</b>     | 08/31/21                   | <b>Run Start Time</b>       | 12:05                         | <b>Run Stop Time</b> | 13:44                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>CO Conc.</b> | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b> | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCO)         | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (Fo)avg                       | (%EA)avg             |                             |
| hh:mm                       | %                           | %                          | ppm             | %                          | lb/lb-mole                  |                               | %                    |                             |
| 01:39                       | 6.58                        | 9.06                       | 2.18            | 84.4                       | 29.41                       | 1.800                         | 68.6                 | YES                         |

| Gas Analysis Data           |                             |                            |                 |                            |                             |                               |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------|----------------------------|-----------------------------|-------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | R-1 100%-3                  |                            | <b>Date</b>     | 08/31/21                   | <b>Run Start Time</b>       | 14:24                         | <b>Run Stop Time</b> | 16:05                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>CO Conc.</b> | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b> | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCO)         | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (Fo)avg                       | (%EA)avg             |                             |
| hh:mm                       | %                           | %                          | ppm             | %                          | lb/lb-mole                  |                               | %                    |                             |
| 01:41                       | 6.58                        | 9.06                       | 2.18            | 84.4                       | 29.41                       | 1.800                         | 68.6                 | YES                         |

# METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

|                          |                                          |                             |          |
|--------------------------|------------------------------------------|-----------------------------|----------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Preliminary Run Date</b> | 08/31/21 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Operator</b>             | TP       |
| <b>Project #</b>         | catc-21-houston.tx-start#1               | <b>Ports Used</b>           | 2        |

| Scale Daily Calibration |              |                 |               |                   |                  |
|-------------------------|--------------|-----------------|---------------|-------------------|------------------|
| <b>Scale Number</b>     | SAMP-SC-0025 | <b>Standard</b> | <b>Result</b> | <b>Difference</b> | <b>Pass/Fail</b> |
| <b>Date</b>             |              | (g)             | (g)           | (g)               | (± 0.5 g)        |
| <b>Test Day 1</b>       | 08/31/21     | 500             | 499.5         | -0.5              | Pass             |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | R-1 100%-1                          |                   | <b>Date</b>       | 08/31/21                      | <b>Start Time</b>            | 09:36                  | <b>Stop Time</b>  | 11:17               |
| <b>Meter Box Number</b>      | samp-cp-0021                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.970             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 62.495            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 29.72             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 878               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | -0.36             | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 84                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.41              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | Dry                                 |                   | DI Water          | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 540.00            | 641.60            | 676.30                        | 874.30                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 360.60            | 635.70            | 672.50                        | 859.20                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 179.4             | 5.9               | 3.8                           | 15.1                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>t</sub> )                   | 204.20            | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 9.628                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 58.697            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 14.09             | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 14.09                  | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | R-1 100%-2                          |                   | <b>Date</b>       | 08/31/21                      | <b>Start Time</b>            | 12:05                  | <b>Stop Time</b>  | 13:44               |
| <b>Meter Box Number</b>      | samp-cp-0021                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.970             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 62.465            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 29.71             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 878               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | -0.36             | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 91                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.43              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | Dry                                 |                   | DI Water          | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 521.40            | 609.40            | 723.30                        | 860.10                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 346.10            | 604.10            | 719.20                        | 844.50                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 175.3             | 5.3               | 4.1                           | 15.6                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>t</sub> )                   | 200.30            | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 9.444                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 57.810            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 14.04             | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 14.04                  | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | R-1 100%-3                          |                   | <b>Date</b>       | 08/31/21                      | <b>Start Time</b>            | 14:24                  | <b>Stop Time</b>  | 16:05               |
| <b>Meter Box Number</b>      | samp-cp-0021                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.970             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 62.265            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 29.66             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 877               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | -0.36             | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 77                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.47              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | Dry                                 |                   | DI Water          | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 573.90            | 618.50            | 758.30                        | 870.70                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 347.60            | 615.30            | 754.70                        | 855.40                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 226.3             | 3.2               | 3.6                           | 15.3                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>t</sub> )                   | 248.40            | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 11.712                 | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 59.138            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 16.53             | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 16.53                  | %                 |                     |

METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |  |                                          |  |  |  |            |  |            |  |                |  |  |  |  |  |
|-------------------|--|------------------------------------------|--|--|--|------------|--|------------|--|----------------|--|--|--|--|--|
| Plant Name        |  | Stewart and Stevenson Integration Center |  |  |  | Date       |  | 08/31/21   |  | Filter #       |  |  |  |  |  |
| Sampling Location |  | Caterpillar G3520 TALE                   |  |  |  | Operator   |  | TP         |  | 0523           |  |  |  |  |  |
| Project #         |  | catc-21-houston.tx-start#1               |  |  |  | Run Number |  | R-1 100%-1 |  | R-1 100%-1-CPM |  |  |  |  |  |

|             |          |       |          |         |            |      |          |                           |                    |        |    |  |  |  |  |
|-------------|----------|-------|----------|---------|------------|------|----------|---------------------------|--------------------|--------|----|--|--|--|--|
| Leak Checks |          |       |          |         |            |      |          | Sampling Equipment        |                    |        |    |  |  |  |  |
| [change]    |          |       |          | [level] |            |      |          | [time]                    |                    |        |    |  |  |  |  |
| Train       | Pre      | 0.000 | ft³/min@ | 15.0    | in Hg for  | 60.0 | sec ≥60] | Meter Box Number          | samp-cp-0021       |        |    |  |  |  |  |
| PASS        | Post     | 0.000 | ft³/min@ | 15.0    | in Hg for  | 60.0 | sec ≥60] | Meter Cal Factor          | (Y)                | 0.970  |    |  |  |  |  |
| Pitot       | Pre (+)  | 0.00  | in H₂O   | 4.5     | in H₂O for | 15.0 | sec ≥15] | Nozzle Number             | H-10               |        |    |  |  |  |  |
| PASS        | Pre (-)  | 0.00  | in H₂O   | 5.1     | in H₂O for | 15.0 | sec ≥15] | Average Nozzle Diameter   | (D <sub>na</sub> ) | 0.2930 | in |  |  |  |  |
|             | Post (+) | 0.00  | in H₂O   | 5.0     | in H₂O for | 15.0 | sec ≥15] | Suggested Nozzle Diameter | (D <sub>m</sub> )  | 0.2696 | in |  |  |  |  |
|             | Post (-) | 0.00  | in H₂O   | 5.2     | in H₂O for | 15.0 | sec ≥15] | Probe Number              | samp-hp-0079       |        | in |  |  |  |  |
|             |          |       |          |         |            |      |          | Probe Length              | 60                 |        | in |  |  |  |  |
|             |          |       |          |         |            |      |          | Liner Material            | glass              |        |    |  |  |  |  |
|             |          |       |          |         |            |      |          | Sample Case / Oven Number | samp-BH-0036       |        |    |  |  |  |  |
|             |          |       |          |         |            |      |          | Impinger Case Number      | samp-cc-0009       |        |    |  |  |  |  |

|                     |       |       |       |          |  |  |  |              |              |  |  |  |
|---------------------|-------|-------|-------|----------|--|--|--|--------------|--------------|--|--|--|
| Nozzle Measurements |       |       |       | ID: H-10 |  |  |  | Barometer ID |              |  |  |  |
| Pre                 | 0.293 | 0.292 | 0.294 | PASS     |  |  |  |              | SAMP-WE-0014 |  |  |  |
| Post                | 0.293 | 0.292 | 0.294 | PASS     |  |  |  |              | Scale ID     |  |  |  |
|                     |       |       |       |          |  |  |  | SAMP-SC-0025 |              |  |  |  |

|          |       |       |       |         |       |       |       |       |       |       |       |
|----------|-------|-------|-------|---------|-------|-------|-------|-------|-------|-------|-------|
| Run Time |       |       |       | Weights |       |       |       |       |       |       |       |
| Start    | 09:36 | End   | 11:17 | Imp 1   | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
| Pre      | 360.6 | 635.7 | 672.5 | 859.2   |       |       |       |       |       |       |       |
| Post     | 540.0 | 641.6 | 676.3 | 874.3   |       |       |       |       |       |       |       |

|                                                   |                                     |        |                     |                         |                        |       |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|-------------------------|------------------------|-------|---------------------|
| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     | Pressures               |                        |       |                     |
| Pitot Coefficient / ID                            | (C <sub>p</sub> )                   | 0.8230 | A5708               | Barometric Pressure     | (P <sub>b</sub> )      | 29.72 | in Hg               |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 877.8  | °F                  | Stack Static Pressure   | (P <sub>static</sub> ) | -0.36 | in H <sub>2</sub> O |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 83.5   |                     | Absolute Stack Pressure | (P <sub>a</sub> )      | 29.69 | in Hg               |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.812  | in H <sub>2</sub> O | Absolute Meter Pressure | (P <sub>m</sub> )      | 29.85 | in Hg               |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.76   | in H <sub>2</sub> O |                         |                        |       |                     |
| Stack Moisture Content                            | (B <sub>wt</sub> )                  | 14.09  | %                   |                         |                        |       |                     |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.44  | lb/lb-mole          |                         |                        |       |                     |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.75   | acfm                |                         |                        |       |                     |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 | 2.43   |                     |                         |                        |       |                     |

|              |  |  |  |  |  |    |
|--------------|--|--|--|--|--|----|
| Wash Volumes |  |  |  |  |  | ml |
|              |  |  |  |  |  | ml |

|                     |                   |              |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
|---------------------|-------------------|--------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-----------------------|------------------------|----------------------------|--------------------|------------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
| Identification Nos. |                   | samp-cp-0021 | samp-cp-0021                            | samp-cp-0021        |                                       |                                      | samp-hp-0079                 | samp-hp-0079          | samp-BH-0036           | samp-cc-0009               | 2917               | 1004                         | samp-cp-0021                        | samp-cp-0021                         |             |                                     |                                        |                                                      |                               |                                                       |
| Traverse Point #    | Sampling Time (Θ) | Timer Time   | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Probe Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (≤68°F) | Cond. Temp (≤85°F) | CPM Filter Temp (76.5±8.5°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (V <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|                     | min               | hh:mm:ss     | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                    | °F                     | °F                         | °F                 | °F                           | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1                 | 0.0               | 00:00:00     | 921.610                                 | 0.65                | 1.577                                 | 1.60                                 | 888                          | 888                   | 252                    | 53                         | 73                 | 84                           | 77                                  | 77                                   | 4.5         | 0.81                                | 72.46                                  | 2.402                                                | 94.3                          | 57.638                                                |
| A-2                 | 3.8               | 00:03:45     | 924.135                                 | 0.66                | 1.601                                 | 1.60                                 | 890                          | 890                   | 253                    | 56                         | 77                 | 85                           | 79                                  | 79                                   | 5.0         | 0.81                                | 73.07                                  | 5.097                                                | 100.0                         | 61.170                                                |
| A-3                 | 7.5               | 00:07:30     | 926.980                                 | 0.65                | 1.577                                 | 1.60                                 | 888                          | 888                   | 249                    | 56                         | 85                 | 84                           | 79                                  | 79                                   | 5.0         | 0.81                                | 72.46                                  | 7.817                                                | 102.3                         | 62.536                                                |
| A-4                 | 11.3              | 00:11:15     | 929.850                                 | 0.71                | 1.722                                 | 1.70                                 | 887                          | 887                   | 249                    | 54                         | 83                 | 82                           | 79                                  | 79                                   | 5.0         | 0.84                                | 75.70                                  | 10.566                                               | 102.6                         | 63.394                                                |
| A-5                 | 15.0              | 00:15:00     | 932.750                                 | 0.72                | 1.746                                 | 1.80                                 | 885                          | 885                   | 250                    | 58                         | 85                 | 81                           | 81                                  | 81                                   | 5.0         | 0.85                                | 76.17                                  | 13.584                                               | 104.8                         | 65.201                                                |
| A-6                 | 18.8              | 00:18:45     | 935.945                                 | 0.75                | 1.819                                 | 1.80                                 | 882                          | 882                   | 253                    | 55                         | 82                 | 79                           | 80                                  | 80                                   | 5.0         | 0.87                                | 77.66                                  | 15.836                                               | 101.5                         | 63.343                                                |
| A-7                 | 22.5              | 00:22:30     | 938.325                                 | 0.65                | 1.577                                 | 1.60                                 | 875                          | 875                   | 252                    | 57                         | 81                 | 81                           | 81                                  | 81                                   | 5.0         | 0.81                                | 72.11                                  | 18.607                                               | 102.5                         | 63.794                                                |
| A-8                 | 26.3              | 00:26:15     | 941.260                                 | 0.56                | 1.358                                 | 1.30                                 | 874                          | 874                   | 248                    | 61                         | 82                 | 83                           | 83                                  | 83                                   | 3.5         | 0.75                                | 66.90                                  | 21.079                                               | 102.7                         | 63.236                                                |
| A-9                 | 30.0              | 00:30:00     | 943.890                                 | 0.49                | 1.188                                 | 1.20                                 | 862                          | 862                   | 256                    | 63                         | 73                 | 83                           | 82                                  | 82                                   | 3.5         | 0.70                                | 62.30                                  | 23.437                                               | 103.0                         | 62.498                                                |
| A-10                | 33.8              | 00:33:45     | 946.395                                 | 0.40                | 0.970                                 | 0.98                                 | 863                          | 863                   | 246                    | 60                         | 74                 | 83                           | 84                                  | 84                                   | 3.5         | 0.63                                | 56.31                                  | 25.762                                               | 104.1                         | 61.828                                                |
| A-11                | 37.5              | 00:37:30     | 948.875                                 | 0.39                | 0.946                                 | 0.95                                 | 855                          | 855                   | 248                    | 61                         | 69                 | 83                           | 84                                  | 84                                   | 3.0         | 0.62                                | 55.43                                  | 27.754                                               | 103.8                         | 60.553                                                |
| A-12                | 41.3              | 00:41:15     | 951.000                                 | 0.39                | 0.946                                 | 0.95                                 | 855                          | 855                   | 256                    | 66                         | 74                 | 85                           | 84                                  | 84                                   | 3.0         | 0.62                                | 55.43                                  | 29.628                                               | 103.2                         | 59.257                                                |
| B-1                 | 45.0              | 00:45:00     | 953.000                                 | 0.51                | 1.237                                 | 1.20                                 | 882                          | 882                   | 256                    | 66                         | 73                 | 85                           | 85                                  | 85                                   | 3.5         | 0.71                                | 64.04                                  | 31.805                                               | 102.7                         | 58.717                                                |
| B-2                 | 48.8              | 00:48:45     | 955.325                                 | 0.53                | 1.286                                 | 1.30                                 | 884                          | 884                   | 246                    | 52                         | 77                 | 82                           | 84                                  | 84                                   | 4.0         | 0.73                                | 65.33                                  | 34.198                                               | 102.8                         | 58.624                                                |
| B-3                 | 52.5              | 00:52:30     | 957.875                                 | 0.57                | 1.383                                 | 1.40                                 | 884                          | 884                   | 251                    | 50                         | 75                 | 78                           | 85                                  | 85                                   | 4.0         | 0.75                                | 67.75                                  | 36.600                                               | 102.6                         | 58.560                                                |
| B-4                 | 56.3              | 00:56:15     | 960.440                                 | 0.61                | 1.480                                 | 1.50                                 | 885                          | 885                   | 250                    | 54                         | 55                 | 78                           | 84                                  | 84                                   | 4.0         | 0.78                                | 70.11                                  | 39.003                                               | 102.3                         | 58.505                                                |
| B-5                 | 60.0              | 01:00:00     | 963.000                                 | 0.63                | 1.528                                 | 1.50                                 | 886                          | 886                   | 254                    | 55                         | 55                 | 79                           | 85                                  | 85                                   | 4.0         | 0.79                                | 71.28                                  | 41.486                                               | 102.1                         | 58.568                                                |
| B-6                 | 63.8              | 01:03:45     | 965.650                                 | 0.66                | 1.601                                 | 1.60                                 | 886                          | 886                   | 250                    | 57                         | 57                 | 80                           | 86                                  | 86                                   | 4.5         | 0.81                                | 72.96                                  | 44.077                                               | 102.0                         | 58.769                                                |
| B-7                 | 67.5              | 01:07:30     | 968.420                                 | 0.71                | 1.722                                 | 1.70                                 | 882                          | 882                   | 253                    | 58                         | 60                 | 79                           | 86                                  | 86                                   | 4.5         | 0.84                                | 75.56                                  | 46.631                                               | 101.7                         | 58.903                                                |
| B-8                 | 71.3              | 01:11:15     | 971.150                                 | 0.65                | 1.577                                 | 1.60                                 | 878                          | 878                   | 253                    | 58                         | 66                 | 84                           | 86                                  | 86                                   | 4.5         | 0.81                                | 72.19                                  | 49.297                                               | 101.8                         | 59.157                                                |
| B-9                 | 75.0              | 01:15:00     | 974.000                                 | 0.58                | 1.407                                 | 1.40                                 | 876                          | 876                   | 249                    | 59                         | 62                 | 85                           | 87                                  | 87                                   | 4.5         | 0.76                                | 68.14                                  | 51.836                                               | 102.0                         | 59.241                                                |
| B-10                | 78.8              | 01:18:45     | 976.720                                 | 0.56                | 1.358                                 | 1.40                                 | 875                          | 875                   | 251                    | 60                         | 59                 | 85                           | 87                                  | 87                                   | 4.5         | 0.75                                | 66.93                                  | 54.286                                               | 102.0                         | 59.221                                                |
| B-11                | 82.5              | 01:22:30     | 979.345                                 | 0.47                | 1.140                                 | 1.10                                 | 870                          | 870                   | 251                    | 56                         | 57                 | 85                           | 88                                  | 88                                   | 3.5         | 0.69                                | 61.20                                  | 56.515                                               | 102.0                         | 58.972                                                |
| B-12                | 86.3              | 01:26:15     | 981.740                                 | 0.46                | 1.116                                 | 1.10                                 | 874                          | 874                   | 255                    | 63                         | 61                 | 85                           | 89                                  | 89                                   | 3.5         | 0.68                                | 60.64                                  | 58.713                                               | 102.0                         | 58.713                                                |
| Last Pt             | 90.0              | 01:30:00     | 984.105                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val           | 90.0              | 01:30:00     | 984.105                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      | Max Vac     | 5.0                                 | Final Values                           | 58.713                                               | 102.0                         |                                                       |
| Average Values      |                   |              |                                         | 0.58                |                                       | 1.41                                 | 878                          | 878                   | 251                    | 58                         | 71                 | 82                           | 84                                  | 84                                   |             | 0.76                                | 68.00                                  |                                                      |                               |                                                       |
|                     |                   |              |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    | 84                           |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |

Notes:

Probe temp out of specification due to: stack temp

METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                                          |
|-------------------|------------------------------------------|
| Plant Name        | Stewart and Stevenson Integration Center |
| Sampling Location | Caterpillar G3520 TALE                   |
| Project #         | catc-21-houston.tx-start#1               |

|            |            |
|------------|------------|
| Date       | 08/31/21   |
| Operator   | TP         |
| Run Number | R-1 100%-2 |

|          |                |
|----------|----------------|
| Filter # | 0916           |
|          | R-1 100%-2-CPM |

| Leak Checks |          | [change] | [level]               | [time] |
|-------------|----------|----------|-----------------------|--------|
| Train       | Pre      | 0.000    | ft <sup>3</sup> /min@ | 15.0   |
| PASS        | Post     | 0.000    | ft <sup>3</sup> /min@ | 15.0   |
| Pitot       | Pre (+)  | 0.00     | in H <sub>2</sub> O   | 4.6    |
|             | Pre (-)  | 0.00     | in H <sub>2</sub> O   | 4.3    |
|             | Post (+) | 0.00     | in H <sub>2</sub> O   | 5.1    |
|             | Post (-) | 0.00     | in H <sub>2</sub> O   | 4.3    |

| Nozzle Measurements |       | ID: H-10 |      |
|---------------------|-------|----------|------|
| Pre                 | 0.293 | 0.292    | PASS |
| Post                | 0.293 | 0.292    | PASS |

| Run Time |       |
|----------|-------|
| Start    | 12:05 |
| End      | 13:44 |

| Barometer ID |  |
|--------------|--|
| SAMP-WE-0014 |  |
| Scale ID     |  |
| SAMP-SC-0025 |  |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 346.1 | 604.1 | 719.2 | 844.5 |       |       |       |       |
| Post    | 521.4 | 609.4 | 723.3 | 860.1 |       |       |       |       |

| Sampling Equipment        |                    |        |
|---------------------------|--------------------|--------|
| Meter Box Number          | samp-cp-0021       |        |
| Meter Cal Factor          | (Y)                | 0.970  |
| Nozzle Number             | H-10               |        |
| Average Nozzle Diameter   | (D <sub>na</sub> ) | 0.2930 |
| Suggested Nozzle Diameter | (D <sub>m</sub> )  | 0.2494 |
| Probe Number              | samp-hp-0079       |        |
| Probe Length              | 60                 |        |
| Liner Material            | glass              |        |
| Sample Case / Oven Number | samp-BH-0036       |        |
| Impinger Case Number      | samp-cc-0009       |        |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient / ID                            | (C <sub>p</sub> )                   | 0.8230 | A5708               |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 878.1  | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 91.5   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.812  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.76   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 14.04  | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.41  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.65   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 | 2.46   |                     |

| Pressures               |                        |       |
|-------------------------|------------------------|-------|
| Barometric Pressure     | (P <sub>b</sub> )      | 29.71 |
| Stack Static Pressure   | (P <sub>static</sub> ) | -0.36 |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 29.68 |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 29.84 |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Identification Nos. |                   | samp-cp-0021 | samp-cp-0021                            | samp-cp-0021        |                                       |                                      | samp-hp-0079                 | samp-hp-0079          | samp-BH-0036           | samp-cc-0009               | 3006               | 8471                         | samp-cp-0021                        | samp-cp-0021                         |             |                                                            |                                        |                                                      |                               |                                                       |
|---------------------|-------------------|--------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-----------------------|------------------------|----------------------------|--------------------|------------------------------|-------------------------------------|--------------------------------------|-------------|------------------------------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
| Traverse Point #    | Sampling Time (Θ) | Timer Time   | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Probe Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (≤68°F) | Cond. Temp (≤85°F) | CPM Filter Temp (76.5±8.5°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (Δp <sup>1/2</sup> ) √(in H <sub>2</sub> O) | Local Stack Velocity (V <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|                     | min               | hh:mm:ss     | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                    | °F                     | °F                         | °F                 | °F                           | °F                                  | °F                                   | in Hg       |                                                            | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1                 | 0.0               | 00:00:00     | 984.410                                 | 0.60                | 1.477                                 | 1.50                                 | 883                          | 883                   | 255                    | 64                         | 46                 | 84                           | 88                                  | 88                                   | 4.5         | 0.77                                                       | 69.51                                  | 2.534                                                | 103.3                         | 60.807                                                |
| A-2                 | 3.8               | 00:03:45     | 987.130                                 | 0.60                | 1.477                                 | 1.50                                 | 881                          | 881                   | 251                    | 59                         | 47                 | 84                           | 87                                  | 87                                   | 4.5         | 0.77                                                       | 69.46                                  | 5.025                                                | 102.4                         | 60.303                                                |
| A-3                 | 7.5               | 00:07:30     | 989.800                                 | 0.64                | 1.576                                 | 1.60                                 | 883                          | 883                   | 247                    | 56                         | 50                 | 76                           | 88                                  | 88                                   | 4.5         | 0.80                                                       | 71.79                                  | 7.541                                                | 101.3                         | 60.327                                                |
| A-4                 | 11.3              | 00:11:15     | 992.500                                 | 0.63                | 1.551                                 | 1.50                                 | 883                          | 883                   | 254                    | 56                         | 51                 | 73                           | 88                                  | 88                                   | 4.5         | 0.79                                                       | 71.23                                  | 10.009                                               | 100.6                         | 60.056                                                |
| A-5                 | 15.0              | 00:15:00     | 995.150                                 | 0.64                | 1.576                                 | 1.60                                 | 882                          | 882                   | 250                    | 56                         | 57                 | 73                           | 89                                  | 89                                   | 4.5         | 0.80                                                       | 71.76                                  | 12.627                                               | 101.1                         | 60.611                                                |
| A-6                 | 18.8              | 00:18:45     | 997.965                                 | 0.68                | 1.674                                 | 1.70                                 | 882                          | 882                   | 247                    | 56                         | 63                 | 77                           | 90                                  | 90                                   | 4.5         | 0.82                                                       | 73.97                                  | 15.074                                               | 99.9                          | 60.296                                                |
| A-7                 | 22.5              | 00:22:30     | 1000.600                                | 0.62                | 1.527                                 | 1.50                                 | 878                          | 878                   | 251                    | 57                         | 49                 | 76                           | 92                                  | 92                                   | 4.5         | 0.79                                                       | 70.53                                  | 17.686                                               | 100.6                         | 60.639                                                |
| A-8                 | 26.3              | 00:26:15     | 1003.425                                | 0.56                | 1.379                                 | 1.40                                 | 874                          | 874                   | 250                    | 56                         | 49                 | 72                           | 91                                  | 91                                   | 4.5         | 0.75                                                       | 66.93                                  | 20.104                                               | 100.7                         | 60.311                                                |
| A-9                 | 30.0              | 00:30:00     | 1006.035                                | 0.53                | 1.305                                 | 1.30                                 | 873                          | 873                   | 253                    | 55                         | 47                 | 71                           | 92                                  | 92                                   | 4.0         | 0.73                                                       | 65.09                                  | 22.414                                               | 100.6                         | 59.772                                                |
| A-10                | 33.8              | 00:33:45     | 1008.535                                | 0.47                | 1.157                                 | 1.10                                 | 872                          | 872                   | 253                    | 56                         | 48                 | 70                           | 93                                  | 93                                   | 3.5         | 0.69                                                       | 61.27                                  | 24.637                                               | 100.7                         | 59.128                                                |
| A-11                | 37.5              | 00:37:30     | 1010.945                                | 0.44                | 1.083                                 | 1.10                                 | 867                          | 867                   | 256                    | 57                         | 50                 | 71                           | 93                                  | 93                                   | 3.5         | 0.66                                                       | 59.17                                  | 26.785                                               | 100.8                         | 58.441                                                |
| A-12                | 41.3              | 00:41:15     | 1013.275                                | 0.44                | 1.083                                 | 1.10                                 | 862                          | 862                   | 251                    | 56                         | 52                 | 71                           | 94                                  | 94                                   | 3.5         | 0.66                                                       | 59.06                                  | 28.880                                               | 100.7                         | 57.759                                                |
| B-1                 | 45.0              | 00:45:00     | 1015.550                                | 0.63                | 1.551                                 | 1.50                                 | 884                          | 884                   | 254                    | 68                         | 59                 | 85                           | 94                                  | 94                                   | 4.0         | 0.79                                                       | 71.25                                  | 31.321                                               | 100.4                         | 57.824                                                |
| B-2                 | 48.8              | 00:48:45     | 1018.200                                | 0.63                | 1.551                                 | 1.50                                 | 886                          | 886                   | 252                    | 56                         | 64                 | 84                           | 94                                  | 94                                   | 4.0         | 0.79                                                       | 71.31                                  | 33.781                                               | 100.2                         | 57.911                                                |
| B-3                 | 52.5              | 00:52:30     | 1020.870                                | 0.64                | 1.576                                 | 1.60                                 | 889                          | 889                   | 247                    | 57                         | 69                 | 83                           | 94                                  | 94                                   | 4.5         | 0.80                                                       | 71.95                                  | 36.279                                               | 100.1                         | 58.046                                                |
| B-4                 | 56.3              | 00:56:15     | 1023.580                                | 0.67                | 1.650                                 | 1.60                                 | 884                          | 884                   | 248                    | 61                         | 52                 | 80                           | 96                                  | 96                                   | 4.5         | 0.82                                                       | 73.48                                  | 38.915                                               | 100.2                         | 58.372                                                |
| B-5                 | 60.0              | 01:00:00     | 1026.450                                | 0.67                | 1.650                                 | 1.60                                 | 883                          | 883                   | 247                    | 64                         | 55                 | 69                           | 97                                  | 97                                   | 4.5         | 0.82                                                       | 73.45                                  | 41.344                                               | 99.8                          | 58.368                                                |
| B-6                 | 63.8              | 01:03:45     | 1029.100                                | 0.69                | 1.699                                 | 1.70                                 | 882                          | 882                   | 249                    | 63                         | 55                 | 70                           | 96                                  | 96                                   | 4.5         | 0.83                                                       | 74.51                                  | 44.145                                               | 100.3                         | 58.860                                                |
| B-7                 | 67.5              | 01:07:30     | 1032.150                                | 0.69                | 1.699                                 | 1.70                                 | 882                          | 882                   | 256                    | 64                         | 61                 | 71                           | 95                                  | 95                                   | 4.5         | 0.83                                                       | 74.51                                  | 46.519                                               | 99.7                          | 58.761                                                |
| B-8                 | 71.3              | 01:11:15     | 1034.730                                | 0.70                | 1.724                                 | 1.70                                 | 887                          | 887                   | 254                    | 64                         | 66                 | 73                           | 93                                  | 93                                   | 4.5         | 0.84                                                       | 75.19                                  | 49.124                                               | 99.7                          | 58.948                                                |
| B-9                 | 75.0              | 01:15:00     | 1037.550                                | 0.55                | 1.354                                 | 1.30                                 | 879                          | 879                   | 249                    | 67                         | 71                 | 74                           | 90                                  | 90                                   | 4.0         | 0.74                                                       | 66.45                                  | 51.526                                               | 99.8                          | 58.887                                                |
| B-10                | 78.8              | 01:18:45     | 1040.140                                | 0.45                | 1.108                                 | 1.10                                 | 878                          | 878                   | 254                    | 64                         | 52                 | 74                           | 88                                  | 88                                   | 3.5         | 0.67                                                       | 60.09                                  | 53.764                                               | 100.0                         | 58.652                                                |
| B-11                | 82.5              | 01:22:30     | 1042.545                                | 0.41                | 1.010                                 | 1.00                                 | 860                          | 860                   | 255                    | 63                         | 50                 | 72                           | 87                                  | 87                                   | 3.0         | 0.64                                                       | 56.97                                  | 55.801                                               | 100.0                         | 58.227                                                |
| B-12                | 86.3              | 01:26:15     | 1044.730                                | 0.42                | 1.034                                 | 1.00                                 | 860                          | 860                   | 248                    | 67                         | 48                 | 73                           | 86                                  | 86                                   | 3.0         | 0.65                                                       | 57.66                                  | 57.804                                               | 99.9                          | 57.804                                                |
| Last Pt             | 90.0              | 01:30:00     | 1046.875                                |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |             |                                                            |                                        |                                                      |                               |                                                       |
| Final Val           | 90.0              | 01:30:00     | 1046.875                                |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      | Max Vac     | 4.5                                                        | Final Values                           | 57.804                                               | 99.9                          |                                                       |
| Average Values      |                   |              |                                         | 0.58                |                                       | 1.43                                 | 878                          | 878                   | 251                    | 60                         | 55                 | 75                           | 91                                  | 91                                   |             | 0.76                                                       | 68.19                                  |                                                      |                               |                                                       |
|                     |                   |              |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    |                              | 91                                  |                                      |             |                                                            |                                        |                                                      |                               |                                                       |

Notes:

Probe temp out of specification due to: stack temp

METHOD 5 (FRONT) AND 202 (BACK) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                                          |
|-------------------|------------------------------------------|
| Plant Name        | Stewart and Stevenson Integration Center |
| Sampling Location | Caterpillar G3520 TALE                   |
| Project #         | catc-21-houston.tx-start#1               |

|            |            |
|------------|------------|
| Date       | 08/31/21   |
| Operator   | TP         |
| Run Number | R-1 100%-3 |

|          |                |
|----------|----------------|
| Filter # | 0917           |
|          | R-1 100%-3-CPM |

| Leak Checks |       |          | [change]              | [level]             | [time]                                     |
|-------------|-------|----------|-----------------------|---------------------|--------------------------------------------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                | in Hg for 60.0 sec [≥60]                   |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                | in Hg for 60.0 sec [≥60]                   |
| PASS        | Pitot | Pre (+)  | 0.00                  | in H <sub>2</sub> O | 5.0 in H <sub>2</sub> O for 15.0 sec [≥15] |
|             |       | Pre (-)  | 0.00                  | in H <sub>2</sub> O | 6.0 in H <sub>2</sub> O for 15.0 sec [≥15] |
|             |       | Post (+) | 0.00                  | in H <sub>2</sub> O | 5.8 in H <sub>2</sub> O for 15.0 sec [≥15] |
|             |       | Post (-) | 0.00                  | in H <sub>2</sub> O | 5.2 in H <sub>2</sub> O for 15.0 sec [≥15] |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | samp-cp-0021       |           |
| Meter Cal Factor          | (Y)                | 0.970     |
| Nozzle Number             | H-10               |           |
| Average Nozzle Diameter   | (D <sub>na</sub> ) | 0.2930 in |
| Suggested Nozzle Diameter | (D <sub>m</sub> )  | 0.2501 in |
| Probe Number              | samp-hp-0079       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | glass              |           |
| Sample Case / Oven Number | samp-BH-0036       |           |
| Impinger Case Number      | samp-cc-0009       |           |

| Nozzle Measurements |       | ID: H-10 |       |      |
|---------------------|-------|----------|-------|------|
| Pre                 | 0.293 | 0.292    | 0.294 | PASS |
| Post                | 0.293 | 0.292    | 0.294 | PASS |

| Barometer ID |  |
|--------------|--|
| SAMP-WE-0014 |  |
| Scale ID     |  |
| SAMP-SC-0025 |  |

| Run Time |       |           |
|----------|-------|-----------|
| Start    | 14:24 | End 16:05 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 347.6 | 615.3 | 754.7 | 855.4 |       |       |       |       |
| Post    | 573.9 | 618.5 | 758.3 | 870.7 |       |       |       |       |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient / ID                            | (C <sub>p</sub> )                   | 0.8230 | A5708               |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 876.7  | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 76.5   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.812  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.76   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 16.53  | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.41  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.64   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 | 2.28   |                     |

| Pressures               |                        |                           |
|-------------------------|------------------------|---------------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 29.66 in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | -0.36 in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 29.63 in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 29.79 in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Identification Nos. |                   | samp-cp-0021 | samp-cp-0021                            | samp-cp-0021        |                                       |                                      | samp-hp-0079                 | samp-hp-0079          | samp-BH-0036           | samp-cc-0009               | 2917               | 1004                         | samp-cp-0021                        | samp-cp-0021                         |             |                                     |                                        |                                                      |                               |                                                       |
|---------------------|-------------------|--------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-----------------------|------------------------|----------------------------|--------------------|------------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
| Traverse Point #    | Sampling Time (Θ) | Timer Time   | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Probe Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (≤68°F) | Cond. Temp (≤85°F) | CPM Filter Temp (76.5±8.5°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (Δp <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|                     | min               | hh:mm:ss     | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                    | °F                     | °F                         | °F                 | °F                           | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1                 | 0.0               | 00:00:00     | 48.125                                  | 0.63                | 1.439                                 | 1.60                                 | 885                          | 885                   | 251                    | 67                         | 38                 | 84                           | 72                                  | 72                                   | 3.5         | 0.79                                | 71.71                                  | 2.597                                                | 106.0                         | 62.317                                                |
| A-2                 | 3.8               | 00:03:45     | 50.835                                  | 0.63                | 1.439                                 | 1.60                                 | 888                          | 888                   | 252                    | 58                         | 41                 | 76                           | 73                                  | 73                                   | 3.5         | 0.79                                | 71.79                                  | 5.140                                                | 105.0                         | 61.684                                                |
| A-3                 | 7.5               | 00:07:30     | 53.495                                  | 0.72                | 1.645                                 | 1.80                                 | 890                          | 890                   | 249                    | 55                         | 43                 | 71                           | 75                                  | 75                                   | 3.5         | 0.85                                | 76.80                                  | 7.843                                                | 104.4                         | 62.742                                                |
| A-4                 | 11.3              | 00:11:15     | 56.330                                  | 0.75                | 1.713                                 | 1.90                                 | 886                          | 886                   | 255                    | 55                         | 43                 | 68                           | 75                                  | 75                                   | 3.5         | 0.87                                | 78.27                                  | 10.675                                               | 104.8                         | 64.047                                                |
| A-5                 | 15.0              | 00:15:00     | 59.300                                  | 0.75                | 1.713                                 | 1.90                                 | 885                          | 885                   | 254                    | 55                         | 43                 | 68                           | 75                                  | 75                                   | 3.5         | 0.87                                | 78.24                                  | 13.487                                               | 104.9                         | 64.739                                                |
| A-6                 | 18.8              | 00:18:45     | 62.250                                  | 0.72                | 1.645                                 | 1.80                                 | 881                          | 881                   | 254                    | 54                         | 44                 | 68                           | 76                                  | 76                                   | 3.5         | 0.85                                | 76.55                                  | 16.246                                               | 104.9                         | 64.986                                                |
| A-7                 | 22.5              | 00:22:30     | 65.150                                  | 0.66                | 1.508                                 | 1.60                                 | 880                          | 880                   | 255                    | 52                         | 44                 | 68                           | 76                                  | 76                                   | 3.5         | 0.81                                | 73.26                                  | 18.862                                               | 104.8                         | 64.668                                                |
| A-8                 | 26.3              | 00:26:15     | 67.900                                  | 0.60                | 1.371                                 | 1.50                                 | 877                          | 877                   | 255                    | 52                         | 46                 | 69                           | 76                                  | 76                                   | 3.5         | 0.77                                | 69.77                                  | 21.476                                               | 105.3                         | 64.428                                                |
| A-9                 | 30.0              | 00:30:00     | 70.650                                  | 0.48                | 1.097                                 | 1.20                                 | 877                          | 877                   | 253                    | 52                         | 43                 | 68                           | 76                                  | 76                                   | 3.0         | 0.69                                | 62.41                                  | 23.937                                               | 106.3                         | 63.831                                                |
| A-10                | 33.8              | 00:33:45     | 73.240                                  | 0.40                | 0.914                                 | 1.00                                 | 865                          | 865                   | 257                    | 52                         | 41                 | 69                           | 77                                  | 77                                   | 2.5         | 0.63                                | 56.71                                  | 26.060                                               | 106.4                         | 62.544                                                |
| A-11                | 37.5              | 00:37:30     | 75.480                                  | 0.37                | 0.845                                 | 0.91                                 | 862                          | 862                   | 249                    | 51                         | 42                 | 69                           | 77                                  | 77                                   | 2.5         | 0.61                                | 54.48                                  | 28.040                                               | 106.3                         | 61.179                                                |
| A-12                | 41.3              | 00:41:15     | 77.570                                  | 0.36                | 0.822                                 | 0.90                                 | 854                          | 854                   | 254                    | 54                         | 44                 | 70                           | 77                                  | 77                                   | 2.5         | 0.60                                | 53.58                                  | 29.954                                               | 106.0                         | 59.909                                                |
| B-1                 | 45.0              | 00:45:00     | 79.590                                  | 0.65                | 1.485                                 | 1.60                                 | 882                          | 882                   | 248                    | 63                         | 38                 | 74                           | 75                                  | 75                                   | 3.0         | 0.81                                | 72.76                                  | 32.489                                               | 105.7                         | 59.979                                                |
| B-2                 | 48.8              | 00:48:45     | 82.250                                  | 0.65                | 1.485                                 | 1.60                                 | 882                          | 882                   | 250                    | 50                         | 38                 | 68                           | 75                                  | 75                                   | 3.0         | 0.81                                | 72.76                                  | 35.061                                               | 105.5                         | 60.105                                                |
| B-3                 | 52.5              | 00:52:30     | 84.950                                  | 0.71                | 1.622                                 | 1.80                                 | 883                          | 883                   | 251                    | 49                         | 38                 | 68                           | 75                                  | 75                                   | 3.5         | 0.84                                | 76.07                                  | 37.635                                               | 105.1                         | 60.216                                                |
| B-4                 | 56.3              | 00:56:15     | 87.650                                  | 0.74                | 1.691                                 | 1.80                                 | 884                          | 884                   | 248                    | 52                         | 41                 | 68                           | 77                                  | 77                                   | 3.5         | 0.86                                | 77.69                                  | 40.484                                               | 105.2                         | 60.726                                                |
| B-5                 | 60.0              | 01:00:00     | 90.650                                  | 0.75                | 1.713                                 | 1.85                                 | 881                          | 881                   | 251                    | 51                         | 39                 | 68                           | 78                                  | 78                                   | 3.5         | 0.87                                | 78.12                                  | 43.186                                               | 104.9                         | 60.968                                                |
| B-6                 | 63.8              | 01:03:45     | 93.500                                  | 0.75                | 1.713                                 | 1.85                                 | 882                          | 882                   | 249                    | 51                         | 40                 | 69                           | 78                                  | 78                                   | 3.5         | 0.87                                | 78.15                                  | 45.982                                               | 104.9                         | 61.310                                                |
| B-7                 | 67.5              | 01:07:30     | 96.450                                  | 0.55                | 1.257                                 | 1.40                                 | 874                          | 874                   | 252                    | 51                         | 39                 | 69                           | 78                                  | 78                                   | 3.0         | 0.74                                | 66.73                                  | 48.416                                               | 105.0                         | 61.157                                                |
| B-8                 | 71.3              | 01:11:15     | 99.020                                  | 0.53                | 1.211                                 | 1.30                                 | 875                          | 875                   | 248                    | 51                         | 40                 | 70                           | 79                                  | 79                                   | 3.0         | 0.73                                | 65.53                                  | 50.797                                               | 105.0                         | 60.957                                                |
| B-9                 | 75.0              | 01:15:00     | 101.540                                 | 0.46                | 1.051                                 | 1.10                                 | 870                          | 870                   | 255                    | 50                         | 39                 | 70                           | 79                                  | 79                                   | 2.5         | 0.68                                | 60.93                                  | 52.932                                               | 104.8                         | 60.494                                                |
| B-10                | 78.8              | 01:18:45     | 103.800                                 | 0.39                | 0.891                                 | 1.00                                 | 862                          | 862                   | 251                    | 51                         | 40                 | 70                           | 79                                  | 79                                   | 2.0         | 0.62                                | 55.94                                  | 54.986                                               | 104.9                         | 59.985                                                |
| B-11                | 82.5              | 01:22:30     | 105.975                                 | 0.44                | 1.005                                 | 1.10                                 | 868                          | 868                   | 255                    | 52                         | 39                 | 69                           | 79                                  | 79                                   | 2.5         | 0.66                                | 59.55                                  | 57.064                                               | 104.7                         | 59.545                                                |
| B-12                | 86.3              | 01:26:15     | 108.175                                 | 0.44                | 1.005                                 | 1.10                                 | 867                          | 867                   | 249                    | 53                         | 39                 | 70                           | 79                                  | 79                                   | 2.5         | 0.66                                | 59.52                                  | 59.156                                               | 104.6                         | 59.156                                                |
| Last Pt             | 90.0              | 01:30:00     | 110.390                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val           | 90.0              | 01:30:00     | 110.390                                 |                     |                                       |                                      |                              |                       |                        |                            |                    |                              |                                     |                                      | Max Vac     | 3.5                                 | Final Values                           | 59.156                                               | 104.6                         |                                                       |
| Average Values      |                   |              |                                         | 0.59                |                                       | 1.47                                 | 877                          | 877                   | 252                    | 53                         | 41                 | 70                           | 77                                  | 77                                   |             | 0.76                                | 68.64                                  |                                                      |                               |                                                       |
|                     |                   |              |                                         |                     |                                       |                                      |                              |                       |                        |                            |                    |                              | 77                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

Notes:

Probe temp out of specification due to: stack temp



**APPENDIX C**

**CALIBRATION GAS CERTIFICATIONS**



Assay Laboratory: Red Ball TGS  
555 Craig Kennedy Way  
Shreveport, LA 71107  
800-551-8150

## CERTIFICATE OF ANALYSIS (Zero Ambient Nitrogen)

|                    |                     |                               |                     |
|--------------------|---------------------|-------------------------------|---------------------|
| Cylinder Number:   | CC727745            | Certification Date:           | 03/16/2021          |
| Product ID Number: | 121026              | Expiration Date:              | 03/14/2029          |
| Cylinder Pressure: | 1900 PSIG           | MFG Facility:                 | RBTGS-Shreveport-LA |
| COA #              | CC727745.20210316-0 | Lot Number:                   | CC727745.20210316   |
| Customer PO. NO.:  |                     | Tracking Number:              | 098853339           |
| Customer:          |                     | Previous Certification Dates: |                     |

|                                                                                                                    |  |
|--------------------------------------------------------------------------------------------------------------------|--|
| This mixture is for laboratory use only, not for drug, household or other use.                                     |  |
| This mixture is certified in Mole % to be within $\pm 2\%$ of the actual number reported with a confidence of 95%. |  |
| This mixture was manufactured by scale; weights traceable to N.I.S.T. Certificate #822/266926-02.                  |  |
| Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).                                                          |  |

### Composing Material: Zero Ambient Nitrogen, Cert., Sz152

| Component                            | Specification | Concentration |
|--------------------------------------|---------------|---------------|
| Nitrogen                             | Balance       | Balance       |
| Oxygen as Impurity                   | <1.0 PPM      | <1.0 PPM      |
| Carbon Dioxide as Impurity           | <0.5 PPM      | <0.5 PPM      |
| Carbon Monoxide as Impurity          | <0.5 PPM      | <0.5 PPM      |
| Total Oxides of Nitrogen as Impurity | <0.1 PPM      | <0.1 PPM      |
| Sulfur Dioxide as Impurity           | <0.1 PPM      | <0.1 PPM      |
| Total Hydrocarbons as Impurity       | <0.1 PPM      | <0.1 PPM      |

Red Ball Technical Gas Service  
PGVP Vendor ID # G12021  
Information and Ordering  
800-551-8150  
Fax (318-425-6309)



Brandon Theus  
Laboratory Supervisor

Version 02-B, Revised on 2015-05-27



Red Ball Technical Gas Service  
555 Craig Kennedy Way  
Shreveport, LA 71107  
800-551-8150  
PGVP Vendor ID # G12018

## EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

|                    |                      |                               |                    |
|--------------------|----------------------|-------------------------------|--------------------|
| Cylinder Number:   | EB0059402            | Certification Date:           | 06/06/2018         |
| Product ID Number: | 124605               | Expiration Date:              | 06/04/2026         |
| Cylinder Pressure: | 1900 PSIG            | MFG Facility:                 | - Shreveport - LA  |
| COA #              | EB0059402.20180530-0 | Lot Number:                   | EB0059402.20180530 |
| Customer PO. NO.:  |                      | Tracking Number:              | 074332991          |
| Customer:          |                      | Previous Certification Dates: |                    |

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G2.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

### Certified Concentration(s)

| Component      | Concentration | Uncertainty | Analytical Principle | Assayed On |
|----------------|---------------|-------------|----------------------|------------|
| Carbon Dioxide | 19.0 %        | ±0.19 %     | NDIR                 | 06/06/2018 |
| Oxygen         | 21.0 %        | ±0.11 %     | MPA                  | 06/05/2018 |
| Nitrogen       | Balance       |             |                      |            |

Analytical Measurement Data Available Online.

### Reference Standard(s)

| Serial Number | Lot                | Expiration | Type | Balance | Component | Concentration | Uncertainty(%) | NIST Reference |
|---------------|--------------------|------------|------|---------|-----------|---------------|----------------|----------------|
| CC237204      | CC237204.071001a   | 04/05/2023 | NTRM | N2      | O2        | 24.31 %       | 0.49           | 071001         |
| EB0034340     | EB0034340.20170209 | 05/09/2026 | GMIS | N2      | O2        | 20 %          | 0.5            | 071001         |
| EB0072967     | EB0072967.20170424 | 11/25/2025 | GMIS | N2      | CO2       | 9.52 %        | 0.753          | C1309410.01    |

### Analytical Instrumentation

| Component | Principle | Make   | Model | Serial     | MPC Date   |
|-----------|-----------|--------|-------|------------|------------|
| O2        | MPA       | Thermo | 410i  | 1162980025 | 05/11/2018 |
| CO2       | NDIR      | Thermo | 410i  | 1162980025 | 06/06/2018 |

### SMART-CERT



This is to certify the gases referenced have been calibrated/tested, and verified to meet the defined specifications. This calibration/test was performed using Gases or Scales that are traceable through National Institute of Standards and Technology (NIST) to the International System of Units (SI). The basis of compliance stated is a comparison of the measurement parameters to the specified or required calibration/testing process. The expanded uncertainties use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from Red Ball Technical Gas Services. If not included, the uncertainty of calibrations are available upon request and were taken into account when determining pass or fail.

*B. Theus*

Brandon Theus  
Analytical Chemist  
Assay Laboratory: Red Ball TGS  
Version 02-1, Revised on 2017-09-07



Red Ball Technical Gas Service  
555 Craig Kennedy Way  
Shreveport, LA 71107  
800-551-8150  
PGVP Vendor ID # G12021

## EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

|                    |                     |                               |                   |
|--------------------|---------------------|-------------------------------|-------------------|
| Cylinder Number:   | CC712952            | Certification Date:           | 04/16/2021        |
| Product ID Number: | 124606              | Expiration Date:              | 04/14/2029        |
| Cylinder Pressure: | 1900 PSIG           | MFG Facility:                 | - Shreveport - LA |
| COA #              | CC712952.20210412-0 | Lot Number:                   | CC712952.20210412 |
| Customer PO. NO.:  |                     | Tracking Number:              | 097024578         |
| Customer:          |                     | Previous Certification Dates: |                   |

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

### Certified Concentration(s)

| Component      | Concentration | Uncertainty | Analytical Principle | Assayed On |
|----------------|---------------|-------------|----------------------|------------|
| Carbon Dioxide | 8.95 %        | ±0.08 %     | NDIR                 | 04/16/2021 |
| Oxygen         | 11.99 %       | ±0.03 %     | MPA                  | 04/16/2021 |
| Nitrogen       | Balance       |             |                      |            |

Analytical Measurement Data Available Online.

### Reference Standard(s)

| Serial Number | Lot                | Expiration | Type | Balance | Component | Concentration | Uncertainty(%) | NIST Reference |
|---------------|--------------------|------------|------|---------|-----------|---------------|----------------|----------------|
| FF61011       | 71-F-34            | 02/27/2026 | SRM  | N2      | O2        | 20.753 %      | 0.101          | SRM 2659a      |
| EB0007615     | EB0007615.20190610 | 11/24/2027 | GMIS | N2      | CO2       | 24.71 %       | 0.274          | C1579010.02    |
| EB0059422     | EB0059422.20191017 | 01/07/2028 | GMIS | N2      | O2        | 12.02 %       | 0.139          | SRM 2659a      |
| EB0087520     | EB0087520.20191025 | 03/08/2029 | GMIS | N2      | CO2       | 9.48 %        | 0.331          | C1847810.03    |

### Analytical Instrumentation

| Component | Principle | Make   | Model | Serial     | MPC Date   |
|-----------|-----------|--------|-------|------------|------------|
| CO2       | NDIR      | Thermo | 410i  | 1162980025 | 04/09/2021 |
| O2        | MPA       | Thermo | 410i  | 1162980025 | 04/08/2021 |

### SMART-CERT



This is to certify the gases referenced have been calibrated/tested, and verified to meet the defined specifications. This calibration/test was performed using Gases or Scales that are traceable through National Institute of Standards and Technology (NIST) to the International System of Units (SI). The basis of compliance stated is a comparison of the measurement parameters to the specified or required calibration/testing process. The expanded uncertainties use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from Red Ball Technical Gas Services. If not included, the uncertainty of calibrations are available upon request and were taken into account when determining pass or fail.

*Amisha Jewitt*

Amisha Jewitt  
Analytical Chemist  
Assay Laboratory: Red Ball TGS  
Version 02-J, Revised on 2018-09-17



Assay Laboratory: Red Ball TGS  
555 Craig Kennedy Way  
Shreveport, LA 71107  
800-551-8150

## EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

|                    |                      |                               |                     |
|--------------------|----------------------|-------------------------------|---------------------|
| Cylinder Number:   | EB0034654            | Certification Date:           | 03/10/2014          |
| Product ID Number: | 125021               | Expiration Date:              | 03/08/2022          |
| Cylinder Pressure: | 1900 PSIG            | MFG Facility:                 | RBTGS-Shreveport-LA |
| COA #              | EB0034654.20140306-0 | Lot Number:                   | EB0034654.20140306  |
| Customer PO. NO.:  |                      | Tracking Number:              | 056563667           |
| Customer:          |                      | Previous Certification Dates: |                     |

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

### Certified Concentration(s)

| Component | Concentration | Uncertainty | Analytical Principle |
|-----------|---------------|-------------|----------------------|
| Propane   | 802 PPM       | ±2 PPM      | FTIR                 |
| Nitrogen  | Balance       |             |                      |

Analytical Measurement Data Available Online.

### Reference Standard(s)

| Lot          | Expiration | Type | Balance | Component | Concentration | Uncertainty(%) | NIST Reference |
|--------------|------------|------|---------|-----------|---------------|----------------|----------------|
| GC1302210752 | 06/14/2021 | GMIS | N2      | C3H8      | 1003 PPM      | 0.587          | 2647a          |

### Analytical Instrumentation

| Component | Analytical Principle | Make | Model               | Serial    | MPC Date              |
|-----------|----------------------|------|---------------------|-----------|-----------------------|
| C3H8      | FTIR                 | MKS  | MKS 2031DJG2EKVS13T | 017146467 | 3/10/2014 10:30:00 AM |

Red Ball Technical Gas Service  
PGVP Vendor ID # G12014  
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800-551-8150  
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Fred Holt  
Analyst



|                    |                      |                               |                     |
|--------------------|----------------------|-------------------------------|---------------------|
| Cylinder Number:   | EB0093622            | Certification Date:           | 05/16/2017          |
| Product ID Number: | 125267               | Expiration Date:              | 05/14/2025          |
| Cylinder Pressure: | 1900 PSIG            | MFG Facility:                 | RBTGS-Shreveport-LA |
| COA #              | EB0093622.20170427-0 | Lot Number:                   | EB0093622.20170427  |
| Customer PO. NO.:  |                      | Tracking Number:              | 095483935           |
| Customer:          |                      | Previous Certification Dates: |                     |

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

**Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).**

| Component | Concentration | Uncertainty | Analytical Principle | Assayed On |
|-----------|---------------|-------------|----------------------|------------|
| Propane   | 456 PPM       | ±1.5 PPM    | FTIR                 | 05/16/2017 |
| Nitrogen  | Balance       |             |                      |            |

Analytical Measurement Data Available Online.

| Serial Number | Lot                 | Expiration | Type | Balance | Component | Concentration | Uncertainty(%) | NIST Reference |
|---------------|---------------------|------------|------|---------|-----------|---------------|----------------|----------------|
| EB0031829     | EB0031829.20160114g | 05/17/2024 | GMIS | N2      | C3H8      | 2461 PPM      | 0.57           | 2647a          |

| Component | Analytical Principle | Make | Model               | Serial    | MPC Date   |
|-----------|----------------------|------|---------------------|-----------|------------|
| C3H8      | FTIR                 | MKS  | MKS 2031DJG2EKVS13T | 017146467 | 05/16/2017 |



**Brandon Theus**  
Analytical Chemis

This is to certify the gases referenced have been calibrated/tested, and verified to meet the defined specifications. This calibration/test was performed using Gases or Scales that are traceable through National Institute of Standards and Technology (NIST) to the International System of Units (SI). The basis of compliance stated is a comparison of the measurement parameters to the specified or required calibration/testing process. The expanded uncertainties use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from Red Ball Technical Gas Services. If not included, the uncertainty of calibrations are available upon request and were taken into account when determining pass or fail.

Version 02-E, Revised on 2016-04-27



Assay Laboratory: Red Ball TGS  
555 Craig Kennedy Way  
Shreveport, LA 71107  
800-551-8150

## EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

|                    |                      |                               |                     |
|--------------------|----------------------|-------------------------------|---------------------|
| Cylinder Number:   | EB0032453            | Certification Date:           | 03/10/2014          |
| Product ID Number: | 125020               | Expiration Date:              | 03/08/2022          |
| Cylinder Pressure: | 1900 PSIG            | MFG Facility:                 | RBTGS-Shreveport-LA |
| COA #              | EB0032453.20140306-0 | Lot Number:                   | EB0032453.20140306  |
| Customer PO. NO.:  |                      | Tracking Number:              | 056560484           |
| Customer:          |                      | Previous Certification Dates: |                     |

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

### Certified Concentration(s)

| Component | Concentration | Uncertainty | Analytical Principle |
|-----------|---------------|-------------|----------------------|
| Propane   | 302 PPM       | ±2 PPM      | FTIR                 |
| Nitrogen  | Balance       |             |                      |

Analytical Measurement Data Available Online.

### Reference Standard(s)

| Lot          | Expiration | Type | Balance | Component | Concentration | Uncertainty(%) | NIST Reference |
|--------------|------------|------|---------|-----------|---------------|----------------|----------------|
| GC1302210752 | 06/14/2021 | GMIS | N2      | C3H8      | 1003 PPM      | 0.587          | 2647a          |

### Analytical Instrumentation

| Component | Analytical Principle | Make | Model               | Serial    | MPC Date              |
|-----------|----------------------|------|---------------------|-----------|-----------------------|
| C3H8      | FTIR                 | MKS  | MKS 2031DJG2EKVS13T | 017146467 | 3/10/2014 10:30:00 AM |

Red Ball Technical Gas Service  
PGVP Vendor ID # G12014  
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Fred Holt  
Analyst

**APPENDIX D**

**QUALITY ASSURANCE AND QUALITY CONTROL DATA**



## QA/QC PROGRAM

AIR HYGIENE ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance (QA) program. The program is developed and administered by an internal QA team and encompasses six major areas:

1. Field Qualifications
2. QA reviews of reports, laboratory work, and field testing;
3. Equipment calibration and maintenance;
4. Chain-of-custody;
5. Training; and
6. Knowledge of current test methods

### Field Qualifications

Air Hygiene personnel are required to gain and maintain competence with testing methods and techniques according to their job titles and the roles they play during field testing events. Qualifications for each job description include:

**Staff Technician** - An entry level position with responsibility to test on the stack by performing duties that include: keep trucks and trailers stocked and clean, travel to and from job site, be the “hands of the test” on the stack; stay on a stack during the sample test, set up and tear down equipment on-site, perform maintenance on equipment in the shop and on-site.

**Test Technician or Specialist** - Acts as the “hands of the test” on the stack by performing duties that include: stay on a stack during the sample test, migrate to the testing trailer and learn the different analyzers and testing methods used on site, set up and tear down testing equipment on site, learn the system for testing from Testing Managers and Project Managers, travel to and from job site; including driving responsibilities under DOT requirements, follow directions of Testing Managers and Project Managers, learn the proper way to conduct on-site test of stationary stacks

**Test Manager or Engineer** - Directs and coordinates all aspects of a successful test by performing the following duties personally or through subordinate supervisors including: operating analyzers and consoles during testing along with QA/QC procedures, supervise set up and tear down of equipment on site, writing, reviewing, and revising final test reports, working with the client or state personnel while on the job site, managing pre-test checklists and onsite testing procedures, diagnose and repair any problems that may arise with the equipment, safely operate a man lift and drive a truck with or without a trailer, act as crew leader in the field, write protocols and reports, maintain project log of services performed on the job, verify all equipment needed for a job was loaded on the trailer. Test Managers must hold at least one QSTI certificate.

**Project Manager** - Directs and coordinates all aspects of a successful test by performing the following duties personally or through subordinate supervisors including: operating analyzers and consoles during testing along with QA/QC procedures, supervise set up and tear down of equipment on site, writing, reviewing, and revising final test reports, working with the client or state personnel while on the job site, managing pre-test checklists and onsite testing procedures, diagnose and repair any problems that may arise with the equipment, safely operate a man lift and drive a truck with or without a trailer, act as crew leader in the field, write protocols and reports, maintain project log of services performed on the job, verify all equipment needed for a job was loaded on the trailer. Project Managers typically hold QSTI certificates in Groups 1 through 4.

### QA Reviews

Air Hygiene’s review procedure includes review of each source test report, along with laboratory and fieldwork, by the QA Team. The most important review is the one that takes place before a test program begins. The QA Team works closely with technical division personnel to prepare and review test protocols. Test protocol review includes selection of appropriate test procedures, evaluation of interferences or other restrictions that might preclude use of standard test procedures, and evaluation and/or development of alternate procedures.

### Equipment Calibration and Maintenance

The equipment used to conduct the emission measurements is maintained according to the manufacturer’s instructions to ensure proper operation. In addition to the maintenance program, calibrations are carried out on each measurement device according to the schedule outlined by the Environmental Protection Agency. Quality control checks are also conducted in the field for each test program. In conformance with ASTM D7036 Section 15.3.15, all metering and monitoring equipment meets or exceeds the uncertainty criteria contained in the method language that pertains to that equipment.

### **Chain-of-Custody**

Air Hygiene maintains full chain-of-custody documentation on all samples and data sheets. In addition to normal documentation of changes between field sample custodians, laboratory personnel, and field test personnel, Air Hygiene documents every individual who handles any test component in the field (e.g., probe wash, impinger loading and recovery, filter loading and recovery, etc.). Samples are stored in a locked area to which only Air Hygiene personnel have access. Field data sheets are secured at Air Hygiene's offices upon return from the field.

### **Training**

Personnel's training is essential to ensure quality testing. Air Hygiene has formal and informal training programs, which include:

1. Attendance at EPA-sponsored training courses
2. Enrollment in EPA correspondence courses
3. A requirement for all technicians to read and understand Air Hygiene's QA manual
4. In-house training and QA meetings on a regular basis
5. Maintenance of training records

### **Knowledge of Current Test Methods**

With the constant updating of standard test methods and the wide variety of emerging test procedures, it is essential that any qualified source tester keep abreast of new developments. Air Hygiene subscribes to services, which provide updates on EPA reference methods, rules, and regulations. Additionally, source test personnel regularly attend and present papers at testing and emission-related seminars and conferences. Air Hygiene personnel maintain membership in the Air and Waste Management Association and the American Industrial Hygiene Association.

### **Reproduction and Distribution Policy**

Reproducing portions of this test report may omit critical or substantial documentation or be taken out of context and due care must be exercised in this regard. Furthermore, this test report and its associated data shall not be reproduced in full or in part without the written consent of the customer.

### **Data Provided by Client**

Data provided by the Client is clearly identified in the report. Air Hygiene accepts data provided by the Client as accurate.

## COMBUSTION TESTING QUALITY ASSURANCE ACTIVITIES

In conformance with ASTM D7036 Section 15.3.11 and 13, all testing was performed without any real or apparent errors, with the exception of those that would be listed in Section 2.0 of this report. In addition, all testing was conducted according to the approved testing protocol, test methods, Air Hygiene Quality Manual, or ASTM D7036, with the exception of specifics noted in Section 2.0 of this report. A number of quality assurance activities were undertaken before, during, and after this testing project. This section of the report combined with the documentation in Appendix C describes each of those activities.

Each instrument's response was checked and adjusted in the field prior to the collection of data via multi-point calibration. The instrument's linearity was checked by adjusting its zero and span responses to zero nitrogen and an upscale calibration gas in the range of the expected concentrations. The instrument response was then challenged with other calibration gases of known concentration and accepted as being linear if the response of the other calibration gases agreed within plus or minus two percent of the range of predicted values. NO<sub>2</sub> to NO conversion was checked via direct connect with an EPA Protocol certified concentration of NO<sub>2</sub> in a balance of air or nitrogen. Conversion was verified to be between 90 and 110 percent.

After each test run, the analyzers were checked for zero and span drift. This allowed each test run to be bracketed by calibrations and documents the precision of the data just collected. The criterion for acceptable data is that the instrument drift is no more than three percent of the full-scale response. The quality assurance worksheets in the following pages summarize all multipoint calibration checks and zero to span checks performed during the tests. These worksheets (as prepared from the data records of Appendix A) show that no drifts in excess of three percent occurred in the zero to span checks following each test run.

The sampling systems were leak checked by demonstrating that a vacuum greater than 10 in Hg could be held for at least one minute with a decline of less than one inch of Hg. A leak test was conducted after the sample system was set up and before the system was dismantled. This test was conducted to ensure that ambient air had not diluted the sample. Any leakage detected prior to the tests would be repaired and another leak check conducted before testing commenced. No leaks were found during the pre or post-test leak checks.

The absence of leaks in the sampling system was also verified by a sampling system bias check. The sampling system's integrity was tested by comparing the responses of the analyzers to the calibration gases introduced via two paths. The first path was directly into the analyzer and the second path via the sample system at the sample probe. Any difference in the instrument responses by these two methods was attributed to sampling system bias or leakage. The criterion for acceptance is agreement within five percent of the span of the analyzer.

The control gases used to calibrate the instruments were analyzed and certified by the compressed gas vendors to plus or minus one percent accuracy for all gases. EPA Protocol No. 1 was used, where applicable to assign the concentration values traceable to the National Institute of Standards and Technology (NIST), Standard Reference Materials (SRM's). The gas calibration sheets as prepared by the vendor are contained in Appendix C.

Air Hygiene collected and reported the enclosed test data in accordance with the procedures and quality assurance activities described in this test report. Air Hygiene makes no warranty as to the suitability of the test methods. Air Hygiene also assumes no liability relating to the interpretation and use of the test data.

### INSTRUMENTAL ANALYSIS QUALITY ASSURANCE DATA

Date: July 29-30, 2021  
Company: Catalytic Combustion Corporation  
Location: Houston, Texas  
Techs: PM / CK / WN

#### Sample System Leak Check

| Date             | Sample System | Leak Rate (l/min) |
|------------------|---------------|-------------------|
| July 29-30, 2021 | 1             | 0                 |



# Accredited Laboratory

## AIR HYGIENE INTERNATIONAL, INC.

A2LA has accredited

*Broken Arrow, OK*

for technical competence in the field of

### Environmental Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This laboratory also meets the A2LA R219 – Specific Requirements – TNI Field Sampling and Measurement Organization Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 18<sup>th</sup> day of December 2019

Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 3796.01  
Valid to August 31, 2021

For the tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

# *Accredited Air Emission Testing Body*

A2LA has accredited

## AIR HYGIENE INTERNATIONAL, INC.

In recognition of the successful completion of the joint A2LA and Stack Testing Accreditation Council (STAC) evaluation process, this laboratory is accredited to perform testing activities in compliance with ASTM D7036:2004 - Standard Practice for Competence of Air Emission Testing Bodies.

Presented this 18<sup>th</sup> day of December 2019.

A blue ink signature of the Vice President of the Accreditation Council.

Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 3796.02  
Valid to August 31, 2021

*This accreditation program is not included under the A2LA ILAC Mutual Recognition Arrangement.*



# Texas Commission on Environmental Quality



NELAP-Recognized Laboratory Accreditation is hereby awarded to

**Air Hygiene International, Inc.**

**1600 West Tacoma**

**Broken Arrow, OK 74102-1483**

in accordance with Texas Water Code Chapter 5, Subchapter R, Title 30 Texas Administrative Code Chapter 25, and the National Environmental Laboratory Accreditation Program.

The laboratory's scope of accreditation includes the fields of accreditation that accompany this certificate. Continued accreditation depends upon successful ongoing participation in the program. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current location(s) and accreditation status for particular methods and analyses ([www.tceq.texas.gov/goto/lab](http://www.tceq.texas.gov/goto/lab)). Accreditation does not imply that a product, process, system or person is approved by the Texas Commission on Environmental Quality.

A handwritten signature in black ink, appearing to read "T. Beh", located below the accreditation text.

**Certificate Number: T104704523-21-9**

**Effective Date: 3/1/2021**

**Expiration Date: 2/28/2022**

**Executive Director Texas Commission on  
Environmental Quality**





# Texas Commission on Environmental Quality



NELAP-Recognized Laboratory Accreditation is hereby awarded to

## Air Hygiene International, Inc. - Mobile Lab (OK 6782JZ)

1600 West Tacoma  
Broken Arrow, OK 74102-1483

in accordance with Texas Water Code Chapter 5, Subchapter R, Title 30 Texas Administrative Code Chapter 25, and the National Environmental Laboratory Accreditation Program.

The laboratory's scope of accreditation includes the fields of accreditation that accompany this certificate. Continued accreditation depends upon successful ongoing participation in the program. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current location(s) and accreditation status for particular methods and analyses ([www.tceq.texas.gov/goto/lab](http://www.tceq.texas.gov/goto/lab)). Accreditation does not imply that a product, process, system or person is approved by the Texas Commission on Environmental Quality.

A handwritten signature in black ink, appearing to read "T. B. Baker", positioned above the title of the Executive Director.

Certificate Number: 1M104704523-21-9  
Effective Date: 3/1/2021  
Expiration Date: 2/28/2022

Executive Director Texas Commission on  
Environmental Quality



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**PATRICK K. McGOVERN, Jr.**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

**MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE  
SAMPLING METHODS**

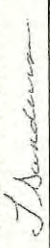
ISSUED THIS 4<sup>TH</sup> DAY OF SEPTEMBER 2020 AND EFFECTIVE UNTIL SEPTEMBER 3<sup>RD</sup>, 2025



Peter R. Westlin, QSTI/QSTO Review Board



Peter S. Pakalnis, QSTI/QSTO Review Board



Tina Sanderson, QSTI/QSTO Review Board



J. Wade Bice, QSTI/QSTO Review Board



Karen D. Kajiye-Mills, QSTI/QSTO Review Board



Bruce Randall, QSTI/QSTO Review Board



CERTIFICATE  
NO.

2008-133



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**PATRICK K. MCGOVERN, Jr.**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### **GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS**

ISSUED THIS 10<sup>TH</sup> DAY OF NOVEMBER 2017 AND EFFECTIVE UNTIL NOVEMBER 9<sup>TH</sup>, 2022



CERTIFICATE  
NO.  
2008-133

*J. Wade Bice*  
J. Wade Bice, QSTI/QSTO Review Board

*Karen D. Kajiy-Mills*  
Karen D. Kajiy-Mills, QSTI/QSTO Review Board

*Bruce Randall*  
Bruce Randall QSTI/QSTO Review Board

*Peter R. Westlin*  
Peter R. Westlin, QSTI/QSTO Review Board

*Peter S. Pakalnis*  
Peter S. Pakalnis, QSTI/QSTO Review Board

*Theresa M. Lowe*  
Theresa Lowe, QSTI/QSTO Review Board

## **QUALITY ASSURANCE AND QUALITY CONTROL DATA**

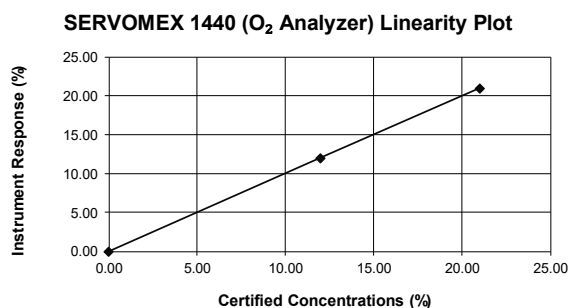
### **Reference Method Analyzer Daily Calibration Data**

Calibration Date: July 29, 2021  
Client: Catalytic Combustion Corporation

Location: Stewart & Stevenson Integration Center -

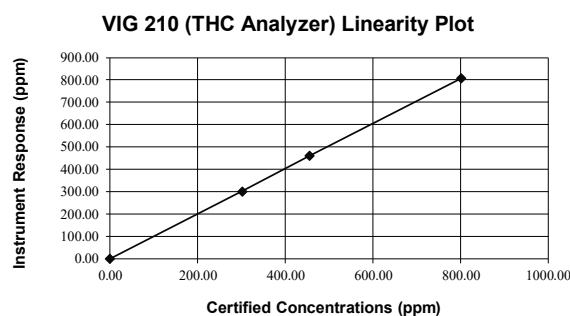
O<sub>2</sub> Span (%) = 21.00

| SERVOMEX 1440 (O <sub>2</sub> Analyzer) |                         |                       |                    |                   |
|-----------------------------------------|-------------------------|-----------------------|--------------------|-------------------|
| Certified Concentration (%)             | Instrument Response (%) | Calibration Error (%) | Absolute Conc. (%) | Pass (±2%, ≤0.5%) |
| 0.00                                    | 0.05                    | 0.24                  | 0.05               | YES (%)           |
| 11.99                                   | 12.02                   | 0.14                  | 0.03               | YES (%)           |
| 21.00                                   | 21.01                   | 0.05                  | 0.01               | YES (%)           |
| Linearity = 1.002                       |                         |                       |                    |                   |



THC (as C<sub>3</sub>H<sub>8</sub>) Range (ppm) = 1000

| VIG 210 (THC Analyzer)        |                           |                       |                       |                           |
|-------------------------------|---------------------------|-----------------------|-----------------------|---------------------------|
| Certified Concentration (ppm) | Instrument Response (ppm) | Calibration Error (%) | Estimated Point (ppm) | Pass (±2,5%) <sup>1</sup> |
| 0.00                          | 1.42                      | 0.14                  | N/A                   | YES                       |
| 302.00                        | 304.24                    | -0.36                 | 305.31                | YES                       |
| 456.00                        | 461.70                    | 0.31                  | 460.28                | YES                       |
| 802.00                        | 808.45                    | 0.65                  | N/A                   | YES                       |
| Linearity = 0.993             |                           |                       |                       |                           |



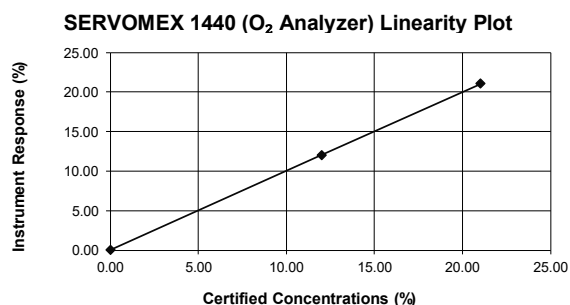
<sup>1</sup> zero/high based on 2% of span, low/mid based on 5% of concentration

Calibration Date: July 30, 2021  
Client: Catalytic Combustion Corporation

Location: Stewart & Stevenson Integration Center -

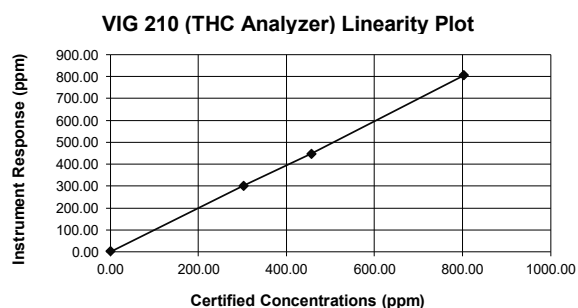
O<sub>2</sub> Span (%) = 21.00

| SERVOMEX 1440 (O <sub>2</sub> Analyzer) |                         |                       |                    |                   |
|-----------------------------------------|-------------------------|-----------------------|--------------------|-------------------|
| Certified Concentration (%)             | Instrument Response (%) | Calibration Error (%) | Absolute Conc. (%) | Pass (±2%, ≤0.5%) |
| 0.00                                    | 0.06                    | 0.29                  | 0.06               | YES (%)           |
| 11.99                                   | 12.03                   | 0.19                  | 0.04               | YES (%)           |
| 21.00                                   | 21.06                   | 0.29                  | 0.06               | YES (%)           |
| Linearity = 1.000                       |                         |                       |                    |                   |



THC (as C<sub>3</sub>H<sub>8</sub>) Range (ppm) = 1000

| VIG 210 (THC Analyzer)        |                           |                       |                       |                           |
|-------------------------------|---------------------------|-----------------------|-----------------------|---------------------------|
| Certified Concentration (ppm) | Instrument Response (ppm) | Calibration Error (%) | Estimated Point (ppm) | Pass (±2,5%) <sup>1</sup> |
| 0.00                          | 1.86                      | 0.19                  | N/A                   | YES                       |
| 302.00                        | 301.28                    | -1.04                 | 304.43                | YES                       |
| 456.00                        | 446.31                    | -2.72                 | 458.72                | YES                       |
| 802.00                        | 805.37                    | 0.34                  | N/A                   | YES                       |
| Linearity = 0.987             |                           |                       |                       |                           |



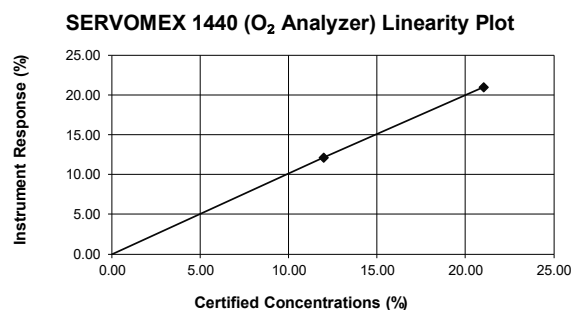
<sup>1</sup>-zero/high based on 2% of span, low/mid based on 5% of concentration

Calibration Date: September 1, 2021  
Client: Catalytic Combustion Corporation

Location: Stewart & Stevenson Integration Center

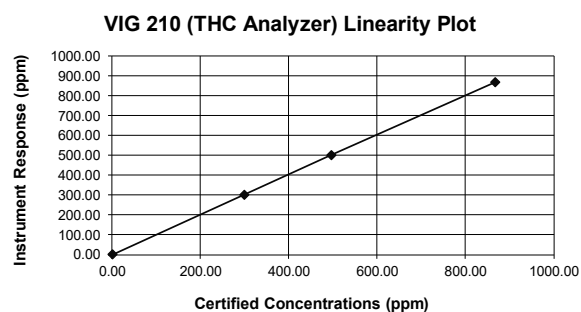
O<sub>2</sub> Span (%) = 21.00

| SERVOMEX 1440 (O <sub>2</sub> Analyzer) |                         |                       |                    |                   |
|-----------------------------------------|-------------------------|-----------------------|--------------------|-------------------|
| Certified Concentration (%)             | Instrument Response (%) | Calibration Error (%) | Absolute Conc. (%) | Pass (±2%, ≤0.5%) |
| 0.00                                    | 0.00                    | -0.01                 | 0.00               | YES (%)           |
| 11.96                                   | 12.09                   | 0.62                  | 0.13               | YES (%)           |
| 21.00                                   | 20.97                   | -0.14                 | 0.03               | YES (%)           |
| Linearity = 1.001                       |                         |                       |                    |                   |



THC (as C<sub>3</sub>H<sub>8</sub>) Range (ppm) = 1000

| VIG 210 (THC Analyzer)        |                           |                       |                       |                           |
|-------------------------------|---------------------------|-----------------------|-----------------------|---------------------------|
| Certified Concentration (ppm) | Instrument Response (ppm) | Calibration Error (%) | Estimated Point (ppm) | Pass (±2.5%) <sup>1</sup> |
| 0.00                          | 0.19                      | 0.02                  | N/A                   | YES                       |
| 299.00                        | 300.99                    | 0.50                  | 299.51                | YES                       |
| 495.00                        | 500.30                    | 0.93                  | 495.71                | YES                       |
| 867.00                        | 868.10                    | 0.11                  | N/A                   | YES                       |
| Linearity = 1.003             |                           |                       |                       |                           |



<sup>1</sup> zero/high based on 2% of span, low/mid based on 5% of concentration



| DRIFT AND BIAS CHECK<br>AND<br>RESPONSE TIME CALCULATOR |                 |        |
|---------------------------------------------------------|-----------------|--------|
| Strat Test Pre and<br>Post QA/QC Check                  | O <sub>2</sub>  | NOx    |
| Initial Zero                                            | 0.03            | 0.66   |
| Final Zero                                              | 0.05            | 0.21   |
| Avg. Zero                                               | 0.04            | 0.44   |
| Initial UpScale                                         | 11.98           | 10.99  |
| Final UpScale                                           | 11.97           | 10.97  |
| Avg. UpScale                                            | 11.98           | 10.98  |
| Sys Resp (Zero)                                         | 0.05            | 0.00   |
| Sys Resp (Upscale)                                      | 12.02           | 11.00  |
| Upscale Cal Gas                                         | 11.99           | 10.80  |
| Initial Zero Bias                                       | -0.10%          | 3.03%  |
| Final Zero Bias                                         | 0.00%           | 0.96%  |
| Zero Drift                                              | 0.10%           | 2.06%  |
| Initial Upscale Bias                                    | -0.19%          | -0.05% |
| Final Upscale Bias                                      | -0.24%          | -0.14% |
| Upscale Drift                                           | 0.05%           | 0.09%  |
| Alternative<br>Specification<br>n<br>Abs Diff           | Initial Zero    | 0.02   |
|                                                         | Final Zero      | 0.00   |
|                                                         | Initial Upscale | 0.04   |
|                                                         | Final Upscale   | 0.05   |
| Calibration Span                                        | 21.00           | 21.80  |
| 3% of Cal. Span (drift)                                 | 0.63            | 0.65   |
| 5% of Cal. Span (bias)                                  | 1.05            | 1.09   |

|                     |     |     |
|---------------------|-----|-----|
| Response Time (min) | 0.8 | 1.2 |
| Sys. Response (min) | 1.2 |     |

| Date/Time<br>mm/dd/yy hh:mm:ss | z | O <sub>2</sub><br>%-10 | s | z | NOx<br>ppm-10 | s |
|--------------------------------|---|------------------------|---|---|---------------|---|
| 07/30/21 10:20:43              |   | 8.92                   |   |   | 6.51          |   |
| 07/30/21 10:20:53              |   | 8.92                   |   |   | 6.51          |   |
| 07/30/21 10:21:03              |   | 8.91                   |   |   | 6.56          |   |
| 07/30/21 10:21:13              |   | 8.79                   |   |   | 6.62          |   |
| 07/30/21 10:21:23              |   | 10.25                  |   |   | 6.73          |   |
| 07/30/21 10:21:33              |   | 11.72                  | x |   | 6.63          |   |
| 07/30/21 10:21:43              |   | 11.94                  |   |   | 3.53          |   |
| 07/30/21 10:21:53              |   | 11.96                  |   | x | 0.70          |   |
| 07/30/21 10:22:03              |   | 11.97                  |   |   | 0.64          |   |
| 07/30/21 10:22:13              |   | 11.97                  |   |   | 0.56          |   |
| 07/30/21 10:22:23              |   | 11.97                  |   |   | 0.66          |   |
| 07/30/21 10:22:33              |   | 11.98                  |   |   | 0.77          |   |
| 07/30/21 10:22:43              |   | 11.98                  |   |   | 0.52          |   |
| 07/30/21 10:22:53              |   | 11.79                  |   |   | 0.39          |   |
| 07/30/21 10:23:03              |   | 8.98                   |   |   | 0.88          |   |
| 07/30/21 10:23:13              |   | 2.37                   |   |   | 1.65          |   |
| 07/30/21 10:23:23              | x | 0.38                   |   |   | 6.15          |   |
| 07/30/21 10:23:33              |   | 0.16                   |   |   | 10.27         |   |
| 07/30/21 10:23:43              |   | 0.04                   |   |   | 10.59         | x |
| 07/30/21 10:23:53              |   | 0.04                   |   |   | 10.95         |   |
| 07/30/21 10:24:03              |   | 0.03                   |   |   | 10.95         |   |
| 07/30/21 10:24:13              |   | 0.03                   |   |   | 10.99         |   |

INJECTIONS

x

x

x

| DRIFT AND BIAS CHECK                     |                 |                                         |
|------------------------------------------|-----------------|-----------------------------------------|
| 50% Load, Run - 1-1                      | O <sub>2</sub>  | THC (as C <sub>3</sub> H <sub>8</sub> ) |
| Raw Average                              | 8.69            | 157.35                                  |
| Corrected Average                        | 8.67            | 183.85                                  |
| Initial Zero                             | 0.03            | 2.53                                    |
| Final Zero                               | 0.07            | 0.12                                    |
| Avg. Zero                                | 0.05            | 1.33                                    |
| Initial UpScale                          | 12.03           | 306.71                                  |
| Final UpScale                            | 11.98           | 307.25                                  |
| Avg. UpScale                             | 12.01           | 306.98                                  |
| Sys Resp (Zero)                          | 0.05            | 1.42                                    |
| Sys Resp (Upscale)                       | 12.02           | 304.24                                  |
| Upscale Cal Gas                          | 11.99           | 302.00                                  |
| Initial Zero Bias                        | -0.10%          | 0.11%                                   |
| Final Zero Bias                          | 0.10%           | -0.13%                                  |
| Zero Drift                               | 0.19%           | 0.24%                                   |
| Initial Upscale Bias                     | 0.05%           | 0.25%                                   |
| Final Upscale Bias                       | -0.19%          | 0.30%                                   |
| Upscale Drift                            | 0.24%           | 0.05%                                   |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.02                                    |
|                                          | Final Zero      | 0.02                                    |
|                                          | Initial Upscale | 0.01                                    |
|                                          | Final Upscale   | 0.04                                    |
| Calibration Span                         | 21.00           | 1,000.00                                |
| 3% of Cal. Span (drift)                  | 0.63            | 30.00                                   |
| 5% of Cal. Span (bias)                   | 1.05            | 50.00                                   |

| DRIFT AND BIAS CHECK                     |                 |                                         |
|------------------------------------------|-----------------|-----------------------------------------|
| 50% Load, Run - 1-2                      | O <sub>2</sub>  | THC (as C <sub>3</sub> H <sub>8</sub> ) |
| Raw Average                              | 8.75            | 163.11                                  |
| Corrected Average                        | 8.74            | 190.60                                  |
| Initial Zero                             | 0.07            | 0.12                                    |
| Final Zero                               | 0.08            | 0.21                                    |
| Avg. Zero                                | 0.08            | 0.17                                    |
| Initial UpScale                          | 11.98           | 307.25                                  |
| Final UpScale                            | 11.97           | 317.42                                  |
| Avg. UpScale                             | 11.98           | 312.34                                  |
| Sys Resp (Zero)                          | 0.05            | 1.42                                    |
| Sys Resp (Upscale)                       | 12.02           | 304.24                                  |
| Upscale Cal Gas                          | 11.99           | 302.00                                  |
| Initial Zero Bias                        | 0.10%           | -0.13%                                  |
| Final Zero Bias                          | 0.14%           | -0.12%                                  |
| Zero Drift                               | 0.05%           | 0.01%                                   |
| Initial Upscale Bias                     | -0.19%          | 0.30%                                   |
| Final Upscale Bias                       | -0.24%          | 1.32%                                   |
| Upscale Drift                            | 0.05%           | 1.02%                                   |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.02                                    |
|                                          | Final Zero      | 0.03                                    |
|                                          | Initial Upscale | 0.04                                    |
|                                          | Final Upscale   | 0.05                                    |
| Calibration Span                         | 21.00           | 1,000.00                                |
| 3% of Cal. Span (drift)                  | 0.63            | 30.00                                   |
| 5% of Cal. Span (bias)                   | 1.05            | 50.00                                   |

| DRIFT AND BIAS CHECK                     |                 |                                         |
|------------------------------------------|-----------------|-----------------------------------------|
| 50% Load, Run - 1-3                      | O <sub>2</sub>  | THC (as C <sub>3</sub> H <sub>8</sub> ) |
| Raw Average                              | 8.80            | 168.64                                  |
| Corrected Average                        | 8.79            | 197.00                                  |
| Initial Zero                             | 0.08            | 0.21                                    |
| Final Zero                               | 0.09            | 0.17                                    |
| Avg. Zero                                | 0.09            | 0.19                                    |
| Initial UpScale                          | 11.97           | 317.42                                  |
| Final UpScale                            | 11.98           | 314.03                                  |
| Avg. UpScale                             | 11.98           | 315.73                                  |
| Sys Resp (Zero)                          | 0.05            | 1.42                                    |
| Sys Resp (Upscale)                       | 12.02           | 304.24                                  |
| Upscale Cal Gas                          | 11.99           | 302.00                                  |
| Initial Zero Bias                        | 0.14%           | -0.12%                                  |
| Final Zero Bias                          | 0.19%           | -0.13%                                  |
| Zero Drift                               | 0.05%           | 0.00%                                   |
| Initial Upscale Bias                     | -0.24%          | 1.32%                                   |
| Final Upscale Bias                       | -0.19%          | 0.98%                                   |
| Upscale Drift                            | 0.05%           | 0.34%                                   |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.03                                    |
|                                          | Final Zero      | 0.04                                    |
|                                          | Initial Upscale | 0.05                                    |
|                                          | Final Upscale   | 0.04                                    |
| Calibration Span                         | 21.00           | 1,000.00                                |
| 3% of Cal. Span (drift)                  | 0.63            | 30.00                                   |
| 5% of Cal. Span (bias)                   | 1.05            | 50.00                                   |

| DRIFT AND BIAS CHECK                     |                 |                                         |
|------------------------------------------|-----------------|-----------------------------------------|
| 75% Load, Run - 2-1                      | O <sub>2</sub>  | THC (as C <sub>3</sub> H <sub>8</sub> ) |
| Raw Average                              | 8.97            | 151.87                                  |
| Corrected Average                        | 8.95            | 176.40                                  |
| Initial Zero                             | 0.07            | 0.13                                    |
| Final Zero                               | 0.06            | 0.27                                    |
| Avg. Zero                                | 0.07            | 0.20                                    |
| Initial UpScale                          | 12.01           | 304.51                                  |
| Final UpScale                            | 11.97           | 310.21                                  |
| Avg. UpScale                             | 11.99           | 307.36                                  |
| Sys Resp (Zero)                          | 0.06            | 1.86                                    |
| Sys Resp (Upscale)                       | 12.03           | 301.28                                  |
| Upscale Cal Gas                          | 11.99           | 302.00                                  |
| Initial Zero Bias                        | 0.05%           | -0.17%                                  |
| Final Zero Bias                          | 0.00%           | -0.16%                                  |
| Zero Drift                               | 0.05%           | 0.01%                                   |
| Initial Upscale Bias                     | -0.10%          | 0.32%                                   |
| Final Upscale Bias                       | -0.29%          | 0.89%                                   |
| Upscale Drift                            | 0.19%           | 0.57%                                   |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.01                                    |
|                                          | Final Zero      | 0.00                                    |
|                                          | Initial Upscale | 0.02                                    |
|                                          | Final Upscale   | 0.06                                    |
| Calibration Span                         | 21.00           | 1,000.00                                |
| 3% of Cal. Span (drift)                  | 0.63            | 30.00                                   |
| 5% of Cal. Span (bias)                   | 1.05            | 50.00                                   |



| DRIFT AND BIAS CHECK                     |                 |                                         |
|------------------------------------------|-----------------|-----------------------------------------|
| 75% Load, Run - 2-2                      | O <sub>2</sub>  | THC (as C <sub>3</sub> H <sub>8</sub> ) |
| Raw Average                              | 8.95            | 169.71                                  |
| Corrected Average                        | 8.96            | 197.01                                  |
| Initial Zero                             | 0.06            | 0.27                                    |
| Final Zero                               | 0.04            | 0.44                                    |
| Avg. Zero                                | 0.05            | 0.36                                    |
| Initial UpScale                          | 11.97           | 310.21                                  |
| Final UpScale                            | 11.95           | 303.21                                  |
| Avg. UpScale                             | 11.96           | 306.71                                  |
| Sys Resp (Zero)                          | 0.06            | 1.86                                    |
| Sys Resp (Upscale)                       | 12.03           | 301.28                                  |
| Upscale Cal Gas                          | 11.99           | 302.00                                  |
| Initial Zero Bias                        | 0.00%           | -0.16%                                  |
| Final Zero Bias                          | -0.10%          | -0.14%                                  |
| Zero Drift                               | 0.10%           | 0.02%                                   |
| Initial Upscale Bias                     | -0.29%          | 0.89%                                   |
| Final Upscale Bias                       | -0.38%          | 0.19%                                   |
| Upscale Drift                            | 0.10%           | 0.70%                                   |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.00                                    |
|                                          | Final Zero      | 0.02                                    |
|                                          | Initial Upscale | 0.06                                    |
|                                          | Final Upscale   | 0.08                                    |
| Calibration Span                         | 21.00           | 1,000.00                                |
| 3% of Cal. Span (drift)                  | 0.63            | 30.00                                   |
| 5% of Cal. Span (bias)                   | 1.05            | 50.00                                   |

| DRIFT AND BIAS CHECK                     |                 |                                         |
|------------------------------------------|-----------------|-----------------------------------------|
| 75% Load, Run - 2-3                      | O <sub>2</sub>  | THC (as C <sub>3</sub> H <sub>8</sub> ) |
| Raw Average                              | 8.91            | 164.95                                  |
| Corrected Average                        | 8.94            | 190.89                                  |
| Initial Zero                             | 0.04            | 0.44                                    |
| Final Zero                               | 0.06            | 1.21                                    |
| Avg. Zero                                | 0.05            | 0.83                                    |
| Initial UpScale                          | 11.95           | 303.21                                  |
| Final UpScale                            | 11.94           | 312.59                                  |
| Avg. UpScale                             | 11.95           | 307.90                                  |
| Sys Resp (Zero)                          | 0.06            | 1.86                                    |
| Sys Resp (Upscale)                       | 12.03           | 301.28                                  |
| Upscale Cal Gas                          | 11.99           | 302.00                                  |
| Initial Zero Bias                        | -0.10%          | -0.14%                                  |
| Final Zero Bias                          | 0.00%           | -0.07%                                  |
| Zero Drift                               | 0.10%           | 0.08%                                   |
| Initial Upscale Bias                     | -0.38%          | 0.19%                                   |
| Final Upscale Bias                       | -0.43%          | 1.13%                                   |
| Upscale Drift                            | 0.05%           | 0.94%                                   |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.02                                    |
|                                          | Final Zero      | 0.00                                    |
|                                          | Initial Upscale | 0.08                                    |
|                                          | Final Upscale   | 0.09                                    |
| Calibration Span                         | 21.00           | 1,000.00                                |
| 3% of Cal. Span (drift)                  | 0.63            | 30.00                                   |
| 5% of Cal. Span (bias)                   | 1.05            | 50.00                                   |

| DRIFT AND BIAS CHECK                     |                 |                                         |
|------------------------------------------|-----------------|-----------------------------------------|
| 100% Load, Run - 3-1                     | O <sub>2</sub>  | THC (as C <sub>3</sub> H <sub>8</sub> ) |
| Raw Average                              | 8.60            | 99.12                                   |
| Corrected Average                        | 8.64            | 114.77                                  |
| Initial Zero                             | 0.01            | 0.19                                    |
| Final Zero                               | 0.02            | 0.20                                    |
| Avg. Zero                                | 0.02            | 0.20                                    |
| Initial UpScale                          | 11.85           | 300.98                                  |
| Final UpScale                            | 11.94           | 300.31                                  |
| Avg. UpScale                             | 11.90           | 300.65                                  |
| Sys Resp (Zero)                          | 0.00            | 0.19                                    |
| Sys Resp (Upscale)                       | 12.09           | 300.99                                  |
| Upscale Cal Gas                          | 11.96           | 299.00                                  |
| Initial Zero Bias                        | 0.08%           | 0.00%                                   |
| Final Zero Bias                          | 0.11%           | 0.00%                                   |
| Zero Drift                               | 0.03%           | 0.00%                                   |
| Initial Upscale Bias                     | -1.14%          | 0.00%                                   |
| Final Upscale Bias                       | -0.71%          | -0.07%                                  |
| Upscale Drift                            | 0.43%           | 0.07%                                   |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | --                                      |
|                                          | Final Zero      | --                                      |
|                                          | Initial Upscale | --                                      |
|                                          | Final Upscale   | --                                      |
| Calibration Span                         | 21.00           | 1,000.00                                |
| 3% of Cal. Span (drift)                  | 0.63            | 30.00                                   |
| 5% of Cal. Span (bias)                   | 1.05            | 50.00                                   |

| DRIFT AND BIAS CHECK                     |                 |                                         |
|------------------------------------------|-----------------|-----------------------------------------|
| 100% Load, Run - 3-2                     | O <sub>2</sub>  | THC (as C <sub>3</sub> H <sub>8</sub> ) |
| Raw Average                              | 9.05            | 93.36                                   |
| Corrected Average                        | 9.06            | 107.19                                  |
| Initial Zero                             | 0.02            | 0.20                                    |
| Final Zero                               | 0.02            | 0.20                                    |
| Avg. Zero                                | 0.02            | 0.20                                    |
| Initial UpScale                          | 11.94           | 300.31                                  |
| Final UpScale                            | 11.95           | 300.00                                  |
| Avg. UpScale                             | 11.95           | 300.16                                  |
| Sys Resp (Zero)                          | 0.00            | 0.19                                    |
| Sys Resp (Upscale)                       | 12.09           | 300.99                                  |
| Upscale Cal Gas                          | 11.96           | 299.00                                  |
| Initial Zero Bias                        | 0.11%           | 0.00%                                   |
| Final Zero Bias                          | 0.11%           | 0.00%                                   |
| Zero Drift                               | 0.00%           | 0.00%                                   |
| Initial Upscale Bias                     | -0.71%          | -0.07%                                  |
| Final Upscale Bias                       | -0.67%          | -0.10%                                  |
| Upscale Drift                            | 0.05%           | 0.03%                                   |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | --                                      |
|                                          | Final Zero      | --                                      |
|                                          | Initial Upscale | --                                      |
|                                          | Final Upscale   | --                                      |
| Calibration Span                         | 21.00           | 1,000.00                                |
| 3% of Cal. Span (drift)                  | 0.63            | 30.00                                   |
| 5% of Cal. Span (bias)                   | 1.05            | 50.00                                   |

| DRIFT AND BIAS CHECK                     |                 |                                         |
|------------------------------------------|-----------------|-----------------------------------------|
| 100% Load, Run - 3-3                     | O <sub>2</sub>  | THC (as C <sub>3</sub> H <sub>8</sub> ) |
| Raw Average                              | 9.23            | 94.52                                   |
| Corrected Average                        | 9.25            | 108.68                                  |
| Initial Zero                             | 0.02            | 0.20                                    |
| Final Zero                               | 0.02            | 0.21                                    |
| Avg. Zero                                | 0.02            | 0.21                                    |
| Initial UpScale                          | 11.95           | 300.00                                  |
| Final UpScale                            | 11.90           | 299.31                                  |
| Avg. UpScale                             | 11.93           | 299.66                                  |
| Sys Resp (Zero)                          | 0.00            | 0.19                                    |
| Sys Resp (Upscale)                       | 12.09           | 300.99                                  |
| Upscale Cal Gas                          | 11.96           | 299.00                                  |
| Initial Zero Bias                        | 0.11%           | 0.00%                                   |
| Final Zero Bias                          | 0.11%           | 0.00%                                   |
| Zero Drift                               | 0.00%           | 0.00%                                   |
| Initial Upscale Bias                     | -0.67%          | -0.10%                                  |
| Final Upscale Bias                       | -0.90%          | -0.17%                                  |
| Upscale Drift                            | 0.24%           | 0.07%                                   |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | --                                      |
|                                          | Final Zero      | --                                      |
|                                          | Initial Upscale | --                                      |
|                                          | Final Upscale   | --                                      |
| Calibration Span                         | 21.00           | 1,000.00                                |
| 3% of Cal. Span (drift)                  | 0.63            | 30.00                                   |
| 5% of Cal. Span (bias)                   | 1.05            | 50.00                                   |

# ENGINE TEST - FIELD DATA SHEET

| Company:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          | Catalytic Combustion Corporation        |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------|-----------------|-------------|--------|-----------------|--|--|--|--|--|--|--------|--------|--------|--------|--------|-----------------------|----------|----------|----------|--|--|----------------------|----------|----------|----------|--|--|------------------------------|------|------|-------|--|--|--------------------------|----|----|----|--|--|-----------------------|----|----|----|--|--|------------------------|--|--|--|--|--|--------------------------------|--|--|--|--|--|-----------------------|--|--|--|--|--|------------------|--|--|--|--|--|--------------------------|-----|-----|-----|--|--|------------------|------|------|------|--|--|-------------------------------------|------|------|------|--|--|-------------------------------|-----|-----|-----|--|--|----------------|------|------|------|--|--|----------|----|----|----|--|--|------------------------|--|--|--|--|--|-------------------------|----|----|----|--|--|
| Facility Name:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          | Stewart & Stevenson Intergration Center |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Location (county & state):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          | Houston, Texas                          |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Physical Address or GPS Coordinates:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          | 10750 Telge Road<br>Houston, Texas      |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Project Code:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          | catc-21-houston.tx-start#1              |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          | 7/29/2021                               |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Unit Make and Model:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |                                         |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Unit Number:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |                                         |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Serial Number:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |                                         |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Data Recorded By:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          | CK                                      |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Tested With AHI Unit(s):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          | Truck(s):                               | 173             | Trailer(s): | 217    |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| LDEQ Warmup/Cal Req:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          | On (Day/Time):                          | Cal (Day/Time): |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| <table border="1"> <thead> <tr> <th colspan="6">RUN INFORMATION</th> </tr> <tr> <th></th> <th>Run #1</th> <th>Run #2</th> <th>Run #3</th> <th>Run #4</th> <th>Run #5</th> </tr> </thead> <tbody> <tr> <td>Time Start (hh:mm:ss)</td> <td>01:34:23</td> <td>12:05:23</td> <td>14:27:23</td> <td></td> <td></td> </tr> <tr> <td>Time Stop (hh:mm:ss)</td> <td>10:33:53</td> <td>13:04:53</td> <td>15:22:53</td> <td></td> <td></td> </tr> <tr> <td>Barometric Pressure (in. Hg)</td> <td>29.9</td> <td>29.9</td> <td>29.84</td> <td></td> <td></td> </tr> <tr> <td>Ambient Temperature (°F)</td> <td>95</td> <td>99</td> <td>96</td> <td></td> <td></td> </tr> <tr> <td>Relative Humidity (%)</td> <td>53</td> <td>49</td> <td>49</td> <td></td> <td></td> </tr> <tr> <td>Stack Temperature (°F)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Fuel Usage (btu/hp*hr or SCFM)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Rated Horsepower (hp)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Rated Engine RPM</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Load % or BHP from panel</td> <td>50%</td> <td>50%</td> <td>50%</td> <td></td> <td></td> </tr> <tr> <td>Engine Speed RPM</td> <td>1799</td> <td>1799</td> <td>1800</td> <td></td> <td></td> </tr> <tr> <td>Air Manifold Pressure (psia/in. Hg)</td> <td>25.2</td> <td>25.4</td> <td>25.3</td> <td></td> <td></td> </tr> <tr> <td>Air Manifold Temperature (°F)</td> <td>122</td> <td>122</td> <td>124</td> <td></td> <td></td> </tr> <tr> <td>Kilowatts (KW)</td> <td>1350</td> <td>1352</td> <td>1390</td> <td></td> <td></td> </tr> <tr> <td>Amps (A)</td> <td>56</td> <td>57</td> <td>56</td> <td></td> <td></td> </tr> <tr> <td>Engine Operating Hours</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Engine Timing (degrees)</td> <td>23</td> <td>23</td> <td>23</td> <td></td> <td></td> </tr> </tbody> </table> |          |                                         |                 |             |        | RUN INFORMATION |  |  |  |  |  |  | Run #1 | Run #2 | Run #3 | Run #4 | Run #5 | Time Start (hh:mm:ss) | 01:34:23 | 12:05:23 | 14:27:23 |  |  | Time Stop (hh:mm:ss) | 10:33:53 | 13:04:53 | 15:22:53 |  |  | Barometric Pressure (in. Hg) | 29.9 | 29.9 | 29.84 |  |  | Ambient Temperature (°F) | 95 | 99 | 96 |  |  | Relative Humidity (%) | 53 | 49 | 49 |  |  | Stack Temperature (°F) |  |  |  |  |  | Fuel Usage (btu/hp*hr or SCFM) |  |  |  |  |  | Rated Horsepower (hp) |  |  |  |  |  | Rated Engine RPM |  |  |  |  |  | Load % or BHP from panel | 50% | 50% | 50% |  |  | Engine Speed RPM | 1799 | 1799 | 1800 |  |  | Air Manifold Pressure (psia/in. Hg) | 25.2 | 25.4 | 25.3 |  |  | Air Manifold Temperature (°F) | 122 | 122 | 124 |  |  | Kilowatts (KW) | 1350 | 1352 | 1390 |  |  | Amps (A) | 56 | 57 | 56 |  |  | Engine Operating Hours |  |  |  |  |  | Engine Timing (degrees) | 23 | 23 | 23 |  |  |
| RUN INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |                                         |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Run #1   | Run #2                                  | Run #3          | Run #4      | Run #5 |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Time Start (hh:mm:ss)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 01:34:23 | 12:05:23                                | 14:27:23        |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Time Stop (hh:mm:ss)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 10:33:53 | 13:04:53                                | 15:22:53        |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Barometric Pressure (in. Hg)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 29.9     | 29.9                                    | 29.84           |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Ambient Temperature (°F)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 95       | 99                                      | 96              |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Relative Humidity (%)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 53       | 49                                      | 49              |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Stack Temperature (°F)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |                                         |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Fuel Usage (btu/hp*hr or SCFM)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |                                         |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Rated Horsepower (hp)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |                                         |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Rated Engine RPM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |                                         |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Load % or BHP from panel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 50%      | 50%                                     | 50%             |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Engine Speed RPM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1799     | 1799                                    | 1800            |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Air Manifold Pressure (psia/in. Hg)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 25.2     | 25.4                                    | 25.3            |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Air Manifold Temperature (°F)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 122      | 122                                     | 124             |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Kilowatts (KW)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1350     | 1352                                    | 1390            |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Amps (A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 56       | 57                                      | 56              |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Engine Operating Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |                                         |                 |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |
| Engine Timing (degrees)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 23       | 23                                      | 23              |             |        |                 |  |  |  |  |  |  |        |        |        |        |        |                       |          |          |          |  |  |                      |          |          |          |  |  |                              |      |      |       |  |  |                          |    |    |    |  |  |                       |    |    |    |  |  |                        |  |  |  |  |  |                                |  |  |  |  |  |                       |  |  |  |  |  |                  |  |  |  |  |  |                          |     |     |     |  |  |                  |      |      |      |  |  |                                     |      |      |      |  |  |                               |     |     |     |  |  |                |      |      |      |  |  |          |    |    |    |  |  |                        |  |  |  |  |  |                         |    |    |    |  |  |

|                         |        |           |           |
|-------------------------|--------|-----------|-----------|
| CYLINDER SERIAL NUMBERS | N2/Low | O2        | VOC       |
|                         | Mid    | CC727745  | EB0032453 |
|                         | High   | CC712952  | EB0093622 |
|                         |        | EB0059402 | EB0034654 |
|                         | N2/Low | NOx       | CO        |
|                         | Mid    |           |           |
| High                    |        |           |           |

| NO2 CONVERSION    |  |
|-------------------|--|
| NO2 Gas (ppm)     |  |
| NO Reading (ppm)  |  |
| NOx Reading (ppm) |  |
| Cylinder Num      |  |
| Time              |  |

|             |                                                                     |
|-------------|---------------------------------------------------------------------|
| Probe Used: | Multi Point Rake<br>Pre-Hung<br>Shepherd's hook<br>Ports where used |
|-------------|---------------------------------------------------------------------|

| REPORT INFORMATION |          |
|--------------------|----------|
| INSTRUMENT         | SERIAL # |
| O2                 |          |
| NOx                |          |
| CO                 |          |
| Dilutor            |          |
| VOC                |          |
| FTIR               |          |

|                          |  |
|--------------------------|--|
| Customer Number:         |  |
| Regulated Entity Number: |  |
| Permit ID:               |  |

|                |  |
|----------------|--|
| Stack Height   |  |
| Stack Diameter |  |

| High Level Diluted Gas Validation Table |                        |                         |
|-----------------------------------------|------------------------|-------------------------|
| Trial #                                 | Dilutor Output (11.0%) | Instrument Response (%) |
| 1                                       |                        |                         |
| 2                                       |                        |                         |
| 3                                       |                        |                         |

| Mid Level Diluted Gas Validation Table |                        |                         |
|----------------------------------------|------------------------|-------------------------|
| Trial #                                | Dilutor Output (11.0%) | Instrument Response (%) |
| 1                                      |                        |                         |
| 2                                      |                        |                         |
| 3                                      |                        |                         |

| Mid Level Protocol Gas Validation Table |                     |                         |
|-----------------------------------------|---------------------|-------------------------|
| Trial #                                 | Certified Value (%) | Instrument Response (%) |
| 1                                       |                     |                         |
| 2                                       |                     |                         |
| 3                                       |                     |                         |

| CALIBRATION | O2    |        | NOx   |        | CO    |        | VOC   |        |
|-------------|-------|--------|-------|--------|-------|--------|-------|--------|
|             | Conc. | Actual | Conc. | Actual | Conc. | Actual | Conc. | Actual |
| Zero Gas    | 0     | 0.5    |       |        |       |        | 0     | 1.42   |
| Low Gas     |       |        |       |        |       |        | 302   | 304.34 |
| Mid Gas     | 12.0  | 12.02  |       |        |       |        | 456   | 461.70 |
| High Gas    | 21    | 21.01  |       |        |       |        | 802   | 808.45 |

| BIAS           | O2   |       | NOx  |     | CO   |        | VOC  |     |
|----------------|------|-------|------|-----|------|--------|------|-----|
|                | Zero | Mid   | Zero | Mid | Zero | Mid    | Zero | Mid |
| Initial/Run #1 | 0.03 | 12.03 |      |     | 2.53 | 306.71 |      |     |
| Run #1/Run #2  | 0.07 | 11.96 |      |     | 1.12 | 307.25 |      |     |
| Run #2/Run #3  | 0.08 | 11.97 |      |     | 1.21 | 317.92 |      |     |
| Run #3/Run #4  |      |       |      |     |      |        |      |     |
| Run #4/Final   |      |       |      |     |      |        |      |     |

Bias Gas Actual Conc.



AIR HYGIENE

Signature: *[Signature]*



| ENGINE TEST - FIELD DATA SHEET         |  |                                         |  |                 |  |             |  |     |  |
|----------------------------------------|--|-----------------------------------------|--|-----------------|--|-------------|--|-----|--|
| Company:                               |  | Catalytic Combustion Corporation        |  |                 |  |             |  |     |  |
| Facility Name:                         |  | Stewart & Stevenson Intergration Center |  |                 |  |             |  |     |  |
| Location (county & state):             |  | Houston, Texas                          |  |                 |  |             |  |     |  |
| Physical Address or GPS Coordinates:   |  | 10750 Teige Road<br>Houston, Texas      |  |                 |  |             |  |     |  |
| Project Code:                          |  | catc-21-houston.tx-start#1              |  |                 |  |             |  |     |  |
| Date:                                  |  | 7/30/2021                               |  |                 |  |             |  |     |  |
| Unit Make and Model:                   |  |                                         |  |                 |  |             |  |     |  |
| Unit Number:                           |  |                                         |  |                 |  |             |  |     |  |
| Serial Number:                         |  | CK                                      |  |                 |  |             |  |     |  |
| Data Recorded By:                      |  | CK                                      |  |                 |  |             |  |     |  |
| Tested With AHI Unit(s):               |  | Truck(s):                               |  | 173             |  | Trailer(s): |  | 217 |  |
| LDEQ Warmup/Cal Req:                   |  | On (Day/Time):                          |  | Cal (Day/Time): |  |             |  |     |  |
| RUN INFORMATION                        |  |                                         |  |                 |  |             |  |     |  |
| Time Start (hh:mm:ss)                  |  | Run #1                                  |  | Run #2          |  | Run #3      |  |     |  |
| Time Stop (hh:mm:ss)                   |  | 13:45:53                                |  | 15:00:23        |  | 16:28:33    |  |     |  |
| Barometric Pressure (in. Hg)           |  | 14:44:53                                |  | 15:59:53        |  | 17:26:53    |  |     |  |
| Ambient Temperature (°F)               |  | 29.89                                   |  | 29.87           |  | 29.46       |  |     |  |
| Relative Humidity (%)                  |  | 44                                      |  | 47              |  | 47          |  |     |  |
| Stack Temperature (°F)                 |  | 53                                      |  | 47              |  | 42          |  |     |  |
| Fuel Usage (btu/hp·hr or SCFM)         |  |                                         |  |                 |  |             |  |     |  |
| Rated Horsepower (hp)                  |  |                                         |  |                 |  |             |  |     |  |
| Rated Engine RPM                       |  |                                         |  |                 |  |             |  |     |  |
| Load % or BHP from panel               |  | 75                                      |  | 75              |  | 75          |  |     |  |
| Engine Speed RPM                       |  | 1500                                    |  | 1500            |  | 1500        |  |     |  |
| Air Manifold Pressure (psig or in. Hg) |  | 36.4                                    |  | 36.7            |  | 35.6        |  |     |  |
| Air Manifold Temperature (°F)          |  | 131                                     |  | 131             |  | 129         |  |     |  |
| Kilowatts (KW)                         |  | 2007                                    |  | 2012            |  | 1951        |  |     |  |
| Ampere (A)                             |  | 89                                      |  | 90              |  | 97          |  |     |  |
| Engine Operating Hours                 |  |                                         |  |                 |  |             |  |     |  |
| Engine Timing (degrees)                |  | 23                                      |  | 23              |  | 23          |  |     |  |

| CALIBRATION | O <sub>2</sub> |        | NOx   |        | CO    |        | VOC   |        |
|-------------|----------------|--------|-------|--------|-------|--------|-------|--------|
|             | Conc.          | Actual | Conc. | Actual | Conc. | Actual | Conc. | Actual |
| Zero Gas    | 0              | 0.06   |       |        | 0     | 1.86   |       |        |
| Low Gas     |                |        |       |        | 302   | 301.29 |       |        |
| Mid Gas     | 12.0           | 12.03  |       |        | 458   | 446.31 |       |        |
| High Gas    | 21             | 21.06  |       |        | 802   | 805.37 |       |        |

| BIAS           | O <sub>2</sub> |       | NOx  |     | CO   |        | VOC  |     |
|----------------|----------------|-------|------|-----|------|--------|------|-----|
|                | Zero           | Mid   | Zero | Mid | Zero | Mid    | Zero | Mid |
| Initial/Run #1 | .07            | 12.01 |      |     | .13  | 304.51 |      |     |
| Run #1/Run #2  | .06            | 11.97 |      |     | .27  | 310.21 |      |     |
| Run #2/Run #3  | .04            | 11.95 |      |     | .44  | 307.2  |      |     |
| Run #3/Run #4  |                |       |      |     |      |        |      |     |
| Run #4/Final   |                |       |      |     |      |        |      |     |

Bias Gas Actual Conc.



AIR HYGIENE

Signature:

*Chad R.*

## **QUALITY ASSURANCE AND QUALITY CONTROL DATA**

### **Fourier Transform Infrared Analyzer Daily QA Data**

**Catalytic Combustion Corporation**  
**July 29, 2021**  
**Caterpillar, G3520 TALE**  
**Stewart & Stevenson Integration Center**

| Sampling System<br>Leak Check | Flow<br>(LPM) | Date<br>(dd/mm/yy) | Time<br>(hh:mm) |
|-------------------------------|---------------|--------------------|-----------------|
|                               | ≤0.2          | 07/29/21           | 6:00            |

FTIR No: 509/ INST-IR-0005  
 Make Model: MKS 2030

|                                      |                          |
|--------------------------------------|--------------------------|
| <b>Analytical System Leak Checks</b> | <b>Vacuum Leak Check</b> |
|--------------------------------------|--------------------------|

| Spectrum            | Date<br>(dd/mm/yy) | Time<br>(hh:mm:ss) | Vacuum<br>(atm) |
|---------------------|--------------------|--------------------|-----------------|
| 0729-PRE_000015.LAB | 07/29/21           | 6:11:04            | 0.99216         |
| 0729-PRE_000016.LAB | 07/29/21           | 6:11:34            | 0.99222         |
| 0729-PRE_000017.LAB | 07/29/21           | 6:12:04            | 0.99226         |
| 0729-PRE_000018.LAB | 07/29/21           | 6:12:34            | 0.99232         |
| 0729-PRE_000019.LAB | 07/29/21           | 6:13:04            | 0.99235         |
| 0729-PRE_000020.LAB | 07/29/21           | 6:13:34            | 0.99241         |
| 0729-PRE_000021.LAB | 07/29/21           | 6:14:04            | 0.99239         |
| 0729-PRE_000022.LAB | 07/29/21           | 6:14:34            | 0.99237         |
| 0729-PRE_000023.LAB | 07/29/21           | 6:15:04            | 0.99289         |

| Pressure Elements        | Vacuum<br>(atm) |
|--------------------------|-----------------|
| Average, $P_s$           | 0.99237         |
| Maximum                  | 0.99289         |
| Minimum                  | 0.99216         |
| Difference, $\Delta P_v$ | 0.00073         |

| Time Elements                | Results<br>(min) |
|------------------------------|------------------|
| Signal Integration, $t_{ss}$ | 0.50             |
| Test Duration, $t_d$         | 4.00             |

|                                      |                            |
|--------------------------------------|----------------------------|
| <b>Analytical System Leak Checks</b> | <b>Pressure Leak Check</b> |
|--------------------------------------|----------------------------|

| Spectrum            | Date<br>(dd/mm/yy) | Time<br>(hh:mm:ss) | Pressure<br>(atm) |
|---------------------|--------------------|--------------------|-------------------|
| 0729-PRE_000002.LAB | 07/29/21           | 6:04:33            | 1.10579           |
| 0729-PRE_000003.LAB | 07/29/21           | 6:05:03            | 1.10579           |
| 0729-PRE_000004.LAB | 07/29/21           | 6:05:33            | 1.10579           |
| 0729-PRE_000005.LAB | 07/29/21           | 6:06:03            | 1.10579           |
| 0729-PRE_000006.LAB | 07/29/21           | 6:06:33            | 1.10579           |
| 0729-PRE_000007.LAB | 07/29/21           | 6:07:03            | 1.10579           |
| 0729-PRE_000008.LAB | 07/29/21           | 6:07:33            | 1.10579           |
| 0729-PRE_000009.LAB | 07/29/21           | 6:08:03            | 1.10579           |
| 0729-PRE_000010.LAB | 07/29/21           | 6:08:33            | 1.10579           |
| 0729-PRE_000011.LAB | 07/29/21           | 6:09:03            | 1.10579           |

| Pressure Elements        | Pressure<br>(atm) |
|--------------------------|-------------------|
| Average, $P_s$           | 1.10579           |
| Maximum                  | 1.10579           |
| Minimum                  | 1.10579           |
| Difference, $\Delta P_p$ | 0.00000           |

|                           |       |
|---------------------------|-------|
| Station Pressure (in. Hg) | 29.90 |
|---------------------------|-------|

| Time Elements                | Results<br>(min) |
|------------------------------|------------------|
| Signal Integration, $t_{ss}$ | 0.50             |
| Test Duration, $t_d$         | 4.50             |

| Parameter                    | Vacuum  | Pressure | Max $\Delta P$ |
|------------------------------|---------|----------|----------------|
| Test Duration, $t_d$         | 4.00    | 4.50     | 4.00           |
| Signal Integ., $t_{ss}$      | 0.50    | 0.50     | 0.50           |
| Difference, $\Delta P$       | 0.00073 | 0.00000  | 0.00073        |
| Average, $P_s$               | 0.99237 | 1.10579  | 0.99237        |
| Leak Volume, %V <sub>L</sub> | 0.009   | 0.000    | 0.009          |
| Pass, ≤4%                    | yes     | yes      | yes            |

$$\%V_L = \frac{100\%}{t_d} t_{ss} \frac{\Delta P_{max}}{P_s}$$

Method 320, Section 8.2.2.4, Equation 2  
 expanded to account for sample duration

Catalytic Combustion Corporation  
July 29, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

|                                                         |          |
|---------------------------------------------------------|----------|
| Protocol No. 1, CO <sub>2</sub> Cylinder Concentration: | 8.95 %vd |
|---------------------------------------------------------|----------|

| Pre-Test Background |                    |                         |                   |                     |                 | FTIR: 509/ INST-IR-0005 |
|---------------------|--------------------|-------------------------|-------------------|---------------------|-----------------|-------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub> | H <sub>2</sub> O<br>(%) |
| 07/29/21            | 6:21:13            | 0729-PRE_000032BKG.LAB  | 191.3             | 0.99                | 0.0000          | 0.0000                  |

| Pre-Test Direct Zero |                    |                         |                   |                     |                 |                         |
|----------------------|--------------------|-------------------------|-------------------|---------------------|-----------------|-------------------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub> | H <sub>2</sub> O<br>(%) |
| 07/29/21             | 6:18:04            | 0729-PRE_000029.LAB     | 191.3             | 0.99                | 0.0060          | 0.0092                  |
| 07/29/21             | 6:18:35            | 0729-PRE_000030.LAB     | 191.3             | 0.99                | -0.0087         | 0.0085                  |
| 07/29/21             | 6:19:04            | 0729-PRE_000031.LAB     | 191.3             | 0.99                | -0.0089         | 0.0019                  |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                 |                         |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|-----------------|-------------------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub> | H <sub>2</sub> O<br>(%) |
| 07/29/21                                     | 6:22:49            | 0729-PRE_000035.LAB     | 191.3             | 0.99                | 8.9948          | 0.0225                  |
| 07/29/21                                     | 6:23:19            | 0729-PRE_000036.LAB     | 191.3             | 0.99                | 9.0258          | 0.0065                  |
| 07/29/21                                     | 6:23:49            | 0729-PRE_000037.LAB     | 191.3             | 0.99                | 9.0322          | -0.0002                 |
| 07/29/21                                     | 6:24:19            | 0729-PRE_000038.LAB     | 191.3             | 0.99                | 9.0356          | 0.0066                  |
| 07/29/21                                     | 6:24:49            | 0729-PRE_000039.LAB     | 191.3             | 0.99                | 9.0464          | 0.0034                  |
| Average                                      |                    |                         | 191.3             | 0.99                | 9.0270          | 0.0078                  |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                 |                         |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|-----------------|-------------------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub> | H <sub>2</sub> O<br>(%) |
| 07/29/21                                      | 17:07:51           | 0729-R3_000460.LAB      | 191.4             | 0.99                | 9.1068          | 0.8887                  |
| 07/29/21                                      | 17:08:21           | 0729-R3_000461.LAB      | 191.4             | 0.99                | 9.1768          | 0.2897                  |
| 07/29/21                                      | 17:09:51           | 0729-R3_000464.LAB      | 191.4             | 0.99                | 9.2146          | 0.1001                  |
| 07/29/21                                      | 17:10:21           | 0729-R3_000465.LAB      | 191.3             | 0.99                | 9.2266          | 0.1005                  |
| 07/29/21                                      | 17:10:51           | 0729-R3_000466.LAB      | 191.4             | 0.99                | 9.2030          | 0.0946                  |
| Average                                       |                    |                         | 191.4             | 0.99                | 9.1856          | 0.2947                  |

| Post-Test Direct Zero |                    |                         |                   |                     |                 |                         |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|-----------------|-------------------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub> | H <sub>2</sub> O<br>(%) |
| 07/29/21              | 17:45:10           | 0729-R3_000534.LAB      | 191.4             | 0.99                | 0.0618          | -0.0234                 |
| 07/29/21              | 17:45:40           | 0729-R3_000535.LAB      | 191.5             | 0.99                | 0.0086          | -0.0113                 |
| 07/29/21              | 17:46:10           | 0729-R3_000536.LAB      | 191.4             | 0.99                | 0.0130          | -0.0153                 |



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**July 29, 2021**  
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**Stewart & Stevenson Integration Center**

| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             |                       | (%)                   |
| 07/29/21                    | 17:48:27    | 0729-R3_000537BKG.LAB | 191.4            | 0.99              | 0.0000                | 0.0000                |

| <b>CTS Results</b> | Protocol No. 1 Concentration | FTIR CO <sub>2</sub><br>Average | Error<br>(%) | Pass<br>(≤5%) |
|--------------------|------------------------------|---------------------------------|--------------|---------------|
| Pre-Test Direct    | 8.95                         | 9.03                            | 0.86         | YES           |
| Post-Test Direct   | 8.95                         | 9.19                            | 2.63         | YES           |

| <b>Pre / Post<br/>Comparison</b> | FTIR CO <sub>2</sub><br>Maximum | FTIR CO <sub>2</sub><br>Pre/Post Mean | Error<br>(%) | Pass<br>(≤5%) |
|----------------------------------|---------------------------------|---------------------------------------|--------------|---------------|
| Pre-Test Direct                  | 9.05                            | 9.11                                  | 0.66         | YES           |
| Post-Test Direct                 | 9.23                            |                                       | 1.30         | YES           |

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|                                                    |          |
|----------------------------------------------------|----------|
| Certified, NH <sub>3</sub> Cylinder Concentration: | 49 ppmvd |
|----------------------------------------------------|----------|

| Pre-Test Background |                    |                         |                   |                     |                            |                         | FTIR: 509/ INST-IR-0005    |
|---------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NH <sub>3</sub><br>(ppmvw) |
| 07/29/21            | 6:21:13            | 0729-PRE_000032BKG.LAB  | 191.3             | 0.99                | 0.0000                     | 0.0000                  | 0.0000                     |

| Pre-Test Direct Zero |                    |                         |                   |                     |                            |                         |                            |
|----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NH <sub>3</sub><br>(ppmvw) |
| 07/29/21             | 6:18:04            | 0729-PRE_000029.LAB     | 191.3             | 0.99                | 0.0060                     | 0.0092                  | 0.0729                     |
| 07/29/21             | 6:18:35            | 0729-PRE_000030.LAB     | 191.3             | 0.99                | -0.0087                    | 0.0085                  | 0.0730                     |
| 07/29/21             | 6:19:04            | 0729-PRE_000031.LAB     | 191.3             | 0.99                | -0.0089                    | 0.0019                  | 0.0763                     |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                            |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NH <sub>3</sub><br>(ppmvw) |
| 07/29/21                                     | 7:26:34            | 0729-PRE_000163.LAB     | 191.3             | 0.99                | 0.0016                     | 0.0092                  | 46.2851                    |
| 07/29/21                                     | 7:28:34            | 0729-PRE_000167.LAB     | 191.3             | 0.99                | -0.0024                    | 0.0120                  | 47.2974                    |
| 07/29/21                                     | 7:29:04            | 0729-PRE_000168.LAB     | 191.3             | 0.99                | 0.0013                     | 0.0064                  | 46.2767                    |
| 07/29/21                                     | 7:29:34            | 0729-PRE_000169.LAB     | 191.3             | 0.99                | 0.0097                     | 0.0036                  | 47.1397                    |
| 07/29/21                                     | 7:30:04            | 0729-PRE_000170.LAB     | 191.3             | 0.99                | 0.0069                     | 0.0053                  | 46.8958                    |
| Average                                      |                    |                         | 191.3             | 0.99                | 0.0034                     | 0.0073                  | 46.7789                    |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                            |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NH <sub>3</sub><br>(ppmvw) |
| 07/29/21                                      | 17:31:53           | 0729-R3_000508.LAB      | 191.4             | 0.99                | 0.0023                     | -0.0039                 | 46.6088                    |
| 07/29/21                                      | 17:32:24           | 0729-R3_000509.LAB      | 191.4             | 0.99                | 0.0178                     | 0.0033                  | 46.7044                    |
| 07/29/21                                      | 17:32:54           | 0729-R3_000510.LAB      | 191.4             | 0.99                | 0.0233                     | -0.0043                 | 46.6023                    |
| 07/29/21                                      | 17:33:24           | 0729-R3_000511.LAB      | 191.4             | 0.99                | 0.0205                     | -0.0039                 | 46.8212                    |
| 07/29/21                                      | 17:33:54           | 0729-R3_000512.LAB      | 191.4             | 0.99                | 0.0073                     | 0.0111                  | 46.7872                    |
| Average                                       |                    |                         | 191.4             | 0.99                | 0.0142                     | 0.0005                  | 46.7048                    |

| Post-Test Direct Zero |                    |                         |                   |                     |                            |                         |                            |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NH <sub>3</sub><br>(ppmvw) |
| 07/29/21              | 17:45:10           | 0729-R3_000534.LAB      | 191.4             | 0.99                | 0.0618                     | -0.0234                 | 0.7380                     |
| 07/29/21              | 17:45:40           | 0729-R3_000535.LAB      | 191.5             | 0.99                | 0.0086                     | -0.0113                 | 0.7408                     |
| 07/29/21              | 17:46:10           | 0729-R3_000536.LAB      | 191.4             | 0.99                | 0.0130                     | -0.0153                 | 0.7300                     |

**Catalytic Combustion Corporation**  
**July 29, 2021**  
**Caterpillar, G3520 TALE**  
**Stewart & Stevenson Integration Center**

| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |                       |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|-----------------------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> | <b>NH<sub>3</sub></b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             | (ppmvw)               | (%)                   | (ppmvw)               |
| 07/29/21                    | 17:48:27    | 0729-R3_000537BKG.LAB | 191.4            | 0.99              | 0.0000                | 0.0000                | 0.0000                |

| <b>CTS Results</b> | Certified Concentration | FTIR NH <sub>3</sub><br>Average | Error<br>(%) | Pass<br>(≤5%) |
|--------------------|-------------------------|---------------------------------|--------------|---------------|
| Pre-Test Direct    | 49.00                   | 46.78                           | 4.53         | YES           |
| Post-Test Direct   | 49.00                   | 46.70                           | 4.68         | YES           |

| <b>Pre / Post<br/>Comparison</b> | FTIR NH <sub>3</sub><br>Maximum | FTIR NH <sub>3</sub><br>Pre/Post Mean | Error<br>(%) | Pass<br>(≤5%) |
|----------------------------------|---------------------------------|---------------------------------------|--------------|---------------|
| Pre-Test Direct                  | 47.30                           | 46.74                                 | 1.17         | YES           |
| Post-Test Direct                 | 46.82                           |                                       | 0.17         | YES           |

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|                                                                  |           |
|------------------------------------------------------------------|-----------|
| Certified, C <sub>2</sub> H <sub>6</sub> Cylinder Concentration: | 100 ppmvd |
|------------------------------------------------------------------|-----------|

| Pre-Test Background |                    |                         |                   |                     |                            |                         | FTIR: 509/ INST-IR-0005                  |
|---------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/29/21            | 6:21:13            | 0729-PRE_000032BKG.LAB  | 191.3             | 0.99                | 0.0000                     | 0.0000                  | 0.0000                                   |

| Pre-Test Direct Zero |                    |                         |                   |                     |                            |                         |                                          |
|----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/29/21             | 6:18:04            | 0729-PRE_000029.LAB     | 191.3             | 0.99                | 0.0060                     | 0.0092                  | -0.0143                                  |
| 07/29/21             | 6:18:35            | 0729-PRE_000030.LAB     | 191.3             | 0.99                | -0.0087                    | 0.0085                  | -0.2806                                  |
| 07/29/21             | 6:19:04            | 0729-PRE_000031.LAB     | 191.3             | 0.99                | -0.0089                    | 0.0019                  | -0.1091                                  |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                                          |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/29/21                                     | 6:26:19            | 0729-PRE_000042.LAB     | 191.3             | 0.99                | 0.0046                     | 0.0038                  | 101.0654                                 |
| 07/29/21                                     | 6:26:49            | 0729-PRE_000043.LAB     | 191.3             | 0.99                | 0.0091                     | -0.0046                 | 101.3680                                 |
| 07/29/21                                     | 6:27:19            | 0729-PRE_000044.LAB     | 191.3             | 0.99                | -0.0013                    | 0.0043                  | 101.0983                                 |
| 07/29/21                                     | 6:27:50            | 0729-PRE_000045.LAB     | 191.3             | 0.99                | 0.0055                     | -0.0011                 | 101.4527                                 |
| 07/29/21                                     | 6:28:20            | 0729-PRE_000046.LAB     | 191.3             | 0.99                | 0.0024                     | -0.0025                 | 101.4251                                 |
| Average                                      |                    |                         | 191.3             | 0.99                | 0.0040                     | 0.0000                  | 101.2819                                 |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                                          |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/29/21                                      | 17:15:52           | 0729-R3_000476.LAB      | 191.4             | 0.99                | 0.0099                     | 0.0079                  | 99.9658                                  |
| 07/29/21                                      | 17:16:22           | 0729-R3_000477.LAB      | 191.4             | 0.99                | 0.0164                     | 0.0016                  | 99.3676                                  |
| 07/29/21                                      | 17:16:52           | 0729-R3_000478.LAB      | 191.4             | 0.99                | 0.0052                     | 0.0063                  | 99.9686                                  |
| 07/29/21                                      | 17:17:22           | 0729-R3_000479.LAB      | 191.4             | 0.99                | 0.0139                     | 0.0039                  | 99.3839                                  |
| 07/29/21                                      | 17:17:52           | 0729-R3_000480.LAB      | 191.4             | 0.99                | 0.0141                     | -0.0024                 | 99.2374                                  |
| Average                                       |                    |                         | 191.4             | 0.99                | 0.0119                     | 0.0035                  | 99.5847                                  |

| Post-Test Direct Zero |                    |                         |                   |                     |                            |                         |                                          |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/29/21              | 17:45:10           | 0729-R3_000534.LAB      | 191.4             | 0.99                | 0.0618                     | -0.0234                 | -0.4644                                  |
| 07/29/21              | 17:45:40           | 0729-R3_000535.LAB      | 191.5             | 0.99                | 0.0086                     | -0.0113                 | -0.3360                                  |
| 07/29/21              | 17:46:10           | 0729-R3_000536.LAB      | 191.4             | 0.99                | 0.0130                     | -0.0153                 | -0.7831                                  |

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| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |                                   |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|-----------------------------------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> | <b>C<sub>2</sub>H<sub>6</sub></b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             | (ppmvw)               | (%)                   | (ppmvw)                           |
| 07/29/21                    | 17:48:27    | 0729-R3_000537BKG.LAB | 191.4            | 0.99              | 0.0000                | 0.0000                | 0.0000                            |

| <b>CTS Results</b> | Certified Concentration | FTIR C <sub>2</sub> H <sub>6</sub><br>Average | Error<br>(%) | Pass<br>(≤5%) |
|--------------------|-------------------------|-----------------------------------------------|--------------|---------------|
| Pre-Test Direct    | 100.00                  | 101.28                                        | 1.28         | YES           |
| Post-Test Direct   | 100.00                  | 99.58                                         | 0.42         | YES           |

| <b>Pre / Post<br/>Comparison</b> | FTIR C <sub>2</sub> H <sub>6</sub><br>Maximum | FTIR C <sub>2</sub> H <sub>6</sub><br>Pre/Post Mean | Error<br>(%) | Pass<br>(≤5%) |
|----------------------------------|-----------------------------------------------|-----------------------------------------------------|--------------|---------------|
| Pre-Test Direct                  | 101.45                                        | 100.43                                              | 1.00         | YES           |
| Post-Test Direct                 | 99.97                                         |                                                     | 0.46         | YES           |

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|                                                    |             |
|----------------------------------------------------|-------------|
| <b>Protocol No. 1, NOx Cylinder Concentration:</b> | 116.1 ppmvd |
|----------------------------------------------------|-------------|

| Pre-Test Background |                    |                         |                   |                     |                            |                         | FTIR: 509/ INST-IR-0005 |
|---------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|-------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw)          |
| 07/29/21            | 6:21:13            | 0729-PRE_000032BKG.LAB  | 191.3             | 0.99                | 0.0000                     | 0.0000                  | 0.0000                  |

| Pre-Test Direct Zero |                    |                         |                   |                     |                            |                         |                |
|----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw) |
| 07/29/21             | 6:18:04            | 0729-PRE_000029.LAB     | 191.3             | 0.99                | 0.0060                     | 0.0092                  | -0.1679        |
| 07/29/21             | 6:18:35            | 0729-PRE_000030.LAB     | 191.3             | 0.99                | -0.0087                    | 0.0085                  | -0.0946        |
| 07/29/21             | 6:19:04            | 0729-PRE_000031.LAB     | 191.3             | 0.99                | -0.0089                    | 0.0019                  | -0.1183        |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                 |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|-----------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw)  |
| 07/29/21                                     | 6:29:20            | 0729-PRE_000048.LAB     | 191.3             | 0.99                | -0.0356                    | 0.0132                  | 118.4758        |
| 07/29/21                                     | 6:29:50            | 0729-PRE_000049.LAB     | 191.3             | 0.99                | -0.0345                    | 0.0001                  | 118.2633        |
| 07/29/21                                     | 6:30:20            | 0729-PRE_000050.LAB     | 191.3             | 0.99                | -0.0255                    | -0.0019                 | 117.9127        |
| 07/29/21                                     | 6:30:50            | 0729-PRE_000051.LAB     | 191.3             | 0.99                | -0.0344                    | 0.0022                  | 118.9113        |
| 07/29/21                                     | 6:31:20            | 0729-PRE_000052.LAB     | 191.3             | 0.99                | -0.0412                    | 0.0002                  | 119.3122        |
| <b>Average</b>                               |                    |                         | <b>191.3</b>      | <b>0.99</b>         | <b>-0.0342</b>             | <b>0.0028</b>           | <b>118.5751</b> |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                 |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|-----------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw)  |
| 07/29/21                                      | 17:12:22           | 0729-R3_000469.LAB      | 191.4             | 0.99                | -0.0204                    | 0.0499                  | 120.3651        |
| 07/29/21                                      | 17:12:52           | 0729-R3_000470.LAB      | 191.4             | 0.99                | -0.0230                    | 0.0303                  | 120.2399        |
| 07/29/21                                      | 17:13:22           | 0729-R3_000471.LAB      | 191.4             | 0.99                | -0.0332                    | 0.0140                  | 120.4058        |
| 07/29/21                                      | 17:13:52           | 0729-R3_000472.LAB      | 191.4             | 0.99                | -0.0284                    | 0.0138                  | 120.5176        |
| 07/29/21                                      | 17:14:22           | 0729-R3_000473.LAB      | 191.4             | 0.99                | -0.0239                    | 0.0099                  | 120.2993        |
| <b>Average</b>                                |                    |                         | <b>191.4</b>      | <b>0.99</b>         | <b>-0.0258</b>             | <b>0.0236</b>           | <b>120.3655</b> |

| Post-Test Direct Zero |                    |                         |                   |                     |                            |                         |                |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw) |
| 07/29/21              | 17:45:10           | 0729-R3_000534.LAB      | 191.4             | 0.99                | 0.0618                     | -0.0234                 | -0.7746        |
| 07/29/21              | 17:45:40           | 0729-R3_000535.LAB      | 191.5             | 0.99                | 0.0086                     | -0.0113                 | -0.2312        |
| 07/29/21              | 17:46:10           | 0729-R3_000536.LAB      | 191.4             | 0.99                | 0.0130                     | -0.0153                 | -0.1751        |

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| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |            |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|------------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> | <b>NOx</b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             | (ppmvw)               | (%)                   | (ppmvw)    |
| 07/29/21                    | 17:48:27    | 0729-R3_000537BKG.LAB | 191.4            | 0.99              | 0.0000                | 0.0000                | 0.0000     |

| <b>CTS Results</b> | Protocol No. 1 Concentration | FTIR NOx<br>Average | Error<br>(%) | Pass<br>(≤5%) |
|--------------------|------------------------------|---------------------|--------------|---------------|
| Pre-Test Direct    | 116.10                       | 118.58              | 2.13         | YES           |
| Post-Test Direct   | 116.10                       | 120.37              | 3.67         | YES           |

| <b>Pre / Post<br/>Comparison</b> | FTIR NOx<br>Maximum | FTIR NOx<br>Pre/Post Mean | Error<br>(%) | Pass<br>(≤5%) |
|----------------------------------|---------------------|---------------------------|--------------|---------------|
| Pre-Test Direct                  | 119.31              | 119.47                    | 0.13         | YES           |
| Post-Test Direct                 | 120.52              |                           | 0.87         | YES           |

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|                                            |           |
|--------------------------------------------|-----------|
| Protocol No. 1, CO Cylinder Concentration: | 122 ppmvd |
|--------------------------------------------|-----------|

| Pre-Test Background |                    |                         |                   |                     |                            |                         | FTIR: 509/ INST-IR-0005 |
|---------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|-------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw)           |
| 07/29/21            | 6:21:13            | 0729-PRE_000032BKG.LAB  | 191.3             | 0.99                | 0.0000                     | 0.0000                  | 0.0000                  |

| Pre-Test Direct Zero |                    |                         |                   |                     |                            |                         |               |
|----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/29/21             | 6:18:04            | 0729-PRE_000029.LAB     | 191.3             | 0.99                | 0.0060                     | 0.0092                  | -0.0233       |
| 07/29/21             | 6:18:35            | 0729-PRE_000030.LAB     | 191.3             | 0.99                | -0.0087                    | 0.0085                  | -0.0104       |
| 07/29/21             | 6:19:04            | 0729-PRE_000031.LAB     | 191.3             | 0.99                | -0.0089                    | 0.0019                  | 0.0645        |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |               |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/29/21                                     | 6:29:20            | 0729-PRE_000048.LAB     | 191.3             | 0.99                | -0.0356                    | 0.0132                  | 121.3862      |
| 07/29/21                                     | 6:29:50            | 0729-PRE_000049.LAB     | 191.3             | 0.99                | -0.0345                    | 0.0001                  | 120.7858      |
| 07/29/21                                     | 6:30:20            | 0729-PRE_000050.LAB     | 191.3             | 0.99                | -0.0255                    | -0.0019                 | 120.6875      |
| 07/29/21                                     | 6:30:50            | 0729-PRE_000051.LAB     | 191.3             | 0.99                | -0.0344                    | 0.0022                  | 121.4610      |
| 07/29/21                                     | 6:31:20            | 0729-PRE_000052.LAB     | 191.3             | 0.99                | -0.0412                    | 0.0002                  | 121.9527      |
| Average                                      |                    |                         | 191.3             | 0.99                | -0.0342                    | 0.0028                  | 121.2546      |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |               |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/29/21                                      | 17:12:22           | 0729-R3_000469.LAB      | 191.4             | 0.99                | -0.0204                    | 0.0499                  | 122.9462      |
| 07/29/21                                      | 17:12:52           | 0729-R3_000470.LAB      | 191.4             | 0.99                | -0.0230                    | 0.0303                  | 122.7267      |
| 07/29/21                                      | 17:13:22           | 0729-R3_000471.LAB      | 191.4             | 0.99                | -0.0332                    | 0.0140                  | 123.2405      |
| 07/29/21                                      | 17:13:52           | 0729-R3_000472.LAB      | 191.4             | 0.99                | -0.0284                    | 0.0138                  | 122.9788      |
| 07/29/21                                      | 17:14:22           | 0729-R3_000473.LAB      | 191.4             | 0.99                | -0.0239                    | 0.0099                  | 122.6847      |
| Average                                       |                    |                         | 191.4             | 0.99                | -0.0258                    | 0.0236                  | 122.9154      |

| Post-Test Direct Zero |                    |                         |                   |                     |                            |                         |               |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/29/21              | 17:45:10           | 0729-R3_000534.LAB      | 191.4             | 0.99                | 0.0618                     | -0.0234                 | 0.1207        |
| 07/29/21              | 17:45:40           | 0729-R3_000535.LAB      | 191.5             | 0.99                | 0.0086                     | -0.0113                 | 0.2300        |
| 07/29/21              | 17:46:10           | 0729-R3_000536.LAB      | 191.4             | 0.99                | 0.0130                     | -0.0153                 | 0.0047        |



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| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |           |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|-----------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> | <b>CO</b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             | (ppmvw)               | (%)                   | (ppmvw)   |
| 07/29/21                    | 17:48:27    | 0729-R3_000537BKG.LAB | 191.4            | 0.99              | 0.0000                | 0.0000                | 0.0000    |

| <b>CTS Results</b> | Protocol No. 1 Concentration | FTIR CO Average | Error (%) | Pass (≤5%) |
|--------------------|------------------------------|-----------------|-----------|------------|
| Pre-Test Direct    | 122.00                       | 121.25          | 0.61      | YES        |
| Post-Test Direct   | 122.00                       | 122.92          | 0.75      | YES        |

| <b>Pre / Post Comparison</b> | FTIR CO Maximum | FTIR CO Pre/Post Mean | Error (%) | Pass (≤5%) |
|------------------------------|-----------------|-----------------------|-----------|------------|
| Pre-Test Direct              | 121.95          | 122.09                | 0.11      | YES        |
| Post-Test Direct             | 123.24          |                       | 0.94      | YES        |

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|                                                                    |            |
|--------------------------------------------------------------------|------------|
| Certified, C <sub>2</sub> H <sub>4</sub> O Cylinder Concentration: | 47.4 ppmvd |
|--------------------------------------------------------------------|------------|

| Pre-Test Background |                    |                         |                   |                     |                            |                         | FTIR: 509/ INST-IR-0005                    |
|---------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|--------------------------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmvw) |
| 07/29/21            | 6:21:13            | 0729-PRE_000032BKG.LAB  | 191.3             | 0.99                | 0.0000                     | 0.0000                  | 0.0000                                     |

| Pre-Test Direct Zero |                    |                         |                   |                     |                            |                         |                                            |
|----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|--------------------------------------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmvw) |
| 07/29/21             | 6:18:04            | 0729-PRE_000029.LAB     | 191.3             | 0.99                | 0.0060                     | 0.0092                  | -0.3305                                    |
| 07/29/21             | 6:18:35            | 0729-PRE_000030.LAB     | 191.3             | 0.99                | -0.0087                    | 0.0085                  | -0.1519                                    |
| 07/29/21             | 6:19:04            | 0729-PRE_000031.LAB     | 191.3             | 0.99                | -0.0089                    | 0.0019                  | -0.4129                                    |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                                            |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|--------------------------------------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmvw) |
| 07/29/21                                     | 6:32:20            | 0729-PRE_000054.LAB     | 191.3             | 0.99                | 0.0102                     | -0.0025                 | 46.1720                                    |
| 07/29/21                                     | 6:32:50            | 0729-PRE_000055.LAB     | 191.3             | 0.99                | 0.0016                     | -0.0038                 | 47.2898                                    |
| 07/29/21                                     | 6:33:20            | 0729-PRE_000056.LAB     | 191.3             | 0.99                | 0.0070                     | -0.0048                 | 47.6549                                    |
| 07/29/21                                     | 6:33:50            | 0729-PRE_000057.LAB     | 191.3             | 0.99                | 0.0126                     | -0.0068                 | 47.3384                                    |
| 07/29/21                                     | 6:34:20            | 0729-PRE_000058.LAB     | 191.3             | 0.99                | 0.0030                     | -0.0075                 | 47.8559                                    |
| Average                                      |                    |                         | 191.3             | 0.99                | 0.0069                     | -0.0051                 | 47.2622                                    |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                                            |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|--------------------------------------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmvw) |
| 07/29/21                                      | 17:18:52           | 0729-R3_000482.LAB      | 191.4             | 0.99                | 0.0101                     | 0.0408                  | 49.2208                                    |
| 07/29/21                                      | 17:19:22           | 0729-R3_000483.LAB      | 191.4             | 0.99                | 0.0057                     | -0.0063                 | 49.2790                                    |
| 07/29/21                                      | 17:19:52           | 0729-R3_000484.LAB      | 191.4             | 0.99                | 0.0063                     | -0.0058                 | 48.3237                                    |
| 07/29/21                                      | 17:20:22           | 0729-R3_000485.LAB      | 191.4             | 0.99                | 0.0040                     | -0.0059                 | 49.9271                                    |
| 07/29/21                                      | 17:20:52           | 0729-R3_000486.LAB      | 191.4             | 0.99                | 0.0152                     | -0.0042                 | 49.7117                                    |
| Average                                       |                    |                         | 191.4             | 0.99                | 0.0083                     | 0.0037                  | 49.2925                                    |

| Post-Test Direct Zero |                    |                         |                   |                     |                            |                         |                                            |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|--------------------------------------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmvw) |
| 07/29/21              | 17:45:10           | 0729-R3_000534.LAB      | 191.4             | 0.99                | 0.0618                     | -0.0234                 | 0.6676                                     |
| 07/29/21              | 17:45:40           | 0729-R3_000535.LAB      | 191.5             | 0.99                | 0.0086                     | -0.0113                 | 0.4959                                     |
| 07/29/21              | 17:46:10           | 0729-R3_000536.LAB      | 191.4             | 0.99                | 0.0130                     | -0.0153                 | 0.3050                                     |

**Catalytic Combustion Corporation**  
**July 29, 2021**  
**Caterpillar, G3520 TALE**  
**Stewart & Stevenson Integration Center**

| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |                                    |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|------------------------------------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> | <b>C<sub>2</sub>H<sub>4</sub>O</b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             | (ppmvw)               | (%)                   | (ppmvw)                            |
| 07/29/21                    | 17:48:27    | 0729-R3_000537BKG.LAB | 191.4            | 0.99              | 0.0000                | 0.0000                | 0.0000                             |

| <b>CTS Results</b> | Certified Concentration | FTIR C <sub>2</sub> H <sub>4</sub> O<br>Average | Error<br>(%) | Pass<br>(≤5%) |
|--------------------|-------------------------|-------------------------------------------------|--------------|---------------|
| Pre-Test Direct    | 47.40                   | 47.26                                           | 0.29         | YES           |
| Post-Test Direct   | 47.40                   | 49.29                                           | 3.99         | YES           |

| <b>Pre / Post<br/>Comparison</b> | FTIR C <sub>2</sub> H <sub>4</sub> O<br>Maximum | FTIR C <sub>2</sub> H <sub>4</sub> O<br>Pre/Post Mean | Error<br>(%) | Pass<br>(≤5%) |
|----------------------------------|-------------------------------------------------|-------------------------------------------------------|--------------|---------------|
| Pre-Test Direct                  | 47.86                                           | 48.28                                                 | 0.88         | YES           |
| Post-Test Direct                 | 49.93                                           |                                                       | 3.30         | YES           |

Catalytic Combustion Corporation  
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Stewart & Stevenson Integration Center

| Trial #1   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |                 |                 |  |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|-----------------|-----------------|--|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | SF <sub>6</sub> | NH <sub>3</sub> |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)         | (ppmvw)         |  |
| 07/29/21   | 7:26:34    | 0729-PRE_000163.LAB           | 191.3     | 0.99       | 0.0016          | 0.0092                  | 11.0529         | 46.2851         |  |
| 07/29/21   | 7:28:34    | 0729-PRE_000167.LAB           | 191.3     | 0.99       | -0.0024         | 0.0120                  | 11.0578         | 47.2974         |  |
| 07/29/21   | 7:29:04    | 0729-PRE_000168.LAB           | 191.3     | 0.99       | 0.0013          | 0.0064                  | 11.0505         | 46.2767         |  |
| 07/29/21   | 7:29:34    | 0729-PRE_000169.LAB           | 191.3     | 0.99       | 0.0097          | 0.0036                  | 11.0187         | 47.1397         |  |
| Average    |            |                               | 191.3     | 0.99       | 0.0026          | 0.0078                  | 11.0450         | 46.7497         |  |

| Trial #1   |            | Pre-Spike - Native Samples |           |            |                 |                  |                 |                 |  |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-----------------|-----------------|--|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | NH <sub>3</sub> |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)         |  |
| 07/29/21   | 13:27:28   | 0729-R3_000020.LAB         | 191.4     | 1.03       | 5.7788          | 13.7763          | -0.0029         | 0.2584          |  |
| 07/29/21   | 13:27:58   | 0729-R3_000021.LAB         | 191.4     | 1.03       | 5.7773          | 13.8252          | -0.0016         | 0.2776          |  |
| 07/29/21   | 13:28:28   | 0729-R3_000022.LAB         | 191.4     | 1.03       | 5.8095          | 13.3030          | -0.0010         | 0.2552          |  |
| 07/29/21   | 13:28:59   | 0729-R3_000023.LAB         | 191.4     | 1.03       | 5.8209          | 13.3611          | 0.0007          | 0.2444          |  |
| Average    |            |                            | 191.4     | 1.03       | 5.7966          | 13.5664          | -0.0012         | 0.2589          |  |

| Trial #1   |            | Spiked Samples     |           |            |                 |                  |                 |                 |  |
|------------|------------|--------------------|-----------|------------|-----------------|------------------|-----------------|-----------------|--|
| Date       | Time       | Spectrum           | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | NH <sub>3</sub> |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)        | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)         |  |
| 07/29/21   | 13:50:01   | 0729-R3_000065.LAB | 191.4     | 1.02       | 5.2051          | 16.0779          | 0.7052          | 2.5695          |  |
| 07/29/21   | 13:50:31   | 0729-R3_000066.LAB | 191.4     | 1.02       | 5.2154          | 16.1184          | 0.7046          | 2.2878          |  |
| 07/29/21   | 13:51:01   | 0729-R3_000067.LAB | 191.4     | 1.02       | 5.1984          | 15.5626          | 0.6996          | 2.3897          |  |
| 07/29/21   | 13:51:31   | 0729-R3_000068.LAB | 191.4     | 1.03       | 5.1159          | 17.0782          | 0.7039          | 2.0829          |  |
| Average    |            |                    | 191.4     | 1.03       | 5.1837          | 16.2093          | 0.7033          | 2.3325          |  |

| Trial #2   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |                 |                 |  |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|-----------------|-----------------|--|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | SF <sub>6</sub> | NH <sub>3</sub> |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)         | (ppmvw)         |  |
| 07/29/21   | 7:26:34    | 0729-PRE_000163.LAB           | 191.3     | 0.99       | 0.0016          | 0.0092                  | 11.0529         | 46.2851         |  |
| 07/29/21   | 7:28:34    | 0729-PRE_000167.LAB           | 191.3     | 0.99       | -0.0024         | 0.0120                  | 11.0578         | 47.2974         |  |
| 07/29/21   | 7:29:04    | 0729-PRE_000168.LAB           | 191.3     | 0.99       | 0.0013          | 0.0064                  | 11.0505         | 46.2767         |  |
| 07/29/21   | 7:29:34    | 0729-PRE_000169.LAB           | 191.3     | 0.99       | 0.0097          | 0.0036                  | 11.0187         | 47.1397         |  |
| Average    |            |                               | 191.3     | 0.99       | 0.0026          | 0.0078                  | 11.0450         | 46.7497         |  |

| Trial #2 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |                            |                            |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------------------|----------------------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | SF <sub>6</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) |
| 07/29/21                            | 15:29:41           | 0729-R3_000264.LAB      | 191.4             | 1.03                | 6.0871                   | 10.4932                 | 0.0086                     | 0.3996                     |
| 07/29/21                            | 15:30:11           | 0729-R3_000265.LAB      | 191.4             | 1.03                | 6.0964                   | 10.4971                 | 0.0088                     | 0.4470                     |
| 07/29/21                            | 15:30:41           | 0729-R3_000266.LAB      | 191.4             | 1.03                | 6.0418                   | 10.9671                 | 0.0082                     | 0.4291                     |
| 07/29/21                            | 15:31:11           | 0729-R3_000267.LAB      | 191.4             | 1.03                | 6.0821                   | 10.6008                 | 0.0035                     | 0.4249                     |
| Average                             |                    |                         | 191.4             | 1.03                | 6.0768                   | 10.6396                 | 0.0073                     | 0.4251                     |

| Trial #2 Spiked Samples |                    |                         |                   |                     |                          |                         |                            |                            |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------------------|----------------------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | SF <sub>6</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) |
| 07/29/21                | 15:36:42           | 0729-R3_000278.LAB      | 191.4             | 1.02                | 5.0614                   | 16.8342                 | 0.8971                     | 3.3038                     |
| 07/29/21                | 15:37:12           | 0729-R3_000279.LAB      | 191.4             | 1.02                | 5.2201                   | 14.6879                 | 0.8932                     | 2.9650                     |
| 07/29/21                | 15:37:42           | 0729-R3_000280.LAB      | 191.4             | 1.02                | 5.2446                   | 14.2924                 | 0.9011                     | 2.9494                     |
| 07/29/21                | 15:38:12           | 0729-R3_000281.LAB      | 191.4             | 1.03                | 5.3618                   | 12.4385                 | 0.9063                     | 2.8430                     |
| Average                 |                    |                         | 191.4             | 1.02                | 5.2220                   | 14.5633                 | 0.8995                     | 3.0153                     |

| Trial #3 Spike Gas Direct Verification |                    |                         |                   |                     |                          | FTIR: 509/ INST-IR-0005 |                            |                            |
|----------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------------------|----------------------------|
| Date<br>(mm/dd/yy)                     | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | SF <sub>6</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) |
| 07/29/21                               | 7:26:34            | 0729-PRE_000163.LAB     | 191.3             | 0.99                | 0.0016                   | 0.0092                  | 11.0529                    | 46.2851                    |
| 07/29/21                               | 7:28:34            | 0729-PRE_000167.LAB     | 191.3             | 0.99                | -0.0024                  | 0.0120                  | 11.0578                    | 47.2974                    |
| 07/29/21                               | 7:29:04            | 0729-PRE_000168.LAB     | 191.3             | 0.99                | 0.0013                   | 0.0064                  | 11.0505                    | 46.2767                    |
| 07/29/21                               | 7:29:34            | 0729-PRE_000169.LAB     | 191.3             | 0.99                | 0.0097                   | 0.0036                  | 11.0187                    | 47.1397                    |
| Average                                |                    |                         | 191.3             | 0.99                | 0.0026                   | 0.0078                  | 11.0450                    | 46.7497                    |

| Trial #3 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |                            |                            |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------------------|----------------------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | SF <sub>6</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) |
| 07/29/21                            | 15:53:14           | 0729-R3_000311.LAB      | 191.4             | 1.03                | 5.8236                   | 13.9644                 | 0.0020                     | 0.7851                     |
| 07/29/21                            | 15:53:43           | 0729-R3_000312.LAB      | 191.4             | 1.03                | 5.8299                   | 13.9946                 | 0.0003                     | 0.7793                     |
| 07/29/21                            | 15:54:14           | 0729-R3_000313.LAB      | 191.4             | 1.03                | 5.8400                   | 13.9150                 | 0.0015                     | 0.7948                     |
| 07/29/21                            | 15:54:44           | 0729-R3_000314.LAB      | 191.4             | 1.03                | 5.8328                   | 13.9310                 | -0.0022                    | 0.7720                     |
| Average                             |                    |                         | 191.4             | 1.03                | 5.8316                   | 13.9513                 | 0.0004                     | 0.7828                     |

| Trial #3 Spiked Samples |                    |                         |                   |                     |                          |                         |                            |                            |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------------------|----------------------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | SF <sub>6</sub><br>(ppmvw) | NH <sub>3</sub><br>(ppmvw) |
| 07/29/21                | 16:08:15           | 0729-R3_000341.LAB      | 191.4             | 1.03                | 5.4136                   | 13.4491                 | 0.7531                     | 3.9385                     |
| 07/29/21                | 16:08:45           | 0729-R3_000342.LAB      | 191.4             | 1.03                | 5.4074                   | 13.4088                 | 0.7539                     | 3.8026                     |
| 07/29/21                | 16:09:15           | 0729-R3_000343.LAB      | 191.4             | 1.03                | 5.4029                   | 13.3926                 | 0.7544                     | 3.7165                     |
| 07/29/21                | 16:09:45           | 0729-R3_000344.LAB      | 191.4             | 1.03                | 5.4003                   | 13.3926                 | 0.7529                     | 3.6759                     |
| Average                 |                    |                         | 191.4             | 1.03                | 5.4061                   | 13.4108                 | 0.7536                     | 3.7834                     |

| Parameter                                                               | Units   | Trial #1 | Trial #2 | Trial #3 |
|-------------------------------------------------------------------------|---------|----------|----------|----------|
| Direct Verified Concentration of Sulfur Hexafluoride (SF <sub>6</sub> ) | (ppmvw) | 11.04    | 11.04    | 11.04    |
| Direct Verified Concentration of Ammonia (NH <sub>3</sub> )             | (ppmvw) | 46.75    | 46.75    | 46.75    |
| Stack (Native, Unspiked) CO <sub>2</sub> Concentration                  | (%vw)   | 5.797    | 6.077    | 5.832    |
| Stack (Native, Unspiked) H <sub>2</sub> O Concentration                 | (%)     | 13.566   | 10.640   | 13.951   |
| Stack (Native, Unspiked) SF <sub>6</sub> Concentration                  | (ppmvw) | -0.001   | 0.007    | 0.000    |
| Stack (Native, Unspiked) NH <sub>3</sub> Concentration                  | (ppmvw) | 0.259    | 0.425    | 0.783    |
| Stack + Spike CO <sub>2</sub> Concentration                             | (%vw)   | 5.184    | 5.222    | 5.406    |
| Stack + Spike H <sub>2</sub> O Concentration                            | (%)     | 16.209   | 14.563   | 13.411   |
| Stack + Spike SF <sub>6</sub> Concentration                             | (ppmvw) | 0.703    | 0.899    | 0.754    |
| Stack + Spike NH <sub>3</sub> Concentration                             | (ppmvw) | 2.332    | 3.015    | 3.783    |
| Dilution Factor, calc. from SF <sub>6</sub> (ppmvw)                     |         | 0.064    | 0.081    | 0.068    |
| Dilution Factor, as the ratio of dir to spk                             | (ratio) | 15.7 : 1 | 12.4 : 1 | 14.7 : 1 |
| Expected Concentration of the SF <sub>6</sub> Spike+Native, CS          | (ppmvw) | 0.703    | 0.899    | 0.754    |
| Expected Concentration of the NH <sub>3</sub> Spike+Native, CS          | (ppmvw) | 3.225    | 4.167    | 3.917    |
| Method 320 Spiked / Expected SF <sub>6</sub>                            | %       | 99.99    | 100.07   | 100.00   |
| Method 320 Spiked / Expected NH <sub>3</sub>                            | %       | 72.33    | 72.36    | 96.58    |
| Method 320 Passing SF <sub>6</sub> (70-130%)                            |         | YES      | YES      | YES      |
| Method 320 Passing NH <sub>3</sub> (70-130%)                            |         | YES      | YES      | YES      |

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| Trial #1   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/INST-IR-0005 |                               |
|------------|------------|-------------------------------|-----------|------------|-----------------|------------------------|-------------------------------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O       | C <sub>2</sub> H <sub>6</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                    | (ppmvw)                       |
| 07/29/21   | 6:26:19    | 0729-PRE_000042.LAB           | 191.3     | 0.99       | 0.0046          | 0.0038                 | 101.0654                      |
| 07/29/21   | 6:26:49    | 0729-PRE_000043.LAB           | 191.3     | 0.99       | 0.0091          | -0.0046                | 101.3680                      |
| 07/29/21   | 6:27:19    | 0729-PRE_000044.LAB           | 191.3     | 0.99       | -0.0013         | 0.0043                 | 101.0983                      |
| 07/29/21   | 6:27:50    | 0729-PRE_000045.LAB           | 191.3     | 0.99       | 0.0055          | -0.0011                | 101.4527                      |
| Average    |            |                               | 191.3     | 0.99       | 0.0045          | 0.0006                 | 101.2461                      |

| Trial #1   |            | Pre-Spike - Native Samples |           |            |                 |                  |                               |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-------------------------------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)                       |
| 07/29/21   | 7:54:07    | 0729-PRE_000218.LAB        | 191.4     | 1.03       | 5.9875          | 11.5338          | 0.6056                        |
| 07/29/21   | 7:54:37    | 0729-PRE_000219.LAB        | 191.4     | 1.03       | 5.9302          | 12.1485          | 0.4878                        |
| 07/29/21   | 7:55:07    | 0729-PRE_000220.LAB        | 191.4     | 1.03       | 5.9536          | 11.8260          | 0.6502                        |
| 07/29/21   | 7:55:37    | 0729-PRE_000221.LAB        | 191.4     | 1.03       | 5.7779          | 12.4808          | 0.5425                        |
| Average    |            |                            | 191.4     | 1.03       | 5.9123          | 11.9973          | 0.5715                        |

| Trial #1   |            | Spiked Samples      |           |            |                 |                  |                               |
|------------|------------|---------------------|-----------|------------|-----------------|------------------|-------------------------------|
| Date       | Time       | Spectrum            | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)         | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)                       |
| 07/29/21   | 7:57:37    | 0729-PRE_000225.LAB | 191.4     | 1.03       | 5.4423          | 13.3304          | 6.8719                        |
| 07/29/21   | 7:58:07    | 0729-PRE_000226.LAB | 191.4     | 1.03       | 5.4336          | 13.4652          | 6.6892                        |
| 07/29/21   | 7:58:37    | 0729-PRE_000227.LAB | 191.3     | 1.03       | 5.4348          | 13.3763          | 6.6564                        |
| 07/29/21   | 7:59:07    | 0729-PRE_000228.LAB | 191.4     | 1.03       | 5.4500          | 13.4160          | 6.8767                        |
| Average    |            |                     | 191.4     | 1.03       | 5.4402          | 13.3970          | 6.7735                        |

| Trial #2   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/INST-IR-0005 |                               |
|------------|------------|-------------------------------|-----------|------------|-----------------|------------------------|-------------------------------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O       | C <sub>2</sub> H <sub>6</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                    | (ppmvw)                       |
| 07/29/21   | 6:26:19    | 0729-PRE_000042.LAB           | 191.3     | 0.99       | 0.0046          | 0.0038                 | 101.0654                      |
| 07/29/21   | 6:26:49    | 0729-PRE_000043.LAB           | 191.3     | 0.99       | 0.0091          | -0.0046                | 101.3680                      |
| 07/29/21   | 6:27:19    | 0729-PRE_000044.LAB           | 191.3     | 0.99       | -0.0013         | 0.0043                 | 101.0983                      |
| 07/29/21   | 6:27:50    | 0729-PRE_000045.LAB           | 191.3     | 0.99       | 0.0055          | -0.0011                | 101.4527                      |
| Average    |            |                               | 191.3     | 0.99       | 0.0045          | 0.0006                 | 101.2461                      |

| Trial #2 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |                                          |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/29/21                            | 9:07:29            | 0729-R1_000016.LAB      | 191.4             | 1.03                | 5.6801                   | 15.1958                 | 0.4539                                   |
| 07/29/21                            | 9:07:59            | 0729-R1_000017.LAB      | 191.4             | 1.03                | 5.7495                   | 14.5253                 | 0.4642                                   |
| 07/29/21                            | 9:08:29            | 0729-R1_000018.LAB      | 191.4             | 1.03                | 5.7714                   | 14.4530                 | 0.6337                                   |
| 07/29/21                            | 9:08:59            | 0729-R1_000019.LAB      | 191.4             | 1.03                | 5.7488                   | 14.5817                 | 0.6257                                   |
| Average                             |                    |                         | 191.4             | 1.03                | 5.7375                   | 14.6889                 | 0.5444                                   |

| Trial #2 Spiked Samples |                    |                         |                   |                     |                          |                         |                                          |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/29/21                | 9:11:29            | 0729-R1_000024.LAB      | 191.4             | 1.03                | 5.3331                   | 13.9803                 | 7.4505                                   |
| 07/29/21                | 9:11:59            | 0729-R1_000025.LAB      | 191.4             | 1.03                | 5.3881                   | 13.5880                 | 7.4152                                   |
| 07/29/21                | 9:12:29            | 0729-R1_000026.LAB      | 191.4             | 1.03                | 5.3839                   | 13.3244                 | 7.6570                                   |
| 07/29/21                | 9:12:59            | 0729-R1_000027.LAB      | 191.4             | 1.03                | 5.4045                   | 12.8692                 | 7.9010                                   |
| Average                 |                    |                         | 191.4             | 1.03                | 5.3774                   | 13.4405                 | 7.6059                                   |

| Trial #3 Spike Gas Direct Verification |                    |                         |                   |                     |                          | FTIR: 509/ INST-IR-0005 |                                          |
|----------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)                     | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/29/21                               | 6:26:19            | 0729-PRE_000042.LAB     | 191.3             | 0.99                | 0.0046                   | 0.0038                  | 101.0654                                 |
| 07/29/21                               | 6:26:49            | 0729-PRE_000043.LAB     | 191.3             | 0.99                | 0.0091                   | -0.0046                 | 101.3680                                 |
| 07/29/21                               | 6:27:19            | 0729-PRE_000044.LAB     | 191.3             | 0.99                | -0.0013                  | 0.0043                  | 101.0983                                 |
| 07/29/21                               | 6:27:50            | 0729-PRE_000045.LAB     | 191.3             | 0.99                | 0.0055                   | -0.0011                 | 101.4527                                 |
| Average                                |                    |                         | 191.3             | 0.99                | 0.0045                   | 0.0006                  | 101.2461                                 |

| Trial #3 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |                                          |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/29/21                            | 9:14:30            | 0729-R1_000030.LAB      | 191.4             | 1.03                | 5.8943                   | 12.9276                 | 0.5478                                   |
| 07/29/21                            | 9:15:00            | 0729-R1_000031.LAB      | 191.4             | 1.03                | 5.8058                   | 13.9653                 | 0.5314                                   |
| 07/29/21                            | 9:15:30            | 0729-R1_000032.LAB      | 191.4             | 1.03                | 5.7807                   | 14.0679                 | 0.6174                                   |
| 07/29/21                            | 9:16:00            | 0729-R1_000033.LAB      | 191.4             | 1.02                | 5.5559                   | 16.7870                 | 0.5112                                   |
| Average                             |                    |                         | 191.4             | 1.03                | 5.7592                   | 14.4370                 | 0.5519                                   |

| Trial #3 Spiked Samples |                    |                         |                   |                     |                          |                         |                                          |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/29/21                | 9:17:30            | 0729-R1_000036.LAB      | 191.4             | 1.03                | 5.3371                   | 13.5885                 | 7.9238                                   |
| 07/29/21                | 9:18:00            | 0729-R1_000037.LAB      | 191.4             | 1.03                | 5.4023                   | 12.9546                 | 8.1480                                   |
| 07/29/21                | 9:18:30            | 0729-R1_000038.LAB      | 191.4             | 1.03                | 5.3772                   | 13.1870                 | 8.0203                                   |
| 07/29/21                | 9:19:00            | 0729-R1_000039.LAB      | 191.4             | 1.03                | 5.4150                   | 12.7563                 | 8.1687                                   |
| Average                 |                    |                         | 191.4             | 1.03                | 5.3829                   | 13.1216                 | 8.0652                                   |



| Parameter                                                                    | Units   | Trial #1 | Trial #2 | Trial #3 |
|------------------------------------------------------------------------------|---------|----------|----------|----------|
| Direct Verified Concentration of Ethane (C <sub>2</sub> H <sub>6</sub> )     | (ppmvw) | 101.25   | 101.25   | 101.25   |
| Stack (Native, Unspiked) CO <sub>2</sub> Concentration                       | (%vw)   | 5.912    | 5.737    | 5.759    |
| Stack (Native, Unspiked) H <sub>2</sub> O Concentration                      | (%)     | 11.997   | 14.689   | 14.437   |
| Stack (Native, Unspiked) C <sub>2</sub> H <sub>6</sub> Concentration         | (ppmvw) | 0.572    | 0.544    | 0.552    |
| Stack + Spike CO <sub>2</sub> Concentration                                  | (%vw)   | 5.440    | 5.377    | 5.383    |
| Stack + Spike H <sub>2</sub> O Concentration                                 | (%)     | 13.397   | 13.440   | 13.122   |
| Stack + Spike C <sub>2</sub> H <sub>6</sub> Concentration                    | (ppmvw) | 6.774    | 7.606    | 8.065    |
| Dilution Factor, calc. from CO <sub>2</sub> (%vw)                            |         | 0.080    | 0.063    | 0.065    |
| Dilution Factor, as the ratio of dir to spk                                  | (ratio) | 12.5 : 1 | 15.9 : 1 | 15.3 : 1 |
| Expected Concentration of the C <sub>2</sub> H <sub>6</sub> Spike+Native, CS | (ppmvw) | 8.611    | 6.864    | 7.131    |
| Method 320 Spiked / Expected C <sub>2</sub> H <sub>6</sub>                   | %       | 78.66    | 110.81   | 113.10   |
| Method 320 Passing C <sub>2</sub> H <sub>6</sub> (70-130%)                   |         | YES      | YES      | YES      |

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| Trial #1   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/INST-IR-0005 |          |
|------------|------------|-------------------------------|-----------|------------|-----------------|------------------------|----------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O       | NOx      |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                    | (ppmvw)  |
| 07/29/21   | 6:29:20    | 0729-PRE_000048.LAB           | 191.3     | 0.99       | -0.0356         | 0.0132                 | 118.4758 |
| 07/29/21   | 6:29:50    | 0729-PRE_000049.LAB           | 191.3     | 0.99       | -0.0345         | 0.0001                 | 118.2633 |
| 07/29/21   | 6:30:20    | 0729-PRE_000050.LAB           | 191.3     | 0.99       | -0.0255         | -0.0019                | 117.9127 |
| 07/29/21   | 6:30:50    | 0729-PRE_000051.LAB           | 191.3     | 0.99       | -0.0344         | 0.0022                 | 118.9113 |
| Average    |            |                               | 191.3     | 0.99       | -0.0325         | 0.0034                 | 118.3908 |

| Trial #1   |            | Pre-Spike - Native Samples |           |            |                 |                  |         |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|---------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | NOx     |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw) |
| 07/29/21   | 8:03:08    | 0729-PRE_000236.LAB        | 191.3     | 1.03       | 5.3847          | 13.9361          | 18.9449 |
| 07/29/21   | 8:03:38    | 0729-PRE_000237.LAB        | 191.3     | 1.03       | 5.5921          | 14.3319          | 19.4786 |
| 07/29/21   | 8:04:08    | 0729-PRE_000238.LAB        | 191.4     | 1.03       | 5.7245          | 14.8875          | 19.1555 |
| 07/29/21   | 8:04:38    | 0729-PRE_000239.LAB        | 191.4     | 1.02       | 5.4752          | 18.0467          | 19.5173 |
| Average    |            |                            | 191.3     | 1.02       | 5.5441          | 15.3006          | 19.2741 |

| Trial #1   |            | Spiked Samples      |           |            |                 |                  |         |
|------------|------------|---------------------|-----------|------------|-----------------|------------------|---------|
| Date       | Time       | Spectrum            | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | NOx     |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)         | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw) |
| 07/29/21   | 8:09:08    | 0729-PRE_000248.LAB | 191.2     | 1.03       | 5.1639          | 14.2613          | 28.2136 |
| 07/29/21   | 8:09:38    | 0729-PRE_000249.LAB | 191.1     | 1.03       | 5.2596          | 13.4329          | 29.8942 |
| 07/29/21   | 8:10:08    | 0729-PRE_000250.LAB | 191.1     | 1.03       | 5.2123          | 13.9439          | 29.3501 |
| 07/29/21   | 8:10:39    | 0729-PRE_000251.LAB | 191.2     | 1.03       | 5.2120          | 13.9711          | 28.4101 |
| Average    |            |                     | 191.2     | 1.03       | 5.2119          | 13.9023          | 28.9670 |

| Trial #2   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/INST-IR-0005 |          |
|------------|------------|-------------------------------|-----------|------------|-----------------|------------------------|----------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O       | NOx      |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                    | (ppmvw)  |
| 07/29/21   | 6:29:20    | 0729-PRE_000048.LAB           | 191.3     | 0.99       | -0.0356         | 0.0132                 | 118.4758 |
| 07/29/21   | 6:29:50    | 0729-PRE_000049.LAB           | 191.3     | 0.99       | -0.0345         | 0.0001                 | 118.2633 |
| 07/29/21   | 6:30:20    | 0729-PRE_000050.LAB           | 191.3     | 0.99       | -0.0255         | -0.0019                | 117.9127 |
| 07/29/21   | 6:30:50    | 0729-PRE_000051.LAB           | 191.3     | 0.99       | -0.0344         | 0.0022                 | 118.9113 |
| Average    |            |                               | 191.3     | 0.99       | -0.0325         | 0.0034                 | 118.3908 |

| Trial #2 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |                |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw) |
| 07/29/21                            | 10:41:16           | 0729-R1_000203.LAB      | 191.4             | 1.04                | 6.0667                   | 9.8749                  | 6.6883         |
| 07/29/21                            | 10:41:46           | 0729-R1_000204.LAB      | 191.4             | 1.04                | 6.0394                   | 10.4201                 | 7.0146         |
| 07/29/21                            | 10:42:17           | 0729-R1_000205.LAB      | 191.4             | 1.04                | 6.0349                   | 10.5369                 | 7.0232         |
| 07/29/21                            | 10:42:47           | 0729-R1_000206.LAB      | 191.4             | 1.04                | 5.9472                   | 10.1020                 | 7.0688         |
| Average                             |                    |                         | 191.4             | 1.04                | 6.0221                   | 10.2335                 | 6.9487         |

| Trial #2 Spiked Samples |                    |                         |                   |                     |                          |                         |                |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw) |
| 07/29/21                | 10:44:16           | 0729-R1_000209.LAB      | 191.4             | 1.04                | 5.5818                   | 9.2504                  | 15.0471        |
| 07/29/21                | 10:44:47           | 0729-R1_000210.LAB      | 191.4             | 1.03                | 5.3310                   | 12.2215                 | 14.6741        |
| 07/29/21                | 10:45:17           | 0729-R1_000211.LAB      | 191.4             | 1.03                | 5.2587                   | 13.6691                 | 14.9002        |
| 07/29/21                | 10:45:47           | 0729-R1_000212.LAB      | 191.4             | 1.03                | 5.2719                   | 13.6722                 | 15.1687        |
| Average                 |                    |                         | 191.4             | 1.03                | 5.3609                   | 12.2033                 | 14.9475        |

| Trial #3 Spike Gas Direct Verification |                    |                         |                   |                     |                          |                         | FTIR: 509/ INST-IR-0005 |
|----------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|-------------------------|
| Date<br>(mm/dd/yy)                     | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw)          |
| 07/29/21                               | 6:29:20            | 0729-PRE_000048.LAB     | 191.3             | 0.99                | -0.0356                  | 0.0132                  | 118.4758                |
| 07/29/21                               | 6:29:50            | 0729-PRE_000049.LAB     | 191.3             | 0.99                | -0.0345                  | 0.0001                  | 118.2633                |
| 07/29/21                               | 6:30:20            | 0729-PRE_000050.LAB     | 191.3             | 0.99                | -0.0255                  | -0.0019                 | 117.9127                |
| 07/29/21                               | 6:30:50            | 0729-PRE_000051.LAB     | 191.3             | 0.99                | -0.0344                  | 0.0022                  | 118.9113                |
| Average                                |                    |                         | 191.3             | 0.99                | -0.0325                  | 0.0034                  | 118.3908                |

| Trial #3 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |                |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw) |
| 07/29/21                            | 10:46:47           | 0729-R1_000214.LAB      | 191.4             | 1.03                | 5.6735                   | 14.9820                 | 6.0733         |
| 07/29/21                            | 10:47:17           | 0729-R1_000215.LAB      | 191.4             | 1.02                | 5.4686                   | 17.7606                 | 5.7500         |
| 07/29/21                            | 10:47:47           | 0729-R1_000216.LAB      | 191.4             | 1.02                | 5.5923                   | 16.5758                 | 6.2012         |
| 07/29/21                            | 10:48:17           | 0729-R1_000217.LAB      | 191.4             | 1.03                | 5.6718                   | 15.1855                 | 5.8747         |
| Average                             |                    |                         | 191.4             | 1.03                | 5.6015                   | 16.1260                 | 5.9748         |

| Trial #3 Spiked Samples |                    |                         |                   |                     |                          |                         |                |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw) |
| 07/29/21                | 10:51:47           | 0729-R1_000224.LAB      | 191.4             | 1.03                | 5.1912                   | 14.5061                 | 14.5892        |
| 07/29/21                | 10:52:17           | 0729-R1_000225.LAB      | 191.4             | 1.03                | 5.1831                   | 14.6822                 | 14.4297        |
| 07/29/21                | 10:52:47           | 0729-R1_000226.LAB      | 191.4             | 1.03                | 5.1944                   | 14.6065                 | 14.5221        |
| 07/29/21                | 10:53:17           | 0729-R1_000227.LAB      | 191.3             | 1.03                | 5.2487                   | 13.9940                 | 14.6695        |
| Average                 |                    |                         | 191.4             | 1.03                | 5.2044                   | 14.4472                 | 14.5526        |

| Parameter                                               | Units   | Trial #1 | Trial #2 | Trial #3 |
|---------------------------------------------------------|---------|----------|----------|----------|
| Direct Verified Concentration of Nitrogen Oxides (NOx)  | (ppmvw) | 118.39   | 118.39   | 118.39   |
| Stack (Native, Unspiked) CO <sub>2</sub> Concentration  | (%vw)   | 5.544    | 6.022    | 5.602    |
| Stack (Native, Unspiked) H <sub>2</sub> O Concentration | (%)     | 15.301   | 10.233   | 16.126   |
| Stack (Native, Unspiked) NOx Concentration              | (ppmvw) | 19.274   | 6.949    | 5.975    |
| Stack + Spike CO <sub>2</sub> Concentration             | (%vw)   | 5.212    | 5.361    | 5.204    |
| Stack + Spike H <sub>2</sub> O Concentration            | (%)     | 13.902   | 12.203   | 14.447   |
| Stack + Spike NOx Concentration                         | (ppmvw) | 28.967   | 14.948   | 14.553   |
| Dilution Factor, calc. from CO <sub>2</sub> (%vw)       |         | 0.060    | 0.110    | 0.071    |
| Dilution Factor, as the ratio of dir to spk             | (ratio) | 16.7 : 1 | 9.1 : 1  | 14.1 : 1 |
| Expected Concentration of the NOx Spike+Native, CS      | (ppmvw) | 25.213   | 19.185   | 13.946   |
| Method 320 Spiked / Expected NOx                        | %       | 114.89   | 77.91    | 104.35   |
| Method 320 Passing NOx (70-130%)                        |         | YES      | YES      | YES      |

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| Trial #1   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |          |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|----------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | CO       |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)  |
| 07/29/21   | 6:29:20    | 0729-PRE_000048.LAB           | 191.3     | 0.99       | -0.0356         | 0.0132                  | 121.3862 |
| 07/29/21   | 6:29:50    | 0729-PRE_000049.LAB           | 191.3     | 0.99       | -0.0345         | 0.0001                  | 120.7858 |
| 07/29/21   | 6:30:20    | 0729-PRE_000050.LAB           | 191.3     | 0.99       | -0.0255         | -0.0019                 | 120.6875 |
| 07/29/21   | 6:30:50    | 0729-PRE_000051.LAB           | 191.3     | 0.99       | -0.0344         | 0.0022                  | 121.4610 |
| Average    |            |                               | 191.3     | 0.99       | -0.0325         | 0.0034                  | 121.0801 |

| Trial #1   |            | Pre-Spike - Native Samples |           |            |                 |                  |         |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|---------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | CO      |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw) |
| 07/29/21   | 8:03:08    | 0729-PRE_000236.LAB        | 191.3     | 1.03       | 5.3847          | 13.9361          | 3.9106  |
| 07/29/21   | 8:03:38    | 0729-PRE_000237.LAB        | 191.3     | 1.03       | 5.5921          | 14.3319          | 4.0740  |
| 07/29/21   | 8:04:08    | 0729-PRE_000238.LAB        | 191.4     | 1.03       | 5.7245          | 14.8875          | 4.3006  |
| 07/29/21   | 8:04:38    | 0729-PRE_000239.LAB        | 191.4     | 1.02       | 5.4752          | 18.0467          | 4.1830  |
| Average    |            |                            | 191.3     | 1.02       | 5.5441          | 15.3006          | 4.1170  |

| Trial #1   |            | Spiked Samples      |           |            |                 |                  |         |
|------------|------------|---------------------|-----------|------------|-----------------|------------------|---------|
| Date       | Time       | Spectrum            | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | CO      |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)         | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw) |
| 07/29/21   | 8:08:38    | 0729-PRE_000247.LAB | 191.3     | 1.03       | 5.1809          | 14.2651          | 14.3805 |
| 07/29/21   | 8:09:08    | 0729-PRE_000248.LAB | 191.2     | 1.03       | 5.1639          | 14.2613          | 14.4930 |
| 07/29/21   | 8:09:38    | 0729-PRE_000249.LAB | 191.1     | 1.03       | 5.2596          | 13.4329          | 14.6522 |
| 07/29/21   | 8:10:08    | 0729-PRE_000250.LAB | 191.1     | 1.03       | 5.2123          | 13.9439          | 14.5963 |
| Average    |            |                     | 191.2     | 1.03       | 5.2042          | 13.9758          | 14.5305 |

| Trial #2   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |          |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|----------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | CO       |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)  |
| 07/29/21   | 6:29:20    | 0729-PRE_000048.LAB           | 191.3     | 0.99       | -0.0356         | 0.0132                  | 121.3862 |
| 07/29/21   | 6:29:50    | 0729-PRE_000049.LAB           | 191.3     | 0.99       | -0.0345         | 0.0001                  | 120.7858 |
| 07/29/21   | 6:30:20    | 0729-PRE_000050.LAB           | 191.3     | 0.99       | -0.0255         | -0.0019                 | 120.6875 |
| 07/29/21   | 6:30:50    | 0729-PRE_000051.LAB           | 191.3     | 0.99       | -0.0344         | 0.0022                  | 121.4610 |
| Average    |            |                               | 191.3     | 0.99       | -0.0325         | 0.0034                  | 121.0801 |

| Trial #2 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |               |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/29/21                            | 10:41:46           | 0729-R1_000204.LAB      | 191.4             | 1.04                | 6.0394                   | 10.4201                 | 5.1958        |
| 07/29/21                            | 10:42:17           | 0729-R1_000205.LAB      | 191.4             | 1.04                | 6.0349                   | 10.5369                 | 5.1412        |
| 07/29/21                            | 10:42:47           | 0729-R1_000206.LAB      | 191.4             | 1.04                | 5.9472                   | 10.1020                 | 5.0784        |
| 07/29/21                            | 10:43:17           | 0729-R1_000207.LAB      | 191.4             | 1.04                | 5.5778                   | 9.5137                  | 4.7623        |
| Average                             |                    |                         | 191.4             | 1.04                | 5.8998                   | 10.1432                 | 5.0444        |

| Trial #2 Spiked Samples |                    |                         |                   |                     |                          |                         |               |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/29/21                | 10:44:16           | 0729-R1_000209.LAB      | 191.4             | 1.04                | 5.5818                   | 9.2504                  | 13.6473       |
| 07/29/21                | 10:44:47           | 0729-R1_000210.LAB      | 191.4             | 1.03                | 5.3310                   | 12.2215                 | 14.0312       |
| 07/29/21                | 10:45:17           | 0729-R1_000211.LAB      | 191.4             | 1.03                | 5.2587                   | 13.6691                 | 13.9973       |
| 07/29/21                | 10:45:47           | 0729-R1_000212.LAB      | 191.4             | 1.03                | 5.2719                   | 13.6722                 | 14.0508       |
| Average                 |                    |                         | 191.4             | 1.03                | 5.3609                   | 12.2033                 | 13.9317       |

| Trial #3 Spike Gas Direct Verification |                    |                         |                   |                     |                          |                         | FTIR: 509/ INST-IR-0005 |
|----------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|-------------------------|
| Date<br>(mm/dd/yy)                     | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw)           |
| 07/29/21                               | 6:29:20            | 0729-PRE_000048.LAB     | 191.3             | 0.99                | -0.0356                  | 0.0132                  | 121.3862                |
| 07/29/21                               | 6:29:50            | 0729-PRE_000049.LAB     | 191.3             | 0.99                | -0.0345                  | 0.0001                  | 120.7858                |
| 07/29/21                               | 6:30:20            | 0729-PRE_000050.LAB     | 191.3             | 0.99                | -0.0255                  | -0.0019                 | 120.6875                |
| 07/29/21                               | 6:30:50            | 0729-PRE_000051.LAB     | 191.3             | 0.99                | -0.0344                  | 0.0022                  | 121.4610                |
| Average                                |                    |                         | 191.3             | 0.99                | -0.0325                  | 0.0034                  | 121.0801                |

| Trial #3 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |               |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/29/21                            | 10:47:17           | 0729-R1_000215.LAB      | 191.4             | 1.02                | 5.4686                   | 17.7606                 | 4.9024        |
| 07/29/21                            | 10:47:47           | 0729-R1_000216.LAB      | 191.4             | 1.02                | 5.5923                   | 16.5758                 | 4.8346        |
| 07/29/21                            | 10:48:17           | 0729-R1_000217.LAB      | 191.4             | 1.03                | 5.6718                   | 15.1855                 | 5.0380        |
| 07/29/21                            | 10:48:47           | 0729-R1_000218.LAB      | 191.4             | 1.03                | 5.7312                   | 14.3712                 | 5.0990        |
| Average                             |                    |                         | 191.4             | 1.03                | 5.6160                   | 15.9733                 | 4.9685        |

| Trial #3 Spiked Samples |                    |                         |                   |                     |                          |                         |               |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/29/21                | 10:50:17           | 0729-R1_000221.LAB      | 191.4             | 1.03                | 5.3414                   | 12.8845                 | 14.0327       |
| 07/29/21                | 10:50:47           | 0729-R1_000222.LAB      | 191.3             | 1.03                | 5.2080                   | 14.3284                 | 13.9683       |
| 07/29/21                | 10:51:17           | 0729-R1_000223.LAB      | 191.3             | 1.03                | 5.1211                   | 15.2920                 | 13.8946       |
| 07/29/21                | 10:51:47           | 0729-R1_000224.LAB      | 191.4             | 1.03                | 5.1912                   | 14.5061                 | 13.8609       |
| Average                 |                    |                         | 191.4             | 1.03                | 5.2154                   | 14.2527                 | 13.9391       |

| Parameter                                               | Units   | Trial #1 | Trial #2 | Trial #3 |
|---------------------------------------------------------|---------|----------|----------|----------|
| Direct Verified Concentration of Carbon Monoxide (CO)   | (ppmvw) | 121.08   | 121.08   | 121.08   |
| Stack (Native, Unspiked) CO <sub>2</sub> Concentration  | (%vw)   | 5.544    | 5.900    | 5.616    |
| Stack (Native, Unspiked) H <sub>2</sub> O Concentration | (%)     | 15.301   | 10.143   | 15.973   |
| Stack (Native, Unspiked) CO Concentration               | (ppmvw) | 4.117    | 5.044    | 4.968    |
| Stack + Spike CO <sub>2</sub> Concentration             | (%vw)   | 5.204    | 5.361    | 5.215    |
| Stack + Spike H <sub>2</sub> O Concentration            | (%)     | 13.976   | 12.203   | 14.253   |
| Stack + Spike CO Concentration                          | (ppmvw) | 14.530   | 13.932   | 13.939   |
| Dilution Factor, calc. from CO <sub>2</sub> (%vw)       |         | 0.061    | 0.091    | 0.071    |
| Dilution Factor, as the ratio of dir to spk             | (ratio) | 16.3 : 1 | 10.9 : 1 | 14 : 1   |
| Expected Concentration of the CO Spike+Native, CS       | (ppmvw) | 11.289   | 15.645   | 13.250   |
| Method 320 Spiked / Expected CO                         | %       | 128.71   | 89.05    | 105.20   |
| Method 320 Passing CO (70-130%)                         |         | YES      | YES      | YES      |

Catalytic Combustion Corporation  
 July 29, 2021  
 Caterpillar, G3520 TALE  
 Stewart & Stevenson Integration Center

| Trial #1   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |                 |                                 |  |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|-----------------|---------------------------------|--|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)         | (ppmvw)                         |  |
| 07/29/21   | 6:32:20    | 0729-PRE_000054.LAB           | 191.3     | 0.99       | 0.0102          | -0.0025                 | 5.6174          | 46.1720                         |  |
| 07/29/21   | 6:32:50    | 0729-PRE_000055.LAB           | 191.3     | 0.99       | 0.0016          | -0.0038                 | 5.6081          | 47.2898                         |  |
| 07/29/21   | 6:33:20    | 0729-PRE_000056.LAB           | 191.3     | 0.99       | 0.0070          | -0.0048                 | 5.6041          | 47.6549                         |  |
| 07/29/21   | 6:33:50    | 0729-PRE_000057.LAB           | 191.3     | 0.99       | 0.0126          | -0.0068                 | 5.6117          | 47.3384                         |  |
| Average    |            |                               | 191.3     | 0.99       | 0.0078          | -0.0045                 | 5.6103          | 47.1138                         |  |

| Trial #1   |            | Pre-Spike - Native Samples |           |            |                 |                  |                 |                                 |  |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|--|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |  |
| 07/29/21   | 8:13:09    | 0729-PRE_000256.LAB        | 191.3     | 1.03       | 5.8412          | 13.6062          | -0.0029         | 0.1604                          |  |
| 07/29/21   | 8:13:39    | 0729-PRE_000257.LAB        | 191.4     | 1.03       | 5.7654          | 14.4985          | -0.0054         | 0.4411                          |  |
| 07/29/21   | 8:14:09    | 0729-PRE_000258.LAB        | 191.4     | 1.03       | 5.7930          | 14.2263          | -0.0039         | 0.8452                          |  |
| 07/29/21   | 8:14:39    | 0729-PRE_000259.LAB        | 191.4     | 1.03       | 5.4426          | 14.6566          | -0.0013         | 0.3062                          |  |
| Average    |            |                            | 191.4     | 1.03       | 5.7106          | 14.2469          | -0.0034         | 0.4382                          |  |

| Trial #1   |            | Spiked Samples      |           |            |                 |                  |                 |                                 |  |
|------------|------------|---------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|--|
| Date       | Time       | Spectrum            | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)         | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |  |
| 07/29/21   | 8:17:09    | 0729-PRE_000264.LAB | 191.4     | 1.03       | 5.4266          | 12.7225          | 0.4138          | 3.7061                          |  |
| 07/29/21   | 8:17:39    | 0729-PRE_000265.LAB | 191.4     | 1.03       | 5.2023          | 15.0338          | 0.4087          | 3.6254                          |  |
| 07/29/21   | 8:18:09    | 0729-PRE_000266.LAB | 191.4     | 1.03       | 5.3755          | 13.2563          | 0.4079          | 3.6457                          |  |
| 07/29/21   | 8:18:39    | 0729-PRE_000267.LAB | 191.4     | 1.03       | 5.3797          | 13.4089          | 0.4026          | 3.5155                          |  |
| Average    |            |                     | 191.4     | 1.03       | 5.3460          | 13.6054          | 0.4082          | 3.6232                          |  |

| Trial #2   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |                 |                                 |  |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|-----------------|---------------------------------|--|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)         | (ppmvw)                         |  |
| 07/29/21   | 6:32:20    | 0729-PRE_000054.LAB           | 191.3     | 0.99       | 0.0102          | -0.0025                 | 5.6174          | 46.1720                         |  |
| 07/29/21   | 6:32:50    | 0729-PRE_000055.LAB           | 191.3     | 0.99       | 0.0016          | -0.0038                 | 5.6081          | 47.2898                         |  |
| 07/29/21   | 6:33:20    | 0729-PRE_000056.LAB           | 191.3     | 0.99       | 0.0070          | -0.0048                 | 5.6041          | 47.6549                         |  |
| 07/29/21   | 6:33:50    | 0729-PRE_000057.LAB           | 191.3     | 0.99       | 0.0126          | -0.0068                 | 5.6117          | 47.3384                         |  |
| Average    |            |                               | 191.3     | 0.99       | 0.0078          | -0.0045                 | 5.6103          | 47.1138                         |  |



| Trial #2   |            | Pre-Spike - Native Samples |           |            |                 |                  |                 |                                 |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |
| 07/29/21   | 10:58:18   | 0729-R1_000237.LAB         | 191.4     | 1.03       | 5.8150          | 13.6099          | 0.0006          | 0.3406                          |
| 07/29/21   | 10:58:48   | 0729-R1_000238.LAB         | 191.4     | 1.03       | 5.8728          | 12.9194          | -0.0025         | 0.5241                          |
| 07/29/21   | 10:59:18   | 0729-R1_000239.LAB         | 191.4     | 1.03       | 5.8676          | 12.9379          | -0.0025         | 0.6039                          |
| 07/29/21   | 10:59:48   | 0729-R1_000240.LAB         | 191.4     | 1.03       | 5.4829          | 12.5593          | 0.0002          | 0.3223                          |
| Average    |            |                            | 191.4     | 1.03       | 5.7596          | 13.0067          | -0.0011         | 0.4477                          |

| Trial #2   |            | Spiked Samples     |           |            |                 |                  |                 |                                 |
|------------|------------|--------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum           | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)        | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |
| 07/29/21   | 11:01:49   | 0729-R1_000244.LAB | 191.5     | 1.03       | 5.2712          | 13.8200          | 0.4242          | 3.7331                          |
| 07/29/21   | 11:02:19   | 0729-R1_000245.LAB | 191.5     | 1.03       | 5.3219          | 13.2850          | 0.4282          | 4.2742                          |
| 07/29/21   | 11:02:49   | 0729-R1_000246.LAB | 191.5     | 1.03       | 5.3687          | 12.7560          | 0.4313          | 4.0858                          |
| 07/29/21   | 11:03:18   | 0729-R1_000247.LAB | 191.5     | 1.03       | 5.3000          | 13.5442          | 0.4326          | 4.3084                          |
| Average    |            |                    | 191.5     | 1.03       | 5.3154          | 13.3513          | 0.4291          | 4.1004                          |

| Trial #3   |            | Spike Gas Direct Verification |           |            |                 |                  | FTIR: 509/ INST-IR-0005 |                                 |
|------------|------------|-------------------------------|-----------|------------|-----------------|------------------|-------------------------|---------------------------------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub>         | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)                 | (ppmvw)                         |
| 07/29/21   | 6:32:20    | 0729-PRE_000054.LAB           | 191.3     | 0.99       | 0.0102          | -0.0025          | 5.6174                  | 46.1720                         |
| 07/29/21   | 6:32:50    | 0729-PRE_000055.LAB           | 191.3     | 0.99       | 0.0016          | -0.0038          | 5.6081                  | 47.2898                         |
| 07/29/21   | 6:33:20    | 0729-PRE_000056.LAB           | 191.3     | 0.99       | 0.0070          | -0.0048          | 5.6041                  | 47.6549                         |
| 07/29/21   | 6:33:50    | 0729-PRE_000057.LAB           | 191.3     | 0.99       | 0.0126          | -0.0068          | 5.6117                  | 47.3384                         |
| Average    |            |                               | 191.3     | 0.99       | 0.0078          | -0.0045          | 5.6103                  | 47.1138                         |

| Trial #3   |            | Pre-Spike - Native Samples |           |            |                 |                  |                 |                                 |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |
| 07/29/21   | 11:04:19   | 0729-R1_000249.LAB         | 191.5     | 1.03       | 5.8610          | 12.4156          | 0.0084          | 0.5578                          |
| 07/29/21   | 11:04:49   | 0729-R1_000250.LAB         | 191.4     | 1.03       | 5.7812          | 13.8925          | -0.0013         | 0.2429                          |
| 07/29/21   | 11:05:19   | 0729-R1_000251.LAB         | 191.4     | 1.03       | 5.8004          | 13.6536          | 0.0004          | 0.3584                          |
| 07/29/21   | 11:05:49   | 0729-R1_000252.LAB         | 191.5     | 1.03       | 5.7415          | 14.2661          | -0.0004         | 0.2898                          |
| Average    |            |                            | 191.5     | 1.03       | 5.7960          | 13.5570          | 0.0018          | 0.3622                          |

| Trial #3   |            | Spiked Samples     |           |            |                 |                  |                 |                                 |
|------------|------------|--------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum           | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)        | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |
| 07/29/21   | 11:08:19   | 0729-R1_000257.LAB | 191.5     | 1.03       | 5.3438          | 13.0895          | 0.4337          | 4.2009                          |
| 07/29/21   | 11:08:49   | 0729-R1_000258.LAB | 191.4     | 1.03       | 5.3372          | 12.6090          | 0.4378          | 4.1634                          |
| 07/29/21   | 11:09:19   | 0729-R1_000259.LAB | 191.5     | 1.03       | 5.3282          | 12.4337          | 0.4382          | 4.3737                          |
| 07/29/21   | 11:09:49   | 0729-R1_000260.LAB | 191.4     | 1.04       | 5.3419          | 13.0188          | 0.4436          | 4.5190                          |
| Average    |            |                    | 191.5     | 1.03       | 5.3378          | 12.7877          | 0.4383          | 4.3142                          |

| Parameter                                                                       | Units   | Trial #1 | Trial #2 | Trial #3 |
|---------------------------------------------------------------------------------|---------|----------|----------|----------|
| Direct Verified Concentration of Sulfur Hexafluoride (SF <sub>6</sub> )         | (ppmvw) | 5.61     | 5.61     | 5.61     |
| Direct Verified Concentration of Acetaldehyde (C <sub>2</sub> H <sub>4</sub> O) | (ppmvw) | 47.11    | 47.11    | 47.11    |
| Stack (Native, Unspiked) CO <sub>2</sub> Concentration                          | (%vw)   | 5.711    | 5.760    | 5.796    |
| Stack (Native, Unspiked) H <sub>2</sub> O Concentration                         | (%)     | 14.247   | 13.007   | 13.557   |
| Stack (Native, Unspiked) SF <sub>6</sub> Concentration                          | (ppmvw) | -0.003   | -0.001   | 0.002    |
| Stack (Native, Unspiked) C <sub>2</sub> H <sub>4</sub> O Concentration          | (ppmvw) | 0.438    | 0.448    | 0.362    |
| Stack + Spike CO <sub>2</sub> Concentration                                     | (%vw)   | 5.346    | 5.315    | 5.338    |
| Stack + Spike H <sub>2</sub> O Concentration                                    | (%)     | 13.605   | 13.351   | 12.788   |
| Stack + Spike SF <sub>6</sub> Concentration                                     | (ppmvw) | 0.408    | 0.429    | 0.438    |
| Stack + Spike C <sub>2</sub> H <sub>4</sub> O Concentration                     | (ppmvw) | 3.623    | 4.100    | 4.314    |
| Dilution Factor, calc. from SF <sub>6</sub> (ppmvw)                             |         | 0.073    | 0.077    | 0.078    |
| Dilution Factor, as the ratio of dir to spk                                     | (ratio) | 13.6 : 1 | 13 : 1   | 12.9 : 1 |
| Expected Concentration of the SF <sub>6</sub> Spike+Native, CS                  | (ppmvw) | 0.408    | 0.429    | 0.438    |
| Expected Concentration of the C <sub>2</sub> H <sub>4</sub> O Spike+Native, CS  | (ppmvw) | 3.863    | 4.026    | 4.000    |
| Method 320 Spiked / Expected SF <sub>6</sub>                                    | %       | 99.94    | 99.98    | 100.03   |
| Method 320 Spiked / Expected C <sub>2</sub> H <sub>4</sub> O                    | %       | 93.80    | 101.86   | 107.85   |
| Method 320 Passing SF <sub>6</sub> (70-130%)                                    |         | YES      | YES      | YES      |
| Method 320 Passing C <sub>2</sub> H <sub>4</sub> O (70-130%)                    |         | YES      | YES      | YES      |

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| Sampling System<br>Leak Check | Flow<br>(LPM) | Date<br>(dd/mm/yy) | Time<br>(hh:mm) |
|-------------------------------|---------------|--------------------|-----------------|
|                               | ≤0.2          | 07/30/21           | 5:30            |

FTIR No: 509/ INST-IR-0005  
 Make Model: MKS 2030

|                                      |                          |
|--------------------------------------|--------------------------|
| <b>Analytical System Leak Checks</b> | <b>Vacuum Leak Check</b> |
|--------------------------------------|--------------------------|

| Spectrum            | Date<br>(dd/mm/yy) | Time<br>(hh:mm:ss) | Vacuum<br>(atm) |
|---------------------|--------------------|--------------------|-----------------|
| 0730-PRE_000014.LAB | 07/30/21           | 6:03:12            | 0.99459         |
| 0730-PRE_000015.LAB | 07/30/21           | 6:03:42            | 0.99447         |
| 0730-PRE_000016.LAB | 07/30/21           | 6:04:12            | 0.99512         |
| 0730-PRE_000017.LAB | 07/30/21           | 6:04:42            | 0.99520         |
| 0730-PRE_000018.LAB | 07/30/21           | 6:05:12            | 0.99500         |
| 0730-PRE_000019.LAB | 07/30/21           | 6:05:42            | 0.99504         |
| 0730-PRE_000020.LAB | 07/30/21           | 6:06:12            | 0.99529         |
| 0730-PRE_000021.LAB | 07/30/21           | 6:06:42            | 0.99537         |
| 0730-PRE_000022.LAB | 07/30/21           | 6:07:12            | 0.99551         |

| Pressure Elements           | Vacuum<br>(atm) |
|-----------------------------|-----------------|
| Average, P <sub>s</sub>     | 0.99507         |
| Maximum                     | 0.99551         |
| Minimum                     | 0.99447         |
| Difference, ΔP <sub>v</sub> | 0.00104         |

| Time Elements                       | Results<br>(min) |
|-------------------------------------|------------------|
| Signal Integration, t <sub>ss</sub> | 0.50             |
| Test Duration, t <sub>d</sub>       | 4.00             |

|                                      |                            |
|--------------------------------------|----------------------------|
| <b>Analytical System Leak Checks</b> | <b>Pressure Leak Check</b> |
|--------------------------------------|----------------------------|

| Spectrum            | Date<br>(dd/mm/yy) | Time<br>(hh:mm:ss) | Pressure<br>(atm) |
|---------------------|--------------------|--------------------|-------------------|
| 0730-PRE_000002.LAB | 07/30/21           | 5:57:11            | 1.10579           |
| 0730-PRE_000003.LAB | 07/30/21           | 5:57:41            | 1.10579           |
| 0730-PRE_000004.LAB | 07/30/21           | 5:58:11            | 1.10579           |
| 0730-PRE_000005.LAB | 07/30/21           | 5:58:41            | 1.10579           |
| 0730-PRE_000006.LAB | 07/30/21           | 5:59:11            | 1.10579           |
| 0730-PRE_000007.LAB | 07/30/21           | 5:59:42            | 1.10579           |
| 0730-PRE_000008.LAB | 07/30/21           | 6:00:12            | 1.10579           |
| 0730-PRE_000009.LAB | 07/30/21           | 6:00:42            | 1.10579           |
| 0730-PRE_000010.LAB | 07/30/21           | 6:01:12            | 1.10579           |
| 0730-PRE_000011.LAB | 07/30/21           | 6:01:42            | 1.10579           |

| Pressure Elements           | Pressure<br>(atm) |
|-----------------------------|-------------------|
| Average, P <sub>s</sub>     | 1.10579           |
| Maximum                     | 1.10579           |
| Minimum                     | 1.10579           |
| Difference, ΔP <sub>p</sub> | 0.00000           |

|                           |       |
|---------------------------|-------|
| Station Pressure (in. Hg) | 29.89 |
|---------------------------|-------|

| Time Elements                       | Results<br>(min) |
|-------------------------------------|------------------|
| Signal Integration, t <sub>ss</sub> | 0.50             |
| Test Duration, t <sub>d</sub>       | 4.50             |

| Parameter                      | Vacuum  | Pressure | Max ΔP  |
|--------------------------------|---------|----------|---------|
| Test Duration, t <sub>d</sub>  | 4.00    | 4.50     | 4.00    |
| Signal Integ., t <sub>ss</sub> | 0.50    | 0.50     | 0.50    |
| Difference, ΔP                 | 0.00104 | 0.00000  | 0.00104 |
| Average, P <sub>s</sub>        | 0.99507 | 1.10579  | 0.99507 |
| Leak Volume, %V <sub>L</sub>   | 0.013   | 0.000    | 0.013   |
| Pass, ≤4%                      | yes     | yes      | yes     |

$$\%V_L = \frac{100\%}{t_d} t_{ss} \frac{\Delta P_{max}}{P_s}$$

Method 320, Section 8.2.2.4, Equation 2  
 expanded to account for sample duration

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|                                                         |          |
|---------------------------------------------------------|----------|
| Protocol No. 1, CO <sub>2</sub> Cylinder Concentration: | 8.95 %vd |
|---------------------------------------------------------|----------|

| Pre-Test Background |                    |                         |                   |                     |                 | FTIR: 509/ INST-IR-0005 |
|---------------------|--------------------|-------------------------|-------------------|---------------------|-----------------|-------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub> | H <sub>2</sub> O<br>(%) |
| 07/30/21            | 6:13:32            | 0730-PRE_000031BKG.LAB  | 191.4             | 1.00                | 0.0000          | 0.0000                  |

| Pre-Test Direct Zero |                    |                         |                   |                     |                 |                         |
|----------------------|--------------------|-------------------------|-------------------|---------------------|-----------------|-------------------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub> | H <sub>2</sub> O<br>(%) |
| 07/30/21             | 6:14:09            | 0730-PRE_000032.LAB     | 191.3             | 1.00                | -0.0033         | 0.0042                  |
| 07/30/21             | 6:14:38            | 0730-PRE_000033.LAB     | 191.4             | 1.00                | 0.0086          | -0.0009                 |
| 07/30/21             | 6:15:08            | 0730-PRE_000034.LAB     | 191.3             | 1.00                | -0.0026         | 0.0014                  |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                 |                         |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|-----------------|-------------------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub> | H <sub>2</sub> O<br>(%) |
| 07/30/21                                     | 6:16:09            | 0730-PRE_000036.LAB     | 191.3             | 1.00                | 8.9894          | 0.0085                  |
| 07/30/21                                     | 6:16:39            | 0730-PRE_000037.LAB     | 191.3             | 1.00                | 9.0392          | 0.0043                  |
| 07/30/21                                     | 6:17:09            | 0730-PRE_000038.LAB     | 191.4             | 1.00                | 9.0308          | 0.0029                  |
| 07/30/21                                     | 6:17:39            | 0730-PRE_000039.LAB     | 191.4             | 1.00                | 8.9392          | -0.0020                 |
| 07/30/21                                     | 6:18:09            | 0730-PRE_000040.LAB     | 191.4             | 1.00                | 8.9547          | 0.0015                  |
| Average                                      |                    |                         | 191.4             | 1.00                | 8.9907          | 0.0030                  |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                 |                         |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|-----------------|-------------------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub> | H <sub>2</sub> O<br>(%) |
| 07/30/21                                      | 20:08:00           | 0730-R3_000443.LAB      | 191.4             | 0.99                | 9.0504          | 0.0024                  |
| 07/30/21                                      | 20:08:30           | 0730-R3_000444.LAB      | 191.4             | 0.99                | 9.0830          | -0.0011                 |
| 07/30/21                                      | 20:09:00           | 0730-R3_000445.LAB      | 191.4             | 0.99                | 9.0399          | 0.0029                  |
| 07/30/21                                      | 20:09:30           | 0730-R3_000446.LAB      | 191.4             | 0.99                | 9.0417          | -0.0021                 |
| 07/30/21                                      | 20:10:00           | 0730-R3_000447.LAB      | 191.4             | 0.99                | 9.0313          | -0.0045                 |
| Average                                       |                    |                         | 191.4             | 0.99                | 9.0492          | -0.0005                 |

| Post-Test Direct Zero |                    |                         |                   |                     |                 |                         |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|-----------------|-------------------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub> | H <sub>2</sub> O<br>(%) |
| 07/30/21              | 20:15:00           | 0730-R3_000457.LAB      | 191.4             | 0.99                | 0.0107          | -0.0023                 |
| 07/30/21              | 20:15:30           | 0730-R3_000458.LAB      | 191.4             | 0.99                | 0.0023          | -0.0021                 |
| 07/30/21              | 20:16:00           | 0730-R3_000459.LAB      | 191.4             | 0.99                | 0.0115          | -0.0060                 |

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| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             |                       | (%)                   |
| 07/30/21                    | 20:18:25    | 0730-R3_000460BKG.LAB | 191.3            | 0.99              | 0.0000                | 0.0000                |

| <b>CTS Results</b> | Protocol No. 1 Concentration | FTIR CO <sub>2</sub><br>Average | Error<br>(%) | Pass<br>(≤5%) |
|--------------------|------------------------------|---------------------------------|--------------|---------------|
| Pre-Test Direct    | 8.95                         | 8.99                            | 0.45         | YES           |
| Post-Test Direct   | 8.95                         | 9.05                            | 1.11         | YES           |

| <b>Pre / Post<br/>Comparison</b> | FTIR CO <sub>2</sub><br>Maximum | FTIR CO <sub>2</sub><br>Pre/Post Mean | Error<br>(%) | Pass<br>(≤5%) |
|----------------------------------|---------------------------------|---------------------------------------|--------------|---------------|
| Pre-Test Direct                  | 9.04                            | 9.02                                  | 0.21         | YES           |
| Post-Test Direct                 | 9.08                            |                                       | 0.69         | YES           |

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|                                                    |          |
|----------------------------------------------------|----------|
| Certified, NH <sub>3</sub> Cylinder Concentration: | 49 ppmvd |
|----------------------------------------------------|----------|

| Pre-Test Background |                    |                         |                   |                     |                            |                         | FTIR: 509/ INST-IR-0005    |
|---------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NH <sub>3</sub><br>(ppmvw) |
| 07/30/21            | 6:13:32            | 0730-PRE_000031BKG.LAB  | 191.4             | 1.00                | 0.0000                     | 0.0000                  | 0.0000                     |

| Pre-Test Direct Zero |                    |                         |                   |                     |                            |                         |                            |
|----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NH <sub>3</sub><br>(ppmvw) |
| 07/30/21             | 6:14:09            | 0730-PRE_000032.LAB     | 191.3             | 1.00                | -0.0033                    | 0.0042                  | 0.0083                     |
| 07/30/21             | 6:14:38            | 0730-PRE_000033.LAB     | 191.4             | 1.00                | 0.0086                     | -0.0009                 | -0.0388                    |
| 07/30/21             | 6:15:08            | 0730-PRE_000034.LAB     | 191.3             | 1.00                | -0.0026                    | 0.0014                  | -0.0227                    |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                            |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NH <sub>3</sub><br>(ppmvw) |
| 07/30/21                                     | 6:38:41            | 0730-PRE_000081.LAB     | 191.4             | 1.00                | 0.0045                     | 0.0037                  | 46.4683                    |
| 07/30/21                                     | 6:39:11            | 0730-PRE_000082.LAB     | 191.4             | 1.00                | 0.0114                     | 0.0074                  | 46.4068                    |
| 07/30/21                                     | 6:39:41            | 0730-PRE_000083.LAB     | 191.4             | 1.00                | 0.0126                     | 0.0106                  | 47.4780                    |
| 07/30/21                                     | 6:40:11            | 0730-PRE_000084.LAB     | 191.4             | 1.00                | 0.0086                     | 0.0062                  | 47.5915                    |
| 07/30/21                                     | 6:41:11            | 0730-PRE_000086.LAB     | 191.4             | 1.00                | 0.0281                     | 0.7565                  | 48.0381                    |
| Average                                      |                    |                         | 191.4             | 1.00                | 0.0130                     | 0.1569                  | 47.1965                    |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                            |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NH <sub>3</sub><br>(ppmvw) |
| 07/30/21                                      | 19:53:28           | 0730-R3_000414.LAB      | 191.3             | 1.00                | -0.0003                    | 0.0082                  | 47.5248                    |
| 07/30/21                                      | 19:53:58           | 0730-R3_000415.LAB      | 191.3             | 1.00                | 0.0067                     | 0.0095                  | 46.4149                    |
| 07/30/21                                      | 19:54:28           | 0730-R3_000416.LAB      | 191.3             | 1.00                | 0.0161                     | 0.0061                  | 45.7153                    |
| 07/30/21                                      | 19:54:58           | 0730-R3_000417.LAB      | 191.2             | 1.00                | 0.0057                     | 0.0043                  | 45.8208                    |
| 07/30/21                                      | 19:55:28           | 0730-R3_000418.LAB      | 191.2             | 1.00                | 0.0145                     | 0.0039                  | 47.3945                    |
| Average                                       |                    |                         | 191.3             | 1.00                | 0.0085                     | 0.0064                  | 46.5741                    |

| Post-Test Direct Zero |                    |                         |                   |                     |                            |                         |                            |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NH <sub>3</sub><br>(ppmvw) |
| 07/30/21              | 20:15:00           | 0730-R3_000457.LAB      | 191.4             | 0.99                | 0.0107                     | -0.0023                 | 1.0692                     |
| 07/30/21              | 20:15:30           | 0730-R3_000458.LAB      | 191.4             | 0.99                | 0.0023                     | -0.0021                 | 0.9469                     |
| 07/30/21              | 20:16:00           | 0730-R3_000459.LAB      | 191.4             | 0.99                | 0.0115                     | -0.0060                 | 0.8690                     |

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| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |                       |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|-----------------------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> | <b>NH<sub>3</sub></b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             | (ppmvw)               | (%)                   | (ppmvw)               |
| 07/30/21                    | 20:18:25    | 0730-R3_000460BKG.LAB | 191.3            | 0.99              | 0.0000                | 0.0000                | 0.0000                |

| <b>CTS Results</b> | Certified Concentration | FTIR NH <sub>3</sub><br>Average | Error<br>(%) | Pass<br>(≤5%) |
|--------------------|-------------------------|---------------------------------|--------------|---------------|
| Pre-Test Direct    | 49.00                   | 47.20                           | 3.68         | YES           |
| Post-Test Direct   | 49.00                   | 46.57                           | 4.95         | YES           |

| <b>Pre / Post<br/>Comparison</b> | FTIR NH <sub>3</sub><br>Maximum | FTIR NH <sub>3</sub><br>Pre/Post Mean | Error<br>(%) | Pass<br>(≤5%) |
|----------------------------------|---------------------------------|---------------------------------------|--------------|---------------|
| Pre-Test Direct                  | 48.04                           | 46.89                                 | 2.40         | YES           |
| Post-Test Direct                 | 47.52                           |                                       | 1.35         | YES           |

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|                                                                  |           |
|------------------------------------------------------------------|-----------|
| Certified, C <sub>2</sub> H <sub>6</sub> Cylinder Concentration: | 100 ppmvd |
|------------------------------------------------------------------|-----------|

| Pre-Test Background |                    |                         |                   |                     |                            |                         | FTIR: 509/ INST-IR-0005                  |
|---------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/30/21            | 6:13:32            | 0730-PRE_000031BKG.LAB  | 191.4             | 1.00                | 0.0000                     | 0.0000                  | 0.0000                                   |

| Pre-Test Direct Zero |                    |                         |                   |                     |                            |                         |                                          |
|----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/30/21             | 6:14:09            | 0730-PRE_000032.LAB     | 191.3             | 1.00                | -0.0033                    | 0.0042                  | -0.0546                                  |
| 07/30/21             | 6:14:38            | 0730-PRE_000033.LAB     | 191.4             | 1.00                | 0.0086                     | -0.0009                 | 0.0040                                   |
| 07/30/21             | 6:15:08            | 0730-PRE_000034.LAB     | 191.3             | 1.00                | -0.0026                    | 0.0014                  | -0.0639                                  |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                                          |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/30/21                                     | 6:19:39            | 0730-PRE_000043.LAB     | 191.3             | 1.00                | 0.0072                     | 0.0011                  | 100.6868                                 |
| 07/30/21                                     | 6:20:09            | 0730-PRE_000044.LAB     | 191.4             | 1.00                | 0.0030                     | -0.0006                 | 100.9227                                 |
| 07/30/21                                     | 6:20:39            | 0730-PRE_000045.LAB     | 191.4             | 1.00                | 0.0058                     | -0.0020                 | 100.6889                                 |
| 07/30/21                                     | 6:21:09            | 0730-PRE_000046.LAB     | 191.4             | 1.00                | -0.0050                    | -0.0002                 | 101.1251                                 |
| 07/30/21                                     | 6:21:39            | 0730-PRE_000047.LAB     | 191.4             | 1.00                | 0.0032                     | 0.0017                  | 101.2393                                 |
| Average                                      |                    |                         | 191.4             | 1.00                | 0.0028                     | 0.0000                  | 100.9326                                 |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                                          |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/30/21                                      | 20:04:59           | 0730-R3_000437.LAB      | 191.5             | 0.99                | 0.0128                     | 0.0883                  | 94.9111                                  |
| 07/30/21                                      | 20:05:29           | 0730-R3_000438.LAB      | 191.4             | 0.99                | 0.0051                     | 0.0921                  | 96.0914                                  |
| 07/30/21                                      | 20:05:59           | 0730-R3_000439.LAB      | 191.4             | 0.99                | -0.0016                    | 0.1057                  | 95.6295                                  |
| 07/30/21                                      | 20:06:29           | 0730-R3_000440.LAB      | 191.4             | 0.99                | 0.0089                     | 0.1073                  | 95.1082                                  |
| 07/30/21                                      | 20:06:59           | 0730-R3_000441.LAB      | 191.4             | 0.99                | 0.0170                     | 0.0381                  | 99.3170                                  |
| Average                                       |                    |                         | 191.4             | 0.99                | 0.0084                     | 0.0863                  | 96.2115                                  |

| Post-Test Direct Zero |                    |                         |                   |                     |                            |                         |                                          |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/30/21              | 20:15:00           | 0730-R3_000457.LAB      | 191.4             | 0.99                | 0.0107                     | -0.0023                 | -0.2236                                  |
| 07/30/21              | 20:15:30           | 0730-R3_000458.LAB      | 191.4             | 0.99                | 0.0023                     | -0.0021                 | -0.1017                                  |
| 07/30/21              | 20:16:00           | 0730-R3_000459.LAB      | 191.4             | 0.99                | 0.0115                     | -0.0060                 | -0.3388                                  |



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| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |                                   |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|-----------------------------------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> | <b>C<sub>2</sub>H<sub>6</sub></b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             | (ppmvw)               | (%)                   | (ppmvw)                           |
| 07/30/21                    | 20:18:25    | 0730-R3_000460BKG.LAB | 191.3            | 0.99              | 0.0000                | 0.0000                | 0.0000                            |

| <b>CTS Results</b> | Certified Concentration | FTIR C <sub>2</sub> H <sub>6</sub><br>Average | Error<br>(%) | Pass<br>(≤5%) |
|--------------------|-------------------------|-----------------------------------------------|--------------|---------------|
| Pre-Test Direct    | 100.00                  | 100.93                                        | 0.93         | YES           |
| Post-Test Direct   | 100.00                  | 96.21                                         | 3.79         | YES           |

| <b>Pre / Post<br/>Comparison</b> | FTIR C <sub>2</sub> H <sub>6</sub><br>Maximum | FTIR C <sub>2</sub> H <sub>6</sub><br>Pre/Post Mean | Error<br>(%) | Pass<br>(≤5%) |
|----------------------------------|-----------------------------------------------|-----------------------------------------------------|--------------|---------------|
| Pre-Test Direct                  | 101.24                                        | 98.57                                               | 2.63         | YES           |
| Post-Test Direct                 | 99.32                                         |                                                     | 0.75         | YES           |

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|                                                    |             |
|----------------------------------------------------|-------------|
| <b>Protocol No. 1, NOx Cylinder Concentration:</b> | 116.1 ppmvd |
|----------------------------------------------------|-------------|

| Pre-Test Background |                    |                         |                   |                     |                            |                         | FTIR: 509/ INST-IR-0005 |
|---------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|-------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw)          |
| 07/30/21            | 6:13:32            | 0730-PRE_000031BKG.LAB  | 191.4             | 1.00                | 0.0000                     | 0.0000                  | 0.0000                  |

| Pre-Test Direct Zero |                    |                         |                   |                     |                            |                         |                |
|----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw) |
| 07/30/21             | 6:14:09            | 0730-PRE_000032.LAB     | 191.3             | 1.00                | -0.0033                    | 0.0042                  | 0.0301         |
| 07/30/21             | 6:14:38            | 0730-PRE_000033.LAB     | 191.4             | 1.00                | 0.0086                     | -0.0009                 | -0.0634        |
| 07/30/21             | 6:15:08            | 0730-PRE_000034.LAB     | 191.3             | 1.00                | -0.0026                    | 0.0014                  | 0.0144         |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                 |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|-----------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw)  |
| 07/30/21                                     | 6:22:39            | 0730-PRE_000049.LAB     | 191.4             | 1.00                | -0.0302                    | 0.0182                  | 118.1741        |
| 07/30/21                                     | 6:23:09            | 0730-PRE_000050.LAB     | 191.4             | 1.00                | -0.0389                    | 0.0025                  | 118.8564        |
| 07/30/21                                     | 6:23:39            | 0730-PRE_000051.LAB     | 191.4             | 1.00                | -0.0431                    | -0.0001                 | 118.6155        |
| 07/30/21                                     | 6:24:09            | 0730-PRE_000052.LAB     | 191.4             | 1.00                | -0.0383                    | -0.0029                 | 117.8215        |
| 07/30/21                                     | 6:24:39            | 0730-PRE_000053.LAB     | 191.4             | 1.00                | -0.0356                    | -0.0027                 | 118.2811        |
| <b>Average</b>                               |                    |                         | <b>191.4</b>      | <b>1.00</b>         | <b>-0.0372</b>             | <b>0.0030</b>           | <b>118.3497</b> |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                 |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|-----------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw)  |
| 07/30/21                                      | 20:01:59           | 0730-R3_000431.LAB      | 191.4             | 0.99                | -0.0372                    | 0.0002                  | 119.2568        |
| 07/30/21                                      | 20:02:29           | 0730-R3_000432.LAB      | 191.4             | 0.99                | -0.0273                    | -0.0001                 | 118.8093        |
| 07/30/21                                      | 20:02:59           | 0730-R3_000433.LAB      | 191.4             | 0.99                | -0.0241                    | 0.0010                  | 118.7938        |
| 07/30/21                                      | 20:03:29           | 0730-R3_000434.LAB      | 191.4             | 0.99                | -0.0204                    | -0.0029                 | 118.3085        |
| 07/30/21                                      | 20:03:59           | 0730-R3_000435.LAB      | 191.4             | 0.99                | -0.0253                    | -0.0007                 | 118.3400        |
| <b>Average</b>                                |                    |                         | <b>191.4</b>      | <b>0.99</b>         | <b>-0.0268</b>             | <b>-0.0005</b>          | <b>118.7017</b> |

| Post-Test Direct Zero |                    |                         |                   |                     |                            |                         |                |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|----------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw) |
| 07/30/21              | 20:15:00           | 0730-R3_000457.LAB      | 191.4             | 0.99                | 0.0107                     | -0.0023                 | -0.0462        |
| 07/30/21              | 20:15:30           | 0730-R3_000458.LAB      | 191.4             | 0.99                | 0.0023                     | -0.0021                 | -0.1749        |
| 07/30/21              | 20:16:00           | 0730-R3_000459.LAB      | 191.4             | 0.99                | 0.0115                     | -0.0060                 | -0.0298        |

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| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |            |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|------------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> | <b>NOx</b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             | (ppmvw)               | (%)                   | (ppmvw)    |
| 07/30/21                    | 20:18:25    | 0730-R3_000460BKG.LAB | 191.3            | 0.99              | 0.0000                | 0.0000                | 0.0000     |

| <b>CTS Results</b> | Protocol No. 1 Concentration | FTIR NOx<br>Average | Error<br>(%) | Pass<br>(≤5%) |
|--------------------|------------------------------|---------------------|--------------|---------------|
| Pre-Test Direct    | 116.10                       | 118.35              | 1.94         | YES           |
| Post-Test Direct   | 116.10                       | 118.70              | 2.24         | YES           |

| <b>Pre / Post<br/>Comparison</b> | FTIR NOx<br>Maximum | FTIR NOx<br>Pre/Post Mean | Error<br>(%) | Pass<br>(≤5%) |
|----------------------------------|---------------------|---------------------------|--------------|---------------|
| Pre-Test Direct                  | 118.86              | 118.53                    | 0.28         | YES           |
| Post-Test Direct                 | 119.26              |                           | 0.61         | YES           |

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|                                            |           |
|--------------------------------------------|-----------|
| Protocol No. 1, CO Cylinder Concentration: | 122 ppmvd |
|--------------------------------------------|-----------|

| Pre-Test Background |                    |                         |                   |                     |                            | FTIR: 509/ INST-IR-0005 |               |
|---------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/30/21            | 6:13:32            | 0730-PRE_000031BKG.LAB  | 191.4             | 1.00                | 0.0000                     | 0.0000                  | 0.0000        |

| Pre-Test Direct Zero |                    |                         |                   |                     |                            |                         |               |
|----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/30/21             | 6:14:09            | 0730-PRE_000032.LAB     | 191.3             | 1.00                | -0.0033                    | 0.0042                  | 0.0440        |
| 07/30/21             | 6:14:38            | 0730-PRE_000033.LAB     | 191.4             | 1.00                | 0.0086                     | -0.0009                 | -0.0435       |
| 07/30/21             | 6:15:08            | 0730-PRE_000034.LAB     | 191.3             | 1.00                | -0.0026                    | 0.0014                  | 0.0030        |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |               |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/30/21                                     | 6:22:39            | 0730-PRE_000049.LAB     | 191.4             | 1.00                | -0.0302                    | 0.0182                  | 120.7373      |
| 07/30/21                                     | 6:23:09            | 0730-PRE_000050.LAB     | 191.4             | 1.00                | -0.0389                    | 0.0025                  | 121.4913      |
| 07/30/21                                     | 6:23:39            | 0730-PRE_000051.LAB     | 191.4             | 1.00                | -0.0431                    | -0.0001                 | 121.2086      |
| 07/30/21                                     | 6:24:09            | 0730-PRE_000052.LAB     | 191.4             | 1.00                | -0.0383                    | -0.0029                 | 120.4047      |
| 07/30/21                                     | 6:24:39            | 0730-PRE_000053.LAB     | 191.4             | 1.00                | -0.0356                    | -0.0027                 | 120.4995      |
| Average                                      |                    |                         | 191.4             | 1.00                | -0.0372                    | 0.0030                  | 120.8683      |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |               |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/30/21                                      | 20:01:59           | 0730-R3_000431.LAB      | 191.4             | 0.99                | -0.0372                    | 0.0002                  | 122.2379      |
| 07/30/21                                      | 20:02:29           | 0730-R3_000432.LAB      | 191.4             | 0.99                | -0.0273                    | -0.0001                 | 121.5142      |
| 07/30/21                                      | 20:02:59           | 0730-R3_000433.LAB      | 191.4             | 0.99                | -0.0241                    | 0.0010                  | 121.3072      |
| 07/30/21                                      | 20:03:29           | 0730-R3_000434.LAB      | 191.4             | 0.99                | -0.0204                    | -0.0029                 | 120.9053      |
| 07/30/21                                      | 20:03:59           | 0730-R3_000435.LAB      | 191.4             | 0.99                | -0.0253                    | -0.0007                 | 120.6371      |
| Average                                       |                    |                         | 191.4             | 0.99                | -0.0268                    | -0.0005                 | 121.3203      |

| Post-Test Direct Zero |                    |                         |                   |                     |                            |                         |               |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/30/21              | 20:15:00           | 0730-R3_000457.LAB      | 191.4             | 0.99                | 0.0107                     | -0.0023                 | -0.0600       |
| 07/30/21              | 20:15:30           | 0730-R3_000458.LAB      | 191.4             | 0.99                | 0.0023                     | -0.0021                 | -0.1378       |
| 07/30/21              | 20:16:00           | 0730-R3_000459.LAB      | 191.4             | 0.99                | 0.0115                     | -0.0060                 | -0.0268       |

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| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |           |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|-----------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> | <b>CO</b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             | (ppmvw)               | (%)                   | (ppmvw)   |
| 07/30/21                    | 20:18:25    | 0730-R3_000460BKG.LAB | 191.3            | 0.99              | 0.0000                | 0.0000                | 0.0000    |

| <b>CTS Results</b> | Protocol No. 1 Concentration | FTIR CO Average | Error (%) | Pass (≤5%) |
|--------------------|------------------------------|-----------------|-----------|------------|
| Pre-Test Direct    | 122.00                       | 120.87          | 0.93      | YES        |
| Post-Test Direct   | 122.00                       | 121.32          | 0.56      | YES        |

| <b>Pre / Post Comparison</b> | FTIR CO Maximum | FTIR CO Pre/Post Mean | Error (%) | Pass (≤5%) |
|------------------------------|-----------------|-----------------------|-----------|------------|
| Pre-Test Direct              | 121.49          | 121.09                | 0.33      | YES        |
| Post-Test Direct             | 122.24          |                       | 0.94      | YES        |

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|                                                                    |            |
|--------------------------------------------------------------------|------------|
| Certified, C <sub>2</sub> H <sub>4</sub> O Cylinder Concentration: | 47.4 ppmvd |
|--------------------------------------------------------------------|------------|

| Pre-Test Background |                    |                         |                   |                     |                            |                         | FTIR: 509/ INST-IR-0005                    |
|---------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|--------------------------------------------|
| Date<br>(mm/dd/yy)  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmvw) |
| 07/30/21            | 6:13:32            | 0730-PRE_000031BKG.LAB  | 191.4             | 1.00                | 0.0000                     | 0.0000                  | 0.0000                                     |

| Pre-Test Direct Zero |                    |                         |                   |                     |                            |                         |                                            |
|----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|--------------------------------------------|
| Date<br>(mm/dd/yy)   | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmvw) |
| 07/30/21             | 6:14:09            | 0730-PRE_000032.LAB     | 191.3             | 1.00                | -0.0033                    | 0.0042                  | 0.2031                                     |
| 07/30/21             | 6:14:38            | 0730-PRE_000033.LAB     | 191.4             | 1.00                | 0.0086                     | -0.0009                 | 0.0650                                     |
| 07/30/21             | 6:15:08            | 0730-PRE_000034.LAB     | 191.3             | 1.00                | -0.0026                    | 0.0014                  | 0.1599                                     |

| Pre-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                                            |
|----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|--------------------------------------------|
| Date<br>(mm/dd/yy)                           | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmvw) |
| 07/30/21                                     | 6:25:40            | 0730-PRE_000055.LAB     | 191.4             | 1.00                | 0.0066                     | 0.0047                  | 46.2794                                    |
| 07/30/21                                     | 6:26:10            | 0730-PRE_000056.LAB     | 191.4             | 1.00                | 0.0073                     | -0.0029                 | 47.4824                                    |
| 07/30/21                                     | 6:26:40            | 0730-PRE_000057.LAB     | 191.4             | 1.00                | -0.0018                    | 0.0002                  | 48.0103                                    |
| 07/30/21                                     | 6:27:10            | 0730-PRE_000058.LAB     | 191.4             | 1.00                | -0.0025                    | -0.0030                 | 48.0884                                    |
| 07/30/21                                     | 6:27:40            | 0730-PRE_000059.LAB     | 191.4             | 1.00                | 0.0059                     | -0.0068                 | 48.1908                                    |
| Average                                      |                    |                         | 191.4             | 1.00                | 0.0031                     | -0.0015                 | 47.6103                                    |

| Post-Test Direct Calibration Transfer Spectra |                    |                         |                   |                     |                            |                         |                                            |
|-----------------------------------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|--------------------------------------------|
| Date<br>(mm/dd/yy)                            | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmvw) |
| 07/30/21                                      | 19:58:59           | 0730-R3_000425.LAB      | 191.4             | 0.99                | 0.0109                     | -0.0057                 | 44.9843                                    |
| 07/30/21                                      | 19:59:29           | 0730-R3_000426.LAB      | 191.4             | 0.99                | 0.0138                     | -0.0121                 | 45.1049                                    |
| 07/30/21                                      | 19:59:59           | 0730-R3_000427.LAB      | 191.4             | 0.99                | 0.0118                     | -0.0089                 | 45.3844                                    |
| 07/30/21                                      | 20:00:29           | 0730-R3_000428.LAB      | 191.4             | 0.99                | 0.0115                     | -0.0111                 | 45.3527                                    |
| 07/30/21                                      | 20:00:59           | 0730-R3_000429.LAB      | 191.4             | 0.99                | 0.0119                     | -0.0026                 | 45.4163                                    |
| Average                                       |                    |                         | 191.4             | 0.99                | 0.0120                     | -0.0081                 | 45.2485                                    |

| Post-Test Direct Zero |                    |                         |                   |                     |                            |                         |                                            |
|-----------------------|--------------------|-------------------------|-------------------|---------------------|----------------------------|-------------------------|--------------------------------------------|
| Date<br>(mm/dd/yy)    | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(ppmvw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>4</sub> O<br>(ppmvw) |
| 07/30/21              | 20:15:00           | 0730-R3_000457.LAB      | 191.4             | 0.99                | 0.0107                     | -0.0023                 | -0.0450                                    |
| 07/30/21              | 20:15:30           | 0730-R3_000458.LAB      | 191.4             | 0.99                | 0.0023                     | -0.0021                 | 0.2411                                     |
| 07/30/21              | 20:16:00           | 0730-R3_000459.LAB      | 191.4             | 0.99                | 0.0115                     | -0.0060                 | 0.3815                                     |

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**Caterpillar, G3520 TALE**  
**Stewart & Stevenson Integration Center**

| <b>Post-Test Background</b> |             |                       |                  |                   |                       |                       |                                    |
|-----------------------------|-------------|-----------------------|------------------|-------------------|-----------------------|-----------------------|------------------------------------|
| <b>Date</b>                 | <b>Time</b> | <b>Spectrum</b>       | <b>Cell Temp</b> | <b>Cell Press</b> | <b>CO<sub>2</sub></b> | <b>H<sub>2</sub>O</b> | <b>C<sub>2</sub>H<sub>4</sub>O</b> |
| (mm/dd/yy)                  | (hh:mm:ss)  | (File Name)           | (°C)             | (atm)             | (ppmvw)               | (%)                   | (ppmvw)                            |
| 07/30/21                    | 20:18:25    | 0730-R3_000460BKG.LAB | 191.3            | 0.99              | 0.0000                | 0.0000                | 0.0000                             |

| <b>CTS Results</b> | Certified Concentration | FTIR C <sub>2</sub> H <sub>4</sub> O<br>Average | Error<br>(%) | Pass<br>(≤5%) |
|--------------------|-------------------------|-------------------------------------------------|--------------|---------------|
| Pre-Test Direct    | 47.40                   | 47.61                                           | 0.44         | YES           |
| Post-Test Direct   | 47.40                   | 45.25                                           | 4.54         | YES           |

| <b>Pre / Post<br/>Comparison</b> | FTIR C <sub>2</sub> H <sub>4</sub> O<br>Maximum | FTIR C <sub>2</sub> H <sub>4</sub> O<br>Pre/Post Mean | Error<br>(%) | Pass<br>(≤5%) |
|----------------------------------|-------------------------------------------------|-------------------------------------------------------|--------------|---------------|
| Pre-Test Direct                  | 48.19                                           | 46.43                                                 | 3.66         | YES           |
| Post-Test Direct                 | 45.42                                           |                                                       | 2.23         | YES           |

Catalytic Combustion Corporation  
July 30, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

| Trial #1   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |                 |                 |  |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|-----------------|-----------------|--|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | SF <sub>6</sub> | NH <sub>3</sub> |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)         | (ppmvw)         |  |
| 07/30/21   | 6:38:41    | 0730-PRE_000081.LAB           | 191.4     | 1.00       | 0.0045          | 0.0037                  | 11.0592         | 46.4683         |  |
| 07/30/21   | 6:39:11    | 0730-PRE_000082.LAB           | 191.4     | 1.00       | 0.0114          | 0.0074                  | 11.0565         | 46.4068         |  |
| 07/30/21   | 6:39:41    | 0730-PRE_000083.LAB           | 191.4     | 1.00       | 0.0126          | 0.0106                  | 11.0569         | 47.4780         |  |
| 07/30/21   | 6:40:11    | 0730-PRE_000084.LAB           | 191.4     | 1.00       | 0.0086          | 0.0062                  | 11.0642         | 47.5915         |  |
| Average    |            |                               | 191.4     | 1.00       | 0.0093          | 0.0070                  | 11.0592         | 46.9861         |  |

| Trial #1   |            | Pre-Spike - Native Samples |           |            |                 |                  |                 |                 |  |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-----------------|-----------------|--|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | NH <sub>3</sub> |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)         |  |
| 07/30/21   | 17:29:43   | 0730-R3_000127.LAB         | 191.4     | 1.03       | 5.8899          | 13.0638          | -0.0051         | 13.1427         |  |
| 07/30/21   | 17:30:13   | 0730-R3_000128.LAB         | 191.4     | 1.02       | 5.8880          | 13.1952          | -0.0051         | 13.2455         |  |
| 07/30/21   | 17:30:43   | 0730-R3_000129.LAB         | 191.5     | 1.03       | 5.9085          | 12.4733          | -0.0025         | 13.0278         |  |
| 07/30/21   | 17:31:13   | 0730-R3_000130.LAB         | 191.5     | 1.03       | 5.9130          | 12.4050          | -0.0035         | 13.1000         |  |
| Average    |            |                            | 191.5     | 1.03       | 5.8999          | 12.7843          | -0.0041         | 13.1290         |  |

| Trial #1   |            | Spiked Samples     |           |            |                 |                  |                 |                 |  |
|------------|------------|--------------------|-----------|------------|-----------------|------------------|-----------------|-----------------|--|
| Date       | Time       | Spectrum           | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | NH <sub>3</sub> |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)        | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)         |  |
| 07/30/21   | 17:41:44   | 0730-R3_000151.LAB | 191.4     | 1.01       | 5.1125          | 16.8425          | 4.0957          | 21.6241         |  |
| 07/30/21   | 17:42:14   | 0730-R3_000152.LAB | 191.4     | 1.03       | 4.5930          | 11.9125          | 4.0952          | 21.1914         |  |
| 07/30/21   | 17:42:44   | 0730-R3_000153.LAB | 191.4     | 1.03       | 4.7731          | 13.8540          | 4.0957          | 22.1734         |  |
| 07/30/21   | 17:43:14   | 0730-R3_000154.LAB | 191.3     | 1.02       | 5.1449          | 13.8670          | 4.0952          | 22.5789         |  |
| Average    |            |                    | 191.4     | 1.02       | 4.9059          | 14.1190          | 4.0954          | 21.8920         |  |

| Trial #2   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |                 |                 |  |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|-----------------|-----------------|--|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | SF <sub>6</sub> | NH <sub>3</sub> |  |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)         | (ppmvw)         |  |
| 07/30/21   | 6:38:41    | 0730-PRE_000081.LAB           | 191.4     | 1.00       | 0.0045          | 0.0037                  | 11.0592         | 46.4683         |  |
| 07/30/21   | 6:39:11    | 0730-PRE_000082.LAB           | 191.4     | 1.00       | 0.0114          | 0.0074                  | 11.0565         | 46.4068         |  |
| 07/30/21   | 6:39:41    | 0730-PRE_000083.LAB           | 191.4     | 1.00       | 0.0126          | 0.0106                  | 11.0569         | 47.4780         |  |
| 07/30/21   | 6:40:11    | 0730-PRE_000084.LAB           | 191.4     | 1.00       | 0.0086          | 0.0062                  | 11.0642         | 47.5915         |  |
| Average    |            |                               | 191.4     | 1.00       | 0.0093          | 0.0070                  | 11.0592         | 46.9861         |  |



| Trial #2   |            | Pre-Spike - Native Samples |           |            |                 |                  |                 |                 |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-----------------|-----------------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | NH <sub>3</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)         |
| 07/30/21   | 18:52:21   | 0730-R3_000292.LAB         | 191.3     | 1.04       | 5.5552          | 14.4346          | -0.0093         | 1.8100          |
| 07/30/21   | 18:52:51   | 0730-R3_000293.LAB         | 191.3     | 1.03       | 5.5539          | 14.6010          | -0.0090         | 1.5328          |
| 07/30/21   | 18:53:22   | 0730-R3_000294.LAB         | 191.3     | 1.03       | 5.5866          | 14.1337          | -0.0094         | 1.3203          |
| 07/30/21   | 18:53:52   | 0730-R3_000295.LAB         | 191.3     | 1.03       | 5.6429          | 13.7381          | -0.0080         | 1.1878          |
| Average    |            |                            | 191.3     | 1.03       | 5.5847          | 14.2269          | -0.0089         | 1.4628          |

| Trial #2   |            | Spiked Samples     |           |            |                 |                  |                 |                 |
|------------|------------|--------------------|-----------|------------|-----------------|------------------|-----------------|-----------------|
| Date       | Time       | Spectrum           | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | NH <sub>3</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)        | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)         |
| 07/30/21   | 19:15:54   | 0730-R3_000339.LAB | 191.3     | 1.03       | 4.6391          | 13.2155          | 0.8064          | 4.0219          |
| 07/30/21   | 19:16:24   | 0730-R3_000340.LAB | 191.2     | 1.03       | 4.9884          | 11.5188          | 0.8079          | 4.1450          |
| 07/30/21   | 19:16:54   | 0730-R3_000341.LAB | 191.3     | 1.03       | 4.5691          | 11.4957          | 0.8030          | 3.3466          |
| 07/30/21   | 19:17:24   | 0730-R3_000342.LAB | 191.3     | 1.03       | 4.3604          | 10.6202          | 0.7988          | 3.0584          |
| Average    |            |                    | 191.3     | 1.03       | 4.6393          | 11.7125          | 0.8040          | 3.6430          |

| Trial #3   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |                 |                 |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|-----------------|-----------------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | SF <sub>6</sub> | NH <sub>3</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)         | (ppmvw)         |
| 07/30/21   | 6:38:41    | 0730-PRE_000081.LAB           | 191.4     | 1.00       | 0.0045          | 0.0037                  | 11.0592         | 46.4683         |
| 07/30/21   | 6:39:11    | 0730-PRE_000082.LAB           | 191.4     | 1.00       | 0.0114          | 0.0074                  | 11.0565         | 46.4068         |
| 07/30/21   | 6:39:41    | 0730-PRE_000083.LAB           | 191.4     | 1.00       | 0.0126          | 0.0106                  | 11.0569         | 47.4780         |
| 07/30/21   | 6:40:11    | 0730-PRE_000084.LAB           | 191.4     | 1.00       | 0.0086          | 0.0062                  | 11.0642         | 47.5915         |
| Average    |            |                               | 191.4     | 1.00       | 0.0093          | 0.0070                  | 11.0592         | 46.9861         |

| Trial #3   |            | Pre-Spike - Native Samples |           |            |                 |                  |                 |                 |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-----------------|-----------------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | NH <sub>3</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)         |
| 07/30/21   | 19:20:24   | 0730-R3_000348.LAB         | 191.3     | 1.02       | 5.4440          | 16.3774          | -0.0033         | 1.9032          |
| 07/30/21   | 19:20:55   | 0730-R3_000349.LAB         | 191.3     | 1.02       | 5.5524          | 14.7458          | -0.0042         | 1.7367          |
| 07/30/21   | 19:21:24   | 0730-R3_000350.LAB         | 191.4     | 1.02       | 5.6631          | 13.6230          | -0.0057         | 1.6003          |
| 07/30/21   | 19:21:55   | 0730-R3_000351.LAB         | 191.3     | 1.03       | 5.6113          | 14.0821          | -0.0035         | 1.5597          |
| Average    |            |                            | 191.3     | 1.02       | 5.5677          | 14.7071          | -0.0042         | 1.7000          |

| Trial #3   |            | Spiked Samples     |           |            |                 |                  |                 |                 |
|------------|------------|--------------------|-----------|------------|-----------------|------------------|-----------------|-----------------|
| Date       | Time       | Spectrum           | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | NH <sub>3</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)        | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)         |
| 07/30/21   | 19:28:55   | 0730-R3_000365.LAB | 191.3     | 1.03       | 5.1457          | 13.9195          | 0.8066          | 4.5177          |
| 07/30/21   | 19:29:25   | 0730-R3_000366.LAB | 191.3     | 1.02       | 5.1848          | 13.5242          | 0.8021          | 3.9342          |
| 07/30/21   | 19:29:55   | 0730-R3_000367.LAB | 191.3     | 1.03       | 5.2114          | 13.0419          | 0.8058          | 3.4876          |
| 07/30/21   | 19:30:25   | 0730-R3_000368.LAB | 191.3     | 1.03       | 5.2138          | 12.5100          | 0.8088          | 3.5619          |
| Average    |            |                    | 191.3     | 1.03       | 5.1889          | 13.2489          | 0.8058          | 3.8754          |

| Parameter                                                               | Units   | Trial #1 | Trial #2 | Trial #3 |
|-------------------------------------------------------------------------|---------|----------|----------|----------|
| Direct Verified Concentration of Sulfur Hexafluoride (SF <sub>6</sub> ) | (ppmvw) | 11.06    | 11.06    | 11.06    |
| Direct Verified Concentration of Ammonia (NH <sub>3</sub> )             | (ppmvw) | 46.99    | 46.99    | 46.99    |
| Stack (Native, Unspiked) CO <sub>2</sub> Concentration                  | (%vw)   | 5.900    | 5.585    | 5.568    |
| Stack (Native, Unspiked) H <sub>2</sub> O Concentration                 | (%)     | 12.784   | 14.227   | 14.707   |
| Stack (Native, Unspiked) SF <sub>6</sub> Concentration                  | (ppmvw) | -0.004   | -0.009   | -0.004   |
| Stack (Native, Unspiked) NH <sub>3</sub> Concentration                  | (ppmvw) | 13.129   | 1.463    | 1.700    |
| Stack + Spike CO <sub>2</sub> Concentration                             | (%vw)   | 4.906    | 4.639    | 5.189    |
| Stack + Spike H <sub>2</sub> O Concentration                            | (%)     | 14.119   | 11.713   | 13.249   |
| Stack + Spike SF <sub>6</sub> Concentration                             | (ppmvw) | 4.095    | 0.804    | 0.806    |
| Stack + Spike NH <sub>3</sub> Concentration                             | (ppmvw) | 21.892   | 3.643    | 3.875    |
| Dilution Factor, calc. from SF <sub>6</sub> (ppmvw)                     |         | 0.371    | 0.074    | 0.073    |
| Dilution Factor, as the ratio of dir to spk                             | (ratio) | 2.7 : 1  | 13.6 : 1 | 13.7 : 1 |
| Expected Concentration of the SF <sub>6</sub> Spike+Native, CS          | (ppmvw) | 4.097    | 0.805    | 0.806    |
| Expected Concentration of the NH <sub>3</sub> Spike+Native, CS          | (ppmvw) | 25.679   | 4.809    | 5.017    |
| Method 320 Spiked / Expected SF <sub>6</sub>                            | %       | 99.96    | 99.92    | 99.96    |
| Method 320 Spiked / Expected NH <sub>3</sub>                            | %       | 85.25    | 75.75    | 77.25    |
| Method 320 Passing SF <sub>6</sub> (70-130%)                            |         | YES      | YES      | YES      |
| Method 320 Passing NH <sub>3</sub> (70-130%)                            |         | YES      | YES      | YES      |

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| Trial #1   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |                               |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|-------------------------------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | C <sub>2</sub> H <sub>6</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)                       |
| 07/30/21   | 6:19:39    | 0730-PRE_000043.LAB           | 191.3     | 1.00       | 0.0072          | 0.0011                  | 100.6868                      |
| 07/30/21   | 6:20:09    | 0730-PRE_000044.LAB           | 191.4     | 1.00       | 0.0030          | -0.0006                 | 100.9227                      |
| 07/30/21   | 6:20:39    | 0730-PRE_000045.LAB           | 191.4     | 1.00       | 0.0058          | -0.0020                 | 100.6889                      |
| 07/30/21   | 6:21:09    | 0730-PRE_000046.LAB           | 191.4     | 1.00       | -0.0050         | -0.0002                 | 101.1251                      |
| Average    |            |                               | 191.4     | 1.00       | 0.0027          | -0.0004                 | 100.8559                      |

| Trial #1   |            | Pre-Spike - Native Samples |           |            |                 |                  |                               |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-------------------------------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)                       |
| 07/30/21   | 7:07:14    | 0730-PRE_000138.LAB        | 191.4     | 1.04       | 6.0532          | 8.9759           | 0.7175                        |
| 07/30/21   | 7:07:44    | 0730-PRE_000139.LAB        | 191.4     | 1.04       | 6.0684          | 8.6764           | 1.0738                        |
| 07/30/21   | 7:08:14    | 0730-PRE_000140.LAB        | 191.4     | 1.04       | 5.4819          | 8.8570           | 0.7126                        |
| 07/30/21   | 7:08:44    | 0730-PRE_000141.LAB        | 191.4     | 1.03       | 5.4148          | 11.0471          | 0.4528                        |
| Average    |            |                            | 191.4     | 1.03       | 5.7546          | 9.3891           | 0.7392                        |

| Trial #1   |            | Spiked Samples      |           |            |                 |                  |                               |
|------------|------------|---------------------|-----------|------------|-----------------|------------------|-------------------------------|
| Date       | Time       | Spectrum            | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | C <sub>2</sub> H <sub>6</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)         | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)                       |
| 07/30/21   | 7:10:14    | 0730-PRE_000144.LAB | 191.4     | 1.03       | 5.4320          | 10.5697          | 8.4013                        |
| 07/30/21   | 7:10:44    | 0730-PRE_000145.LAB | 191.4     | 1.03       | 5.2716          | 13.0538          | 8.3076                        |
| 07/30/21   | 7:11:14    | 0730-PRE_000146.LAB | 191.4     | 1.03       | 5.2550          | 12.5253          | 8.4825                        |
| 07/30/21   | 7:11:44    | 0730-PRE_000147.LAB | 191.4     | 1.03       | 5.3563          | 11.4675          | 8.3991                        |
| Average    |            |                     | 191.4     | 1.03       | 5.3287          | 11.9041          | 8.3976                        |

| Trial #2   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |                               |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|-------------------------------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | C <sub>2</sub> H <sub>6</sub> |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)                       |
| 07/30/21   | 6:19:39    | 0730-PRE_000043.LAB           | 191.3     | 1.00       | 0.0072          | 0.0011                  | 100.6868                      |
| 07/30/21   | 6:20:09    | 0730-PRE_000044.LAB           | 191.4     | 1.00       | 0.0030          | -0.0006                 | 100.9227                      |
| 07/30/21   | 6:20:39    | 0730-PRE_000045.LAB           | 191.4     | 1.00       | 0.0058          | -0.0020                 | 100.6889                      |
| 07/30/21   | 6:21:09    | 0730-PRE_000046.LAB           | 191.4     | 1.00       | -0.0050         | -0.0002                 | 101.1251                      |
| Average    |            |                               | 191.4     | 1.00       | 0.0027          | -0.0004                 | 100.8559                      |

| Trial #2 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |                                          |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/30/21                            | 7:12:45            | 0730-PRE_000149.LAB     | 191.4             | 1.03                | 5.8000                   | 12.8597                 | 0.7345                                   |
| 07/30/21                            | 7:13:15            | 0730-PRE_000150.LAB     | 191.4             | 1.03                | 5.8314                   | 11.8100                 | 0.7608                                   |
| 07/30/21                            | 7:13:45            | 0730-PRE_000151.LAB     | 191.4             | 1.03                | 5.6332                   | 14.6153                 | 0.7099                                   |
| 07/30/21                            | 7:14:15            | 0730-PRE_000152.LAB     | 191.4             | 1.02                | 5.5540                   | 16.2007                 | 0.7127                                   |
| Average                             |                    |                         | 191.4             | 1.03                | 5.7047                   | 13.8714                 | 0.7295                                   |

| Trial #2 Spiked Samples |                    |                         |                   |                     |                          |                         |                                          |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/30/21                | 7:15:45            | 0730-PRE_000155.LAB     | 191.4             | 1.02                | 5.1139                   | 14.9382                 | 8.2753                                   |
| 07/30/21                | 7:16:15            | 0730-PRE_000156.LAB     | 191.4             | 1.03                | 5.1541                   | 14.3975                 | 8.4375                                   |
| 07/30/21                | 7:16:45            | 0730-PRE_000157.LAB     | 191.4             | 1.03                | 5.2980                   | 12.8197                 | 8.5701                                   |
| 07/30/21                | 7:17:15            | 0730-PRE_000158.LAB     | 191.4             | 1.03                | 5.2867                   | 12.7394                 | 8.4587                                   |
| Average                 |                    |                         | 191.4             | 1.03                | 5.2132                   | 13.7237                 | 8.4354                                   |

| Trial #3 Spike Gas Direct Verification |                    |                         |                   |                     |                          | FTIR: 509/ INST-IR-0005 |                                          |
|----------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)                     | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/30/21                               | 6:19:39            | 0730-PRE_000043.LAB     | 191.3             | 1.00                | 0.0072                   | 0.0011                  | 100.6868                                 |
| 07/30/21                               | 6:20:09            | 0730-PRE_000044.LAB     | 191.4             | 1.00                | 0.0030                   | -0.0006                 | 100.9227                                 |
| 07/30/21                               | 6:20:39            | 0730-PRE_000045.LAB     | 191.4             | 1.00                | 0.0058                   | -0.0020                 | 100.6889                                 |
| 07/30/21                               | 6:21:09            | 0730-PRE_000046.LAB     | 191.4             | 1.00                | -0.0050                  | -0.0002                 | 101.1251                                 |
| Average                                |                    |                         | 191.4             | 1.00                | 0.0027                   | -0.0004                 | 100.8559                                 |

| Trial #3 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |                                          |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/30/21                            | 7:18:15            | 0730-PRE_000160.LAB     | 191.4             | 1.03                | 5.7401                   | 13.4425                 | 0.7732                                   |
| 07/30/21                            | 7:18:45            | 0730-PRE_000161.LAB     | 191.4             | 1.02                | 5.5498                   | 15.5749                 | 0.5713                                   |
| 07/30/21                            | 7:19:15            | 0730-PRE_000162.LAB     | 191.4             | 1.03                | 5.6786                   | 14.0766                 | 0.7417                                   |
| 07/30/21                            | 7:19:45            | 0730-PRE_000163.LAB     | 191.4             | 1.03                | 5.5581                   | 15.0022                 | 0.8356                                   |
| Average                             |                    |                         | 191.4             | 1.03                | 5.6316                   | 14.5241                 | 0.7304                                   |

| Trial #3 Spiked Samples |                    |                         |                   |                     |                          |                         |                                          |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|------------------------------------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | C <sub>2</sub> H <sub>6</sub><br>(ppmvw) |
| 07/30/21                | 7:21:15            | 0730-PRE_000166.LAB     | 191.4             | 1.03                | 5.2190                   | 13.6704                 | 8.3180                                   |
| 07/30/21                | 7:21:46            | 0730-PRE_000167.LAB     | 191.4             | 1.03                | 5.2700                   | 13.0154                 | 8.5543                                   |
| 07/30/21                | 7:22:16            | 0730-PRE_000168.LAB     | 191.5             | 1.03                | 5.2269                   | 13.5371                 | 8.5568                                   |
| 07/30/21                | 7:22:46            | 0730-PRE_000169.LAB     | 191.4             | 1.03                | 5.2680                   | 13.1603                 | 8.5293                                   |
| Average                 |                    |                         | 191.4             | 1.03                | 5.2460                   | 13.3458                 | 8.4896                                   |

| Parameter                                                                    | Units   | Trial #1 | Trial #2 | Trial #3 |
|------------------------------------------------------------------------------|---------|----------|----------|----------|
| Direct Verified Concentration of Ethane (C <sub>2</sub> H <sub>6</sub> )     | (ppmvw) | 100.86   | 100.86   | 100.86   |
| Stack (Native, Unspiked) CO <sub>2</sub> Concentration                       | (%vw)   | 5.755    | 5.705    | 5.632    |
| Stack (Native, Unspiked) H <sub>2</sub> O Concentration                      | (%)     | 9.389    | 13.871   | 14.524   |
| Stack (Native, Unspiked) C <sub>2</sub> H <sub>6</sub> Concentration         | (ppmvw) | 0.739    | 0.729    | 0.730    |
| Stack + Spike CO <sub>2</sub> Concentration                                  | (%vw)   | 5.329    | 5.213    | 5.246    |
| Stack + Spike H <sub>2</sub> O Concentration                                 | (%)     | 11.904   | 13.724   | 13.346   |
| Stack + Spike C <sub>2</sub> H <sub>6</sub> Concentration                    | (ppmvw) | 8.398    | 8.435    | 8.490    |
| Dilution Factor, calc. from CO <sub>2</sub> (%vw)                            |         | 0.074    | 0.086    | 0.068    |
| Dilution Factor, as the ratio of dir to spk                                  | (ratio) | 13.5 : 1 | 11.6 : 1 | 14.6 : 1 |
| Expected Concentration of the C <sub>2</sub> H <sub>6</sub> Spike+Native, CS | (ppmvw) | 8.148    | 9.356    | 7.587    |
| Method 320 Spiked / Expected C <sub>2</sub> H <sub>6</sub>                   | %       | 103.06   | 90.16    | 111.89   |
| Method 320 Passing C <sub>2</sub> H <sub>6</sub> (70-130%)                   |         | YES      | YES      | YES      |

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| Trial #1   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |          |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|----------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | NOx      |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)  |
| 07/30/21   | 6:22:39    | 0730-PRE_000049.LAB           | 191.4     | 1.00       | -0.0302         | 0.0182                  | 118.1741 |
| 07/30/21   | 6:23:09    | 0730-PRE_000050.LAB           | 191.4     | 1.00       | -0.0389         | 0.0025                  | 118.8564 |
| 07/30/21   | 6:23:39    | 0730-PRE_000051.LAB           | 191.4     | 1.00       | -0.0431         | -0.0001                 | 118.6155 |
| 07/30/21   | 6:24:09    | 0730-PRE_000052.LAB           | 191.4     | 1.00       | -0.0383         | -0.0029                 | 117.8215 |
| Average    |            |                               | 191.4     | 1.00       | -0.0376         | 0.0044                  | 118.3669 |

| Trial #1   |            | Pre-Spike - Native Samples |           |            |                 |                  |         |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|---------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | NOx     |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw) |
| 07/30/21   | 7:23:46    | 0730-PRE_000171.LAB        | 191.4     | 1.03       | 5.6918          | 13.9245          | 16.6396 |
| 07/30/21   | 7:24:16    | 0730-PRE_000172.LAB        | 191.4     | 1.03       | 5.7387          | 13.4806          | 16.3643 |
| 07/30/21   | 7:24:46    | 0730-PRE_000173.LAB        | 191.4     | 1.03       | 5.6194          | 14.7534          | 16.1108 |
| 07/30/21   | 7:25:16    | 0730-PRE_000174.LAB        | 191.4     | 1.02       | 5.5866          | 15.0709          | 15.4793 |
| Average    |            |                            | 191.4     | 1.03       | 5.6591          | 14.3073          | 16.1485 |

| Trial #1   |            | Spiked Samples      |           |            |                 |                  |         |
|------------|------------|---------------------|-----------|------------|-----------------|------------------|---------|
| Date       | Time       | Spectrum            | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | NOx     |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)         | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw) |
| 07/30/21   | 7:27:16    | 0730-PRE_000178.LAB | 191.4     | 1.03       | 5.1608          | 13.8424          | 24.2100 |
| 07/30/21   | 7:27:46    | 0730-PRE_000179.LAB | 191.4     | 1.03       | 5.2530          | 12.8052          | 25.1630 |
| 07/30/21   | 7:28:16    | 0730-PRE_000180.LAB | 191.4     | 1.03       | 5.2479          | 12.9054          | 25.2521 |
| 07/30/21   | 7:28:46    | 0730-PRE_000181.LAB | 191.4     | 1.03       | 5.2082          | 13.2288          | 24.2115 |
| Average    |            |                     | 191.4     | 1.03       | 5.2175          | 13.1954          | 24.7091 |

| Trial #2   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |          |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|----------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | NOx      |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)  |
| 07/30/21   | 6:22:39    | 0730-PRE_000049.LAB           | 191.4     | 1.00       | -0.0302         | 0.0182                  | 118.1741 |
| 07/30/21   | 6:23:09    | 0730-PRE_000050.LAB           | 191.4     | 1.00       | -0.0389         | 0.0025                  | 118.8564 |
| 07/30/21   | 6:23:39    | 0730-PRE_000051.LAB           | 191.4     | 1.00       | -0.0431         | -0.0001                 | 118.6155 |
| 07/30/21   | 6:24:09    | 0730-PRE_000052.LAB           | 191.4     | 1.00       | -0.0383         | -0.0029                 | 117.8215 |
| Average    |            |                               | 191.4     | 1.00       | -0.0376         | 0.0044                  | 118.3669 |

| Trial #2   |            | Pre-Spike - Native Samples |           |            |                 |                  |         |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|---------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | NOx     |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw) |
| 07/30/21   | 14:44:02   | 0730-PRE_001049.LAB        | 191.4     | 1.03       | 5.7369          | 12.4441          | 5.0561  |
| 07/30/21   | 14:44:32   | 0730-PRE_001050.LAB        | 191.4     | 1.03       | 5.7460          | 12.4431          | 5.0416  |
| 07/30/21   | 14:45:02   | 0730-PRE_001051.LAB        | 191.4     | 1.03       | 5.7463          | 12.4741          | 4.9203  |
| 07/30/21   | 14:45:32   | 0730-PRE_001052.LAB        | 191.4     | 1.03       | 5.7250          | 12.5610          | 4.9086  |
| Average    |            |                            | 191.4     | 1.03       | 5.7386          | 12.4806          | 4.9816  |

| Trial #2   |            | Spiked Samples      |           |            |                 |                  |         |
|------------|------------|---------------------|-----------|------------|-----------------|------------------|---------|
| Date       | Time       | Spectrum            | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | NOx     |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)         | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw) |
| 07/30/21   | 14:47:32   | 0730-PRE_001056.LAB | 191.5     | 1.03       | 5.2360          | 13.3371          | 13.5438 |
| 07/30/21   | 14:48:02   | 0730-PRE_001057.LAB | 191.5     | 1.02       | 5.1899          | 13.6994          | 13.3789 |
| 07/30/21   | 14:48:32   | 0730-PRE_001058.LAB | 191.4     | 1.02       | 5.1590          | 13.9761          | 13.0878 |
| 07/30/21   | 14:49:02   | 0730-PRE_001059.LAB | 191.5     | 1.02       | 5.1399          | 14.2498          | 13.1142 |
| Average    |            |                     | 191.5     | 1.02       | 5.1812          | 13.8156          | 13.2812 |

| Trial #3   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |          |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|----------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | NOx      |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)  |
| 07/30/21   | 6:22:39    | 0730-PRE_000049.LAB           | 191.4     | 1.00       | -0.0302         | 0.0182                  | 118.1741 |
| 07/30/21   | 6:23:09    | 0730-PRE_000050.LAB           | 191.4     | 1.00       | -0.0389         | 0.0025                  | 118.8564 |
| 07/30/21   | 6:23:39    | 0730-PRE_000051.LAB           | 191.4     | 1.00       | -0.0431         | -0.0001                 | 118.6155 |
| 07/30/21   | 6:24:09    | 0730-PRE_000052.LAB           | 191.4     | 1.00       | -0.0383         | -0.0029                 | 117.8215 |
| Average    |            |                               | 191.4     | 1.00       | -0.0376         | 0.0044                  | 118.3669 |



| Trial #3 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |                |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw) |
| 07/30/21                            | 14:50:03           | 0730-PRE_001061.LAB     | 191.5             | 1.02                | 5.5992                   | 14.9701                 | 5.0871         |
| 07/30/21                            | 14:50:32           | 0730-PRE_001062.LAB     | 191.5             | 1.02                | 5.5984                   | 14.7950                 | 5.0964         |
| 07/30/21                            | 14:51:02           | 0730-PRE_001063.LAB     | 191.4             | 1.02                | 5.6097                   | 14.6418                 | 5.1337         |
| 07/30/21                            | 14:51:32           | 0730-PRE_001064.LAB     | 191.4             | 1.02                | 5.5973                   | 14.7381                 | 5.1409         |
| Average                             |                    |                         | 191.4             | 1.02                | 5.6012                   | 14.7862                 | 5.1145         |

| Trial #3 Spiked Samples |                    |                         |                   |                     |                          |                         |                |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|----------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | NOx<br>(ppmvw) |
| 07/30/21                | 14:53:03           | 0730-PRE_001067.LAB     | 191.4             | 1.02                | 5.1934                   | 13.8151                 | 13.2145        |
| 07/30/21                | 14:53:33           | 0730-PRE_001068.LAB     | 191.4             | 1.03                | 5.2220                   | 13.6576                 | 13.4804        |
| 07/30/21                | 14:54:03           | 0730-PRE_001069.LAB     | 191.4             | 1.02                | 5.2084                   | 13.5414                 | 13.4392        |
| 07/30/21                | 14:54:33           | 0730-PRE_001070.LAB     | 191.4             | 1.03                | 5.2343                   | 13.4546                 | 13.7276        |
| Average                 |                    |                         | 191.4             | 1.03                | 5.2145                   | 13.6172                 | 13.4654        |

| Parameter                                               | Units   | Trial #1 | Trial #2 | Trial #3 |
|---------------------------------------------------------|---------|----------|----------|----------|
| Direct Verified Concentration of Nitrogen Oxides (NOx)  | (ppmvw) | 118.37   | 118.37   | 118.37   |
| Stack (Native, Unspiked) CO <sub>2</sub> Concentration  | (%vw)   | 5.659    | 5.739    | 5.601    |
| Stack (Native, Unspiked) H <sub>2</sub> O Concentration | (%)     | 14.307   | 12.481   | 14.786   |
| Stack (Native, Unspiked) NOx Concentration              | (ppmvw) | 16.149   | 4.982    | 5.115    |
| Stack + Spike CO <sub>2</sub> Concentration             | (%vw)   | 5.217    | 5.181    | 5.215    |
| Stack + Spike H <sub>2</sub> O Concentration            | (%)     | 13.195   | 13.816   | 13.617   |
| Stack + Spike NOx Concentration                         | (ppmvw) | 24.709   | 13.281   | 13.465   |
| Dilution Factor, calc. from CO <sub>2</sub> (%vw)       |         | 0.078    | 0.097    | 0.069    |
| Dilution Factor, as the ratio of dir to spk             | (ratio) | 12.8 : 1 | 10.3 : 1 | 14.5 : 1 |
| Expected Concentration of the NOx Spike+Native, CS      | (ppmvw) | 24.125   | 15.995   | 12.932   |
| Method 320 Spiked / Expected NOx                        | %       | 102.42   | 83.03    | 104.12   |
| Method 320 Passing NOx (70-130%)                        |         | YES      | YES      | YES      |

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| Trial #1   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |          |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|----------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | CO       |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)  |
| 07/30/21   | 6:22:39    | 0730-PRE_000049.LAB           | 191.4     | 1.00       | -0.0302         | 0.0182                  | 120.7373 |
| 07/30/21   | 6:23:09    | 0730-PRE_000050.LAB           | 191.4     | 1.00       | -0.0389         | 0.0025                  | 121.4913 |
| 07/30/21   | 6:23:39    | 0730-PRE_000051.LAB           | 191.4     | 1.00       | -0.0431         | -0.0001                 | 121.2086 |
| 07/30/21   | 6:24:09    | 0730-PRE_000052.LAB           | 191.4     | 1.00       | -0.0383         | -0.0029                 | 120.4047 |
| Average    |            |                               | 191.4     | 1.00       | -0.0376         | 0.0044                  | 120.9605 |

| Trial #1   |            | Pre-Spike - Native Samples |           |            |                 |                  |         |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|---------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | CO      |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw) |
| 07/30/21   | 7:23:46    | 0730-PRE_000171.LAB        | 191.4     | 1.03       | 5.6918          | 13.9245          | 2.4183  |
| 07/30/21   | 7:24:16    | 0730-PRE_000172.LAB        | 191.4     | 1.03       | 5.7387          | 13.4806          | 2.4016  |
| 07/30/21   | 7:24:46    | 0730-PRE_000173.LAB        | 191.4     | 1.03       | 5.6194          | 14.7534          | 2.4795  |
| 07/30/21   | 7:25:16    | 0730-PRE_000174.LAB        | 191.4     | 1.02       | 5.5866          | 15.0709          | 2.5247  |
| Average    |            |                            | 191.4     | 1.03       | 5.6591          | 14.3073          | 2.4560  |

| Trial #1   |            | Spiked Samples      |           |            |                 |                  |         |
|------------|------------|---------------------|-----------|------------|-----------------|------------------|---------|
| Date       | Time       | Spectrum            | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | CO      |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)         | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw) |
| 07/30/21   | 7:27:16    | 0730-PRE_000178.LAB | 191.4     | 1.03       | 5.1608          | 13.8424          | 11.6753 |
| 07/30/21   | 7:27:46    | 0730-PRE_000179.LAB | 191.4     | 1.03       | 5.2530          | 12.8052          | 11.8689 |
| 07/30/21   | 7:28:16    | 0730-PRE_000180.LAB | 191.4     | 1.03       | 5.2479          | 12.9054          | 12.0123 |
| 07/30/21   | 7:28:46    | 0730-PRE_000181.LAB | 191.4     | 1.03       | 5.2082          | 13.2288          | 12.0099 |
| Average    |            |                     | 191.4     | 1.03       | 5.2175          | 13.1954          | 11.8916 |

| Trial #2   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |          |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|----------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | CO       |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)  |
| 07/30/21   | 6:22:39    | 0730-PRE_000049.LAB           | 191.4     | 1.00       | -0.0302         | 0.0182                  | 120.7373 |
| 07/30/21   | 6:23:09    | 0730-PRE_000050.LAB           | 191.4     | 1.00       | -0.0389         | 0.0025                  | 121.4913 |
| 07/30/21   | 6:23:39    | 0730-PRE_000051.LAB           | 191.4     | 1.00       | -0.0431         | -0.0001                 | 121.2086 |
| 07/30/21   | 6:24:09    | 0730-PRE_000052.LAB           | 191.4     | 1.00       | -0.0383         | -0.0029                 | 120.4047 |
| Average    |            |                               | 191.4     | 1.00       | -0.0376         | 0.0044                  | 120.9605 |

| Trial #2 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |               |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/30/21                            | 14:43:02           | 0730-PRE_001047.LAB     | 191.4             | 1.03                | 5.7266                   | 12.6880                 | 2.9336        |
| 07/30/21                            | 14:43:32           | 0730-PRE_001048.LAB     | 191.4             | 1.03                | 5.7343                   | 12.5239                 | 2.8088        |
| 07/30/21                            | 14:44:02           | 0730-PRE_001049.LAB     | 191.4             | 1.03                | 5.7369                   | 12.4441                 | 3.0307        |
| 07/30/21                            | 14:44:32           | 0730-PRE_001050.LAB     | 191.4             | 1.03                | 5.7460                   | 12.4431                 | 2.9345        |
| Average                             |                    |                         | 191.4             | 1.03                | 5.7360                   | 12.5248                 | 2.9269        |

| Trial #2 Spiked Samples |                    |                         |                   |                     |                          |                         |               |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/30/21                | 14:47:32           | 0730-PRE_001056.LAB     | 191.5             | 1.03                | 5.2360                   | 13.3371                 | 11.4735       |
| 07/30/21                | 14:48:02           | 0730-PRE_001057.LAB     | 191.5             | 1.02                | 5.1899                   | 13.6994                 | 11.3942       |
| 07/30/21                | 14:48:32           | 0730-PRE_001058.LAB     | 191.4             | 1.02                | 5.1590                   | 13.9761                 | 11.3660       |
| 07/30/21                | 14:49:02           | 0730-PRE_001059.LAB     | 191.5             | 1.02                | 5.1399                   | 14.2498                 | 11.5300       |
| Average                 |                    |                         | 191.5             | 1.02                | 5.1812                   | 13.8156                 | 11.4409       |

| Trial #3 Spike Gas Direct Verification |                    |                         |                   |                     |                          |                         | FTIR: 509/ INST-IR-0005 |
|----------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|-------------------------|
| Date<br>(mm/dd/yy)                     | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw)           |
| 07/30/21                               | 6:22:39            | 0730-PRE_000049.LAB     | 191.4             | 1.00                | -0.0302                  | 0.0182                  | 120.7373                |
| 07/30/21                               | 6:23:09            | 0730-PRE_000050.LAB     | 191.4             | 1.00                | -0.0389                  | 0.0025                  | 121.4913                |
| 07/30/21                               | 6:23:39            | 0730-PRE_000051.LAB     | 191.4             | 1.00                | -0.0431                  | -0.0001                 | 121.2086                |
| 07/30/21                               | 6:24:09            | 0730-PRE_000052.LAB     | 191.4             | 1.00                | -0.0383                  | -0.0029                 | 120.4047                |
| Average                                |                    |                         | 191.4             | 1.00                | -0.0376                  | 0.0044                  | 120.9605                |

| Trial #3 Pre-Spike - Native Samples |                    |                         |                   |                     |                          |                         |               |
|-------------------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)                  | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/30/21                            | 14:50:03           | 0730-PRE_001061.LAB     | 191.5             | 1.02                | 5.5992                   | 14.9701                 | 2.9415        |
| 07/30/21                            | 14:50:32           | 0730-PRE_001062.LAB     | 191.5             | 1.02                | 5.5984                   | 14.7950                 | 2.9191        |
| 07/30/21                            | 14:51:02           | 0730-PRE_001063.LAB     | 191.4             | 1.02                | 5.6097                   | 14.6418                 | 2.8402        |
| 07/30/21                            | 14:51:32           | 0730-PRE_001064.LAB     | 191.4             | 1.02                | 5.5973                   | 14.7381                 | 2.8936        |
| Average                             |                    |                         | 191.4             | 1.02                | 5.6012                   | 14.7862                 | 2.8986        |

| Trial #3 Spiked Samples |                    |                         |                   |                     |                          |                         |               |
|-------------------------|--------------------|-------------------------|-------------------|---------------------|--------------------------|-------------------------|---------------|
| Date<br>(mm/dd/yy)      | Time<br>(hh:mm:ss) | Spectrum<br>(File Name) | Cell Temp<br>(°C) | Cell Press<br>(atm) | CO <sub>2</sub><br>(%vw) | H <sub>2</sub> O<br>(%) | CO<br>(ppmvw) |
| 07/30/21                | 14:53:03           | 0730-PRE_001067.LAB     | 191.4             | 1.02                | 5.1934                   | 13.8151                 | 11.4955       |
| 07/30/21                | 14:53:33           | 0730-PRE_001068.LAB     | 191.4             | 1.03                | 5.2220                   | 13.6576                 | 11.5884       |
| 07/30/21                | 14:54:03           | 0730-PRE_001069.LAB     | 191.4             | 1.02                | 5.2084                   | 13.5414                 | 11.5316       |
| 07/30/21                | 14:54:33           | 0730-PRE_001070.LAB     | 191.4             | 1.03                | 5.2343                   | 13.4546                 | 11.4985       |
| Average                 |                    |                         | 191.4             | 1.03                | 5.2145                   | 13.6172                 | 11.5285       |

| Parameter                                               | Units   | Trial #1 | Trial #2 | Trial #3 |
|---------------------------------------------------------|---------|----------|----------|----------|
| Direct Verified Concentration of Carbon Monoxide (CO)   | (ppmvw) | 120.96   | 120.96   | 120.96   |
| Stack (Native, Unspiked) CO <sub>2</sub> Concentration  | (%vw)   | 5.659    | 5.736    | 5.601    |
| Stack (Native, Unspiked) H <sub>2</sub> O Concentration | (%)     | 14.307   | 12.525   | 14.786   |
| Stack (Native, Unspiked) CO Concentration               | (ppmvw) | 2.456    | 2.927    | 2.899    |
| Stack + Spike CO <sub>2</sub> Concentration             | (%vw)   | 5.217    | 5.181    | 5.215    |
| Stack + Spike H <sub>2</sub> O Concentration            | (%)     | 13.195   | 13.816   | 13.617   |
| Stack + Spike CO Concentration                          | (ppmvw) | 11.892   | 11.441   | 11.529   |
| Dilution Factor, calc. from CO <sub>2</sub> (%vw)       |         | 0.078    | 0.097    | 0.069    |
| Dilution Factor, as the ratio of dir to spk             | (ratio) | 12.8 : 1 | 10.3 : 1 | 14.5 : 1 |
| Expected Concentration of the CO Spike+Native, CS       | (ppmvw) | 11.704   | 14.343   | 11.048   |
| Method 320 Spiked / Expected CO                         | %       | 101.60   | 79.77    | 104.35   |
| Method 320 Passing CO (70-130%)                         |         | YES      | YES      | YES      |

Catalytic Combustion Corporation  
July 30, 2021  
Caterpillar, G3520 TALE  
Stewart & Stevenson Integration Center

| Trial #1   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/INST-IR-0005 |                 |                                 |
|------------|------------|-------------------------------|-----------|------------|-----------------|------------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O       | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                    | (ppmvw)         | (ppmvw)                         |
| 07/30/21   | 6:25:40    | 0730-PRE_000055.LAB           | 191.4     | 1.00       | 0.0066          | 0.0047                 | 5.6053          | 46.2794                         |
| 07/30/21   | 6:26:10    | 0730-PRE_000056.LAB           | 191.4     | 1.00       | 0.0073          | -0.0029                | 5.6165          | 47.4824                         |
| 07/30/21   | 6:26:40    | 0730-PRE_000057.LAB           | 191.4     | 1.00       | -0.0018         | 0.0002                 | 5.6054          | 48.0103                         |
| 07/30/21   | 6:27:10    | 0730-PRE_000058.LAB           | 191.4     | 1.00       | -0.0025         | -0.0030                | 5.6293          | 48.0884                         |
| Average    |            |                               | 191.4     | 1.00       | 0.0024          | -0.0002                | 5.6141          | 47.4651                         |

| Trial #1   |            | Pre-Spike - Native Samples |           |            |                 |                  |                 |                                 |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |
| 07/30/21   | 16:08:24   | 0730-R2_000146.LAB         | 191.4     | 1.02       | 5.7713          | 13.7720          | -0.0059         | 3.6044                          |
| 07/30/21   | 16:08:54   | 0730-R2_000147.LAB         | 191.4     | 1.02       | 5.7267          | 13.9990          | -0.0055         | 3.7065                          |
| 07/30/21   | 16:09:24   | 0730-R2_000148.LAB         | 191.4     | 1.02       | 5.7083          | 14.1170          | -0.0069         | 3.7018                          |
| 07/30/21   | 16:09:54   | 0730-R2_000149.LAB         | 191.4     | 1.02       | 5.7255          | 14.1603          | -0.0066         | 4.5399                          |
| Average    |            |                            | 191.4     | 1.02       | 5.7330          | 14.0121          | -0.0062         | 3.8881                          |

| Trial #1   |            | Spiked Samples     |           |            |                 |                  |                 |                                 |
|------------|------------|--------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum           | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)        | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |
| 07/30/21   | 16:12:54   | 0730-R2_000155.LAB | 191.4     | 1.02       | 5.2999          | 13.0120          | 0.4156          | 7.8255                          |
| 07/30/21   | 16:13:24   | 0730-R2_000156.LAB | 191.4     | 1.02       | 5.3080          | 12.8405          | 0.4238          | 7.8915                          |
| 07/30/21   | 16:13:54   | 0730-R2_000157.LAB | 191.4     | 1.03       | 5.3199          | 12.7503          | 0.4258          | 7.8579                          |
| 07/30/21   | 16:14:25   | 0730-R2_000158.LAB | 191.5     | 1.03       | 5.3166          | 12.7834          | 0.4263          | 7.4489                          |
| Average    |            |                    | 191.4     | 1.03       | 5.3111          | 12.8465          | 0.4229          | 7.7559                          |

| Trial #2   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/INST-IR-0005 |                 |                                 |
|------------|------------|-------------------------------|-----------|------------|-----------------|------------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O       | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                    | (ppmvw)         | (ppmvw)                         |
| 07/30/21   | 6:25:40    | 0730-PRE_000055.LAB           | 191.4     | 1.00       | 0.0066          | 0.0047                 | 5.6053          | 46.2794                         |
| 07/30/21   | 6:26:10    | 0730-PRE_000056.LAB           | 191.4     | 1.00       | 0.0073          | -0.0029                | 5.6165          | 47.4824                         |
| 07/30/21   | 6:26:40    | 0730-PRE_000057.LAB           | 191.4     | 1.00       | -0.0018         | 0.0002                 | 5.6054          | 48.0103                         |
| 07/30/21   | 6:27:10    | 0730-PRE_000058.LAB           | 191.4     | 1.00       | -0.0025         | -0.0030                | 5.6293          | 48.0884                         |
| Average    |            |                               | 191.4     | 1.00       | 0.0024          | -0.0002                | 5.6141          | 47.4651                         |

| Trial #2   |            | Pre-Spike - Native Samples |           |            |                 |                  |                 |                                 |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |
| 07/30/21   | 16:15:55   | 0730-R2_000161.LAB         | 191.4     | 1.02       | 5.7123          | 14.0511          | -0.0053         | 4.6214                          |
| 07/30/21   | 16:16:25   | 0730-R2_000162.LAB         | 191.4     | 1.02       | 5.7120          | 14.1027          | -0.0031         | 3.8296                          |
| 07/30/21   | 16:16:55   | 0730-R2_000163.LAB         | 191.5     | 1.02       | 5.4558          | 17.3753          | -0.0039         | 4.3182                          |
| 07/30/21   | 16:17:25   | 0730-R2_000164.LAB         | 191.5     | 1.02       | 5.6095          | 15.7793          | -0.0044         | 3.8522                          |
| Average    |            |                            | 191.4     | 1.02       | 5.6224          | 15.3271          | -0.0042         | 4.1554                          |

| Trial #2   |            | Spiked Samples     |           |            |                 |                  |                 |                                 |
|------------|------------|--------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum           | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)        | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |
| 07/30/21   | 16:18:55   | 0730-R2_000167.LAB | 191.4     | 1.03       | 5.2392          | 13.7149          | 0.4266          | 7.5391                          |
| 07/30/21   | 16:19:25   | 0730-R2_000168.LAB | 191.5     | 1.02       | 5.2282          | 13.8275          | 0.4253          | 7.4193                          |
| 07/30/21   | 16:19:55   | 0730-R2_000169.LAB | 191.5     | 1.03       | 5.2383          | 13.7240          | 0.4255          | 7.7933                          |
| 07/30/21   | 16:20:25   | 0730-R2_000170.LAB | 191.5     | 1.03       | 5.2524          | 13.6092          | 0.4256          | 7.9073                          |
| Average    |            |                    | 191.5     | 1.03       | 5.2395          | 13.7189          | 0.4257          | 7.6648                          |

| Trial #3   |            | Spike Gas Direct Verification |           |            |                 | FTIR: 509/ INST-IR-0005 |                 |                                 |
|------------|------------|-------------------------------|-----------|------------|-----------------|-------------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum                      | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O        | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                   | (°C)      | (atm)      | (%vw)           | (%)                     | (ppmvw)         | (ppmvw)                         |
| 07/30/21   | 6:25:40    | 0730-PRE_000055.LAB           | 191.4     | 1.00       | 0.0066          | 0.0047                  | 5.6053          | 46.2794                         |
| 07/30/21   | 6:26:10    | 0730-PRE_000056.LAB           | 191.4     | 1.00       | 0.0073          | -0.0029                 | 5.6165          | 47.4824                         |
| 07/30/21   | 6:26:40    | 0730-PRE_000057.LAB           | 191.4     | 1.00       | -0.0018         | 0.0002                  | 5.6054          | 48.0103                         |
| 07/30/21   | 6:27:10    | 0730-PRE_000058.LAB           | 191.4     | 1.00       | -0.0025         | -0.0030                 | 5.6293          | 48.0884                         |
| Average    |            |                               | 191.4     | 1.00       | 0.0024          | -0.0002                 | 5.6141          | 47.4651                         |

| Trial #3   |            | Pre-Spike - Native Samples |           |            |                 |                  |                 |                                 |
|------------|------------|----------------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum                   | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)                | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |
| 07/30/21   | 16:21:25   | 0730-R2_000172.LAB         | 191.5     | 1.02       | 5.7333          | 13.6223          | -0.0018         | 3.9788                          |
| 07/30/21   | 16:21:55   | 0730-R2_000173.LAB         | 191.5     | 1.02       | 5.7138          | 14.0067          | -0.0041         | 3.9006                          |
| 07/30/21   | 16:22:25   | 0730-R2_000174.LAB         | 191.4     | 1.02       | 5.7115          | 14.1215          | -0.0078         | 3.8331                          |
| 07/30/21   | 16:22:56   | 0730-R2_000175.LAB         | 191.5     | 1.02       | 5.6979          | 14.2024          | -0.0028         | 4.1707                          |
| Average    |            |                            | 191.5     | 1.02       | 5.7142          | 13.9882          | -0.0041         | 3.9708                          |

| Trial #3   |            | Spiked Samples     |           |            |                 |                  |                 |                                 |
|------------|------------|--------------------|-----------|------------|-----------------|------------------|-----------------|---------------------------------|
| Date       | Time       | Spectrum           | Cell Temp | Cell Press | CO <sub>2</sub> | H <sub>2</sub> O | SF <sub>6</sub> | C <sub>2</sub> H <sub>4</sub> O |
| (mm/dd/yy) | (hh:mm:ss) | (File Name)        | (°C)      | (atm)      | (%vw)           | (%)              | (ppmvw)         | (ppmvw)                         |
| 07/30/21   | 16:23:56   | 0730-R2_000177.LAB | 191.4     | 1.02       | 5.1967          | 14.0712          | 0.4185          | 7.4727                          |
| 07/30/21   | 16:24:26   | 0730-R2_000178.LAB | 191.4     | 1.03       | 5.2160          | 13.7566          | 0.4194          | 7.6900                          |
| 07/30/21   | 16:24:56   | 0730-R2_000179.LAB | 191.5     | 1.03       | 5.2569          | 13.4089          | 0.4242          | 7.6490                          |
| 07/30/21   | 16:25:26   | 0730-R2_000180.LAB | 191.4     | 1.03       | 5.2622          | 13.4270          | 0.4228          | 7.9476                          |
| Average    |            |                    | 191.4     | 1.03       | 5.2329          | 13.6659          | 0.4212          | 7.6898                          |

| Parameter                                                                       | Units   | Trial #1 | Trial #2 | Trial #3 |
|---------------------------------------------------------------------------------|---------|----------|----------|----------|
| Direct Verified Concentration of Sulfur Hexafluoride (SF <sub>6</sub> )         | (ppmvw) | 5.61     | 5.61     | 5.61     |
| Direct Verified Concentration of Acetaldehyde (C <sub>2</sub> H <sub>4</sub> O) | (ppmvw) | 47.47    | 47.47    | 47.47    |
| Stack (Native, Unspiked) CO <sub>2</sub> Concentration                          | (%vw)   | 5.733    | 5.622    | 5.714    |
| Stack (Native, Unspiked) H <sub>2</sub> O Concentration                         | (%)     | 14.012   | 15.327   | 13.988   |
| Stack (Native, Unspiked) SF <sub>6</sub> Concentration                          | (ppmvw) | -0.006   | -0.004   | -0.004   |
| Stack (Native, Unspiked) C <sub>2</sub> H <sub>4</sub> O Concentration          | (ppmvw) | 3.888    | 4.155    | 3.971    |
| Stack + Spike CO <sub>2</sub> Concentration                                     | (%vw)   | 5.311    | 5.240    | 5.233    |
| Stack + Spike H <sub>2</sub> O Concentration                                    | (%)     | 12.847   | 13.719   | 13.666   |
| Stack + Spike SF <sub>6</sub> Concentration                                     | (ppmvw) | 0.423    | 0.426    | 0.421    |
| Stack + Spike C <sub>2</sub> H <sub>4</sub> O Concentration                     | (ppmvw) | 7.756    | 7.665    | 7.690    |
| Dilution Factor, calc. from SF <sub>6</sub> (ppmvw)                             |         | 0.076    | 0.077    | 0.076    |
| Dilution Factor, as the ratio of dir to spk                                     | (ratio) | 13.1 : 1 | 13.1 : 1 | 13.2 : 1 |
| Expected Concentration of the SF <sub>6</sub> Spike+Native, CS                  | (ppmvw) | 0.423    | 0.426    | 0.422    |
| Expected Concentration of the C <sub>2</sub> H <sub>4</sub> O Spike+Native, CS  | (ppmvw) | 7.219    | 7.472    | 7.266    |
| Method 320 Spiked / Expected SF <sub>6</sub>                                    | %       | 99.89    | 99.93    | 99.93    |
| Method 320 Spiked / Expected C <sub>2</sub> H <sub>4</sub> O                    | %       | 107.44   | 102.58   | 105.83   |
| Method 320 Passing SF <sub>6</sub> (70-130%)                                    |         | YES      | YES      | YES      |
| Method 320 Passing C <sub>2</sub> H <sub>4</sub> O (70-130%)                    |         | YES      | YES      | YES      |

## **QUALITY ASSURANCE AND QUALITY CONTROL DATA**

**50% Load  
PM Laboratory Data**



# SAMPLE RECOVERY AND INTEGRITY DATA SHEET

|                          |                                          |                 |          |
|--------------------------|------------------------------------------|-----------------|----------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Date</b>     | 07/28/21 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Operator</b> | JLW      |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |                 |          |

| Run History Data          |           |           |           |            |
|---------------------------|-----------|-----------|-----------|------------|
| Run Number                | R-1 50%-1 | R-1 50%-2 | R-1 50%-3 |            |
| <b>Run Start Time</b>     | 09:34     | 12:05     | 14:23     | (hh:mm)    |
| <b>Run Stop Time</b>      | 11:24     | 13:59     | 15:58     | (hh:mm)    |
| <b>Train Prepared By</b>  | PKM       | PKM       | PKM       |            |
| <b>Train Recovered By</b> | PKM       | PKM       | PKM       |            |
| <b>Recovery Date</b>      | 07/29/21  | 07/29/21  | 07/29/21  | (mm/dd/yy) |
| <b>Relinquished By</b>    | PKM       | PKM       | PKM       |            |
| <b>Relinquished Date</b>  | 08/02/21  | 08/02/21  | 08/02/21  | (mm/dd/yy) |

| Equipment Identification Numbers |               |               |               |
|----------------------------------|---------------|---------------|---------------|
| <b>Impinger Case</b>             | samp-BH-0018  | samp-BH-0018  | samp-BH-0018  |
| <b>Sample Box</b>                | samp-cc-0011  | samp-cc-0011  | samp-cc-0011  |
| <b>PM Filter</b>                 | 00713         | 0652          | 0722          |
| <b>CPM Filter</b>                | R-1 50%-1-CPM | R-1 50%-2-CPM | R-1 50%-3-CPM |

Sample Blank Taken ☒ YES

| Moisture Content Data                 |                    |        |        |        |    |
|---------------------------------------|--------------------|--------|--------|--------|----|
| Impingers 1, 2, and 3 - Liquid Weight |                    |        |        |        |    |
| Final Weight                          | (W <sub>f</sub> )  | 1789.8 | 1796.4 | 1801.3 | g  |
| Initial Weight                        | (W <sub>i</sub> )  | 1672.1 | 1678.6 | 1686.0 | g  |
| Net Weight                            | (W <sub>n</sub> )  | 117.7  | 117.8  | 115.3  | g  |
| Comments                              |                    |        |        |        |    |
| Impinger 4 - Silica Gel Weight        |                    |        |        |        |    |
| Final Weight                          | (W <sub>f</sub> )  | 856.2  | 823.4  | 863.2  | g  |
| Initial Weight                        | (W <sub>i</sub> )  | 847.8  | 816.5  | 856.2  | g  |
| Net Weight                            | (W <sub>n</sub> )  | 8.4    | 6.9    | 7.0    | g  |
| Comments                              |                    |        |        |        |    |
| Total Water Collected                 |                    |        |        |        |    |
| Total Weight                          | (W <sub>lc</sub> ) | 126.1  | 124.7  | 122.3  | g  |
| Total Volume                          | (V <sub>lc</sub> ) | 126.3  | 124.9  | 122.5  | ml |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| Analytical Data        |    | Run                   | R-1 50%-1 |
|------------------------|----|-----------------------|-----------|
| Sample Leakage Evident | NO | Estimated Leak Volume | 0.00 (mg) |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Filter                      | 0652          | 08/11/21 | 14:10 |
| Probe Wash                  | 250-747       | 08/11/21 | 14:10 |
| Inorganic Impinger Contents | 250-302       | 08/11/21 | 14:10 |
| Organic Impinger Contents   | 439           | 08/11/21 | 14:10 |

| Weight Data                                   |          |            | Run     |          | 1    | Start Time        | 09:34 |
|-----------------------------------------------|----------|------------|---------|----------|------|-------------------|-------|
| Filter and Beaker Weight                      | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 48.7912  | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 48.7914  | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Probe Wash and Beaker Weight                  | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 125.9982 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 125.9986 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 118.6959 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 118.6962 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 1.7596   | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 1.7597   | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |

| Blank and Titration Concentrations |        |          |               |        |
|------------------------------------|--------|----------|---------------|--------|
| Blank Type                         | Weight | Volume   | Concentration | Mass   |
|                                    | (g)    | (ml)     | (mg/ml)       | (mg)   |
| Acetone Blank Weight of Solids     | 0.0004 | 137.0000 | 0.002555      | --     |
| DI Water Blank Weight of Solids    | 0.0002 | 224.0000 | 0.000759      | --     |
| Hexane Blank Weight of Solids      | 0.0000 | 123.0000 | 0.000000      | --     |
| 0.1N NH <sub>4</sub> OH Correction | --     | 0.0000   | --            | 0.0000 |

| Gravimetric Concentrations  |          |          | Run    |          | 1                | Start Time    | 09:34 |
|-----------------------------|----------|----------|--------|----------|------------------|---------------|-------|
| Sample Portion              | Final    | Tare     | Gain   | Volume   | Blank Adjustment | Adjusted Gain |       |
|                             | (g)      | (g)      | (mg)   | (ml)     | (mg)             | (mg)          |       |
| Filter                      | 48.7913  | 0.3503   | 2.7000 | --       | --               | 2.7000        |       |
| Filter Beaker               |          | 48.4383  |        | --       | --               |               |       |
| Probe Wash                  | 125.9984 | 125.9889 | 9.5000 | 200.0000 | 0.5109           | 8.9891        |       |
| Inorganic Impinger Contents | 118.6961 | 118.6933 | 2.7500 | 333.3080 | 1.2703           | 1.4797        |       |
| Organic Impinger Contents   | 1.7597   | 1.7540   | 5.6500 | 66.0000  | 0.7297           | 4.9203        |       |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

|                               |    |                              |           |      |      |
|-------------------------------|----|------------------------------|-----------|------|------|
| <b>Analytical Data</b>        |    | <b>Run</b>                   | R-1 50%-2 |      |      |
| <b>Sample Leakage Evident</b> | NO | <b>Estimated Leak Volume</b> |           | 0.00 | (mg) |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Filter                      | 0713          | 08/11/21 | 14:10 |
| Probe Wash                  | 250-494       | 08/11/21 | 14:10 |
| Inorganic Impinger Contents | 250-685       | 08/11/21 | 14:10 |
| Organic Impinger Contents   | 430           | 08/11/21 | 14:10 |

| Weight Data                                   |          |            | Run     |          | 2    | Start Time        | 12:05 |
|-----------------------------------------------|----------|------------|---------|----------|------|-------------------|-------|
| Filter and Beaker Weight                      | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 68.0982  | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 68.0984  | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Probe Wash and Beaker Weight                  | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 120.7377 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 120.7381 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 122.7244 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 122.7249 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 1.7682   | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 1.7683   | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |

| Blank and Titration Concentrations |        |          |               |        |
|------------------------------------|--------|----------|---------------|--------|
| Blank Type                         | Weight | Volume   | Concentration | Mass   |
|                                    | (g)    | (ml)     | (mg/ml)       | (mg)   |
| Acetone Blank Weight of Solids     | 0.0004 | 137.0000 | 0.002555      | --     |
| DI Water Blank Weight of Solids    | 0.0002 | 224.0000 | 0.000759      | --     |
| Hexane Blank Weight of Solids      | 0.0000 | 123.0000 | 0.000000      | --     |
| 0.1N NH <sub>4</sub> OH Correction | --     | 0.0000   | --            | 0.0000 |

| Gravimetric Concentrations  |          |          | Run    |          | 2                | Start Time    | 12:05 |
|-----------------------------|----------|----------|--------|----------|------------------|---------------|-------|
| Sample Portion              | Final    | Tare     | Gain   | Volume   | Blank Adjustment | Adjusted Gain |       |
|                             | (g)      | (g)      | (mg)   | (ml)     | (mg)             | (mg)          |       |
| Filter                      | 68.0983  | 0.3468   | 5.2000 | --       | --               | 5.2000        |       |
| Filter Beaker               |          | 67.7464  |        | --       | --               |               |       |
| Probe Wash                  | 120.7379 | 120.7318 | 6.1000 | 162.0000 | 0.4139           | 5.6861        |       |
| Inorganic Impinger Contents | 122.7247 | 122.7208 | 3.8500 | 342.5887 | 1.2703           | 2.5797        |       |
| Organic Impinger Contents   | 1.7683   | 1.7665   | 1.8000 | 60.0000  | 0.7297           | 1.0703        |       |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

|                               |    |                              |           |      |      |
|-------------------------------|----|------------------------------|-----------|------|------|
| <b>Analytical Data</b>        |    | <b>Run</b>                   | R-1 50%-3 |      |      |
| <b>Sample Leakage Evident</b> | NO | <b>Estimated Leak Volume</b> |           | 0.00 | (mg) |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Filter                      | 0722          | 08/11/21 | 14:10 |
| Probe Wash                  | 250-665       | 08/11/21 | 14:10 |
| Inorganic Impinger Contents | 250-741       | 08/11/21 | 14:10 |
| Organic Impinger Contents   | 446           | 08/11/21 | 14:10 |

| Weight Data                                   |          |            | Run     |          | 3    | Start Time        | 14:23 |
|-----------------------------------------------|----------|------------|---------|----------|------|-------------------|-------|
| Filter and Beaker Weight                      | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 48.2665  | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 48.2668  | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Probe Wash and Beaker Weight                  | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 123.1212 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 123.1211 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 127.5165 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 127.5170 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 1.7761   | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 1.7763   | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |

| Blank and Titration Concentrations |        |          |               |        |
|------------------------------------|--------|----------|---------------|--------|
| Blank Type                         | Weight | Volume   | Concentration | Mass   |
|                                    | (g)    | (ml)     | (mg/ml)       | (mg)   |
| Acetone Blank Weight of Solids     | 0.0004 | 137.0000 | 0.002555      | --     |
| DI Water Blank Weight of Solids    | 0.0002 | 224.0000 | 0.000759      | --     |
| Hexane Blank Weight of Solids      | 0.0000 | 123.0000 | 0.000000      | --     |
| 0.1N NH <sub>4</sub> OH Correction | --     | 0.0000   | --            | 0.0000 |

| Gravimetric Concentrations  |          |          | Run    |          | 3                | Start Time    | 14:23 |
|-----------------------------|----------|----------|--------|----------|------------------|---------------|-------|
| Sample Portion              | Final    | Tare     | Gain   | Volume   | Blank Adjustment | Adjusted Gain |       |
|                             | (g)      | (g)      | (mg)   | (ml)     | (mg)             | (mg)          |       |
| Filter                      | 48.2667  | 0.3583   | 2.3500 | --       | --               | 2.3500        |       |
| Filter Beaker               |          | 47.9060  |        | --       | --               |               |       |
| Probe Wash                  | 123.1212 | 123.1152 | 5.9500 | 124.0000 | 0.3168           | 5.6332        |       |
| Inorganic Impinger Contents | 127.5168 | 127.5147 | 2.1000 | 407.1970 | 1.2703           | 0.8297        |       |
| Organic Impinger Contents   | 1.7762   | 1.7746   | 1.6000 | 72.0000  | 0.7297           | 0.8703        |       |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| Analytical Data               |    | Run                          | R-1 50%-FB |
|-------------------------------|----|------------------------------|------------|
| <b>Sample Leakage Evident</b> | NO | <b>Estimated Leak Volume</b> | 0.00 (mg)  |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Inorganic Impinger Contents | 250-478       | 08/11/21 | 14:10 |
| Organic Impinger Contents   | 464           | 08/11/21 | 14:10 |

| Weight Data                                   |          |            | Run     |          | R-1 50%-FB | Start Time        |  |
|-----------------------------------------------|----------|------------|---------|----------|------------|-------------------|--|
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp       | Calibration Audit |  |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F         | (g)               |  |
| Measurement 1                                 | 121.8241 | 08/17/21   | 07:43   | 45%      | 66.6       |                   |  |
| Measurement 2                                 | 121.8246 | 08/17/21   | 14:14   | 43%      | 68.9       |                   |  |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp       | Calibration Audit |  |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F         | (g)               |  |
| Measurement 1                                 | 1.7720   | 08/17/21   | 07:43   | 45%      | 66.6       |                   |  |
| Measurement 2                                 | 1.7721   | 08/17/21   | 14:14   | 43%      | 68.9       |                   |  |

| Gravimetric Concentrations  |          |          |        |                                               | Actual Gain |
|-----------------------------|----------|----------|--------|-----------------------------------------------|-------------|
| Sample Portion              | Final    | Tare     | Gain   |                                               | (mg)        |
|                             | (g)      | (g)      | (mg)   |                                               |             |
| Inorganic Impinger Contents | 121.8244 | 121.8220 | 1.2703 | max 2 mg total blank adjustment, proportioned | 2.3500      |
| Organic Impinger Contents   | 1.7721   | 1.7707   | 0.7297 |                                               | 1.3500      |

# **EQUIPMENT / INSTRUMENTATION IDENTIFICATION**

| <b>Equipment / Instrumentation</b>             | <b>Identification No.</b> |
|------------------------------------------------|---------------------------|
| Acetone Lot                                    | 20120533                  |
| Hexane Lot                                     | 21030109                  |
| Filterable Particulate Matter Oven ID          | SAMP-OV-0007              |
| Condensable Particulate Matter Oven ID         | SAMP-OV-0008              |
| Sonic Bath ID                                  | SAMP-UB-0001              |
| SAMP-SC-0003 Scale Weight Set ID (1st weights) | LABS-WT-0001              |
| SAMP-SC-0003 Scale Weight Set ID (2nd weights) |                           |
| SAMP-SC-0003 Scale Weight Set ID (3rd weights) |                           |
| SAMP-SC-0003 Scale Weight Set ID (4th weights) |                           |

| Requested Standard Analysis - 5-10 business days after receipt at lab |     |                                                     |          |        |  |  |  |  |  | Contact Information (deliver results to)                                                                                        |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------------------------------------------|-----|-----------------------------------------------------|----------|--------|--|--|--|--|--|---------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|
| Name: (918) 307-8865                                                  |     |                                                     |          |        |  |  |  |  |  | Air Hygiene International, Inc.<br>1600 W Tacoma Street<br>Broken Arrow, Oklahoma 74012<br>(888) 461-8778<br>www.airhygiene.com |  |  |  |  |  |  |  |  |  |  |
| Email: catc-21-houston.tx-start#1                                     |     |                                                     |          |        |  |  |  |  |  | Laboratory Analysis Requested:                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Project Number:                                                       |     |                                                     |          |        |  |  |  |  |  | Gravimetric                                                                                                                     |  |  |  |  |  |  |  |  |  |  |
| Person Taking Samples:                                                |     |                                                     |          |        |  |  |  |  |  | Analysis Method                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| Location                                                              |     |                                                     |          |        |  |  |  |  |  | RM 5 RM 202                                                                                                                     |  |  |  |  |  |  |  |  |  |  |
| Date                                                                  |     |                                                     |          |        |  |  |  |  |  | RM 5 RM 202                                                                                                                     |  |  |  |  |  |  |  |  |  |  |
| Volume                                                                |     |                                                     |          |        |  |  |  |  |  | RM 5 RM 202                                                                                                                     |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-1-F                                                           | 40  | Unit R-1 50% - Run 1 - Filter                       | 07/29/21 | N/A    |  |  |  |  |  | X                                                                                                                               |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-1-PW                                                          | 41  | Unit R-1 50% - Run 1 - Probe Wash                   | 07/29/21 | 540.43 |  |  |  |  |  | X                                                                                                                               |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-1-IC                                                          | 42  | Unit R-1 50% - Run 1 - Inorganic Impinger Contents  | 07/29/21 |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-1-Hex                                                         | 43  | Unit R-1 50% - Run 1 - Organic Impinger Contents    | 07/29/21 |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-1-CPM                                                         | 44  | Unit R-1 50% - Run 1 - CPM Filter                   | 07/29/21 |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-2-F                                                           | 45  | Unit R-1 50% - Run 2 - Filter                       | 07/29/21 | N/A    |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-2-PW                                                          | 46  | Unit R-1 50% - Run 2 - Probe Wash                   | 07/29/21 | 540.43 |  |  |  |  |  | X                                                                                                                               |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-2-IC                                                          | 47  | Unit R-1 50% - Run 2 - Inorganic Impinger Contents  | 07/29/21 |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-2-Hex                                                         | 48  | Unit R-1 50% - Run 2 - Organic Impinger Contents    | 07/29/21 |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-2-CPM                                                         | 49  | Unit R-1 50% - Run 2 - CPM Filter                   | 07/29/21 |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-3-F                                                           | 50  | Unit R-1 50% - Run 3 - Filter                       | 07/29/21 | N/A    |  |  |  |  |  | X                                                                                                                               |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-3-PW                                                          | 51  | Unit R-1 50% - Run 3 - Probe Wash                   | 07/29/21 | 540.43 |  |  |  |  |  | X                                                                                                                               |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-3-IC                                                          | 52  | Unit R-1 50% - Run 3 - Inorganic Impinger Contents  | 07/29/21 |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-3-Hex                                                         | 53  | Unit R-1 50% - Run 3 - Organic Impinger Contents    | 07/29/21 |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-3-CPM                                                         | 54  | Unit R-1 50% - Run 3 - CPM Filter                   | 07/29/21 |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-FB-IC                                                         | 70  | Unit R-1 50% - Run FB - Inorganic Impinger Contents | FB       |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-FB-Hex                                                        | 71  | Unit R-1 50% - Run FB - Organic Impinger Contents   | FB       |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-FB-CPM                                                        | 72  | Unit R-1 50% - Run FB - CPM Filter                  | FB       |        |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-B1-Acetone                                                    | 210 | Unit R-1 50% - Blank - Acetone                      | 07/30/21 | 200    |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-B2-DI Water                                                   | 35  | Unit R-1 50% - Blank - DI Water                     | 07/30/21 | 200    |  |  |  |  |  | X                                                                                                                               |  |  |  |  |  |  |  |  |  |  |
| R-1 50%-B3-Hexane                                                     | 39  | Unit R-1 50% - Blank - Hexane                       | 07/30/21 | 200    |  |  |  |  |  |                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |

SD&L

Isocal-AHI v20210708 CATC 50%

## **QUALITY ASSURANCE AND QUALITY CONTROL DATA**

**75% Load  
PM Laboratory Data**



# **SAMPLE RECOVERY AND INTEGRITY DATA SHEET**

|                          |                                          |                 |          |
|--------------------------|------------------------------------------|-----------------|----------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Date</b>     | 07/28/21 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Operator</b> | JLW      |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |                 |          |

| Run History Data          |           |           |           |            |
|---------------------------|-----------|-----------|-----------|------------|
| <b>Run Number</b>         | R-1 75%-1 | R-1 75%-2 | R-1 75%-3 |            |
| <b>Run Start Time</b>     | 08:08     | 13:17     | 15:25     | (hh:mm)    |
| <b>Run Stop Time</b>      | 09:42     | 14:56     | 17:01     | (hh:mm)    |
| <b>Train Prepared By</b>  | PKM       | PKM       | PKM       |            |
| <b>Train Recovered By</b> | PKM       | PKM       | PKM       |            |
| <b>Recovery Date</b>      | 07/30/21  | 07/30/21  | 07/30/21  | (mm/dd/yy) |
| <b>Relinquished By</b>    | PKM       | PKM       | PKM       |            |
| <b>Relinquished Date</b>  | 08/02/21  | 08/02/21  | 08/02/21  | (mm/dd/yy) |

| Equipment Identification Numbers |               |               |               |
|----------------------------------|---------------|---------------|---------------|
| <b>Impinger Case</b>             | samp-BH-0018  | samp-BH-0018  | samp-BH-0018  |
| <b>Sample Box</b>                | samp-cc-0011  | samp-cc-0011  | samp-cc-0011  |
| <b>PM Filter</b>                 | 0523          | 0916          | 0917          |
| <b>CPM Filter</b>                | R-1 75%-1-CPM | R-1 75%-2-CPM | R-1 75%-3-CPM |

Sample Blank Taken ☒ YES

| Moisture Content Data                 |                    |        |        |        |    |
|---------------------------------------|--------------------|--------|--------|--------|----|
| Impingers 1, 2, and 3 - Liquid Weight |                    |        |        |        |    |
| Final Weight                          | (W <sub>f</sub> )  | 1854.3 | 1851.5 | 1846.1 | g  |
| Initial Weight                        | (W <sub>i</sub> )  | 1685.4 | 1689.6 | 1688.9 | g  |
| Net Weight                            | (W <sub>n</sub> )  | 168.9  | 161.9  | 157.2  | g  |
| Comments                              |                    |        |        |        |    |
| Impinger 4 - Silica Gel Weight        |                    |        |        |        |    |
| Final Weight                          | (W <sub>f</sub> )  | 832.6  | 872.9  | 834.4  | g  |
| Initial Weight                        | (W <sub>i</sub> )  | 823.4  | 863.2  | 823.3  | g  |
| Net Weight                            | (W <sub>n</sub> )  | 9.2    | 9.7    | 11.1   | g  |
| Comments                              |                    |        |        |        |    |
| Total Water Collected                 |                    |        |        |        |    |
| Total Weight                          | (W <sub>lc</sub> ) | 178.1  | 171.6  | 168.3  | g  |
| Total Volume                          | (V <sub>lc</sub> ) | 178.4  | 171.9  | 168.6  | ml |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| Analytical Data               |    | Run                          | R-1 75%-1 |      |  |
|-------------------------------|----|------------------------------|-----------|------|--|
| <b>Sample Leakage Evident</b> | NO | <b>Estimated Leak Volume</b> | 0.00      | (mg) |  |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Filter                      | 0523          | 08/11/21 | 14:10 |
| Probe Wash                  | 250-853       | 08/11/21 | 14:10 |
| Inorganic Impinger Contents | 250-338       | 08/11/21 | 14:10 |
| Organic Impinger Contents   | 438           | 08/11/21 | 14:10 |

| Weight Data                                   |          |            | Run     |          | 1    | Start Time        | 08:08 |
|-----------------------------------------------|----------|------------|---------|----------|------|-------------------|-------|
| Filter and Beaker Weight                      | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 69.3936  | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 69.3938  | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Probe Wash and Beaker Weight                  | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 121.8107 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 121.8110 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 112.7466 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 112.7470 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 1.7471   | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 1.7473   | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |

| Blank and Titration Concentrations |        |          |               |        |
|------------------------------------|--------|----------|---------------|--------|
| Blank Type                         | Weight | Volume   | Concentration | Mass   |
|                                    | (g)    | (ml)     | (mg/ml)       | (mg)   |
| Acetone Blank Weight of Solids     | 0.0004 | 137.0000 | 0.002555      | --     |
| DI Water Blank Weight of Solids    | 0.0002 | 224.0000 | 0.000759      | --     |
| Hexane Blank Weight of Solids      | 0.0000 | 123.0000 | 0.000000      | --     |
| 0.1N NH <sub>4</sub> OH Correction | --     | 0.0000   | --            | 0.0000 |

| Gravimetric Concentrations  |          |          | Run    |          | 1                | Start Time    | 08:08 |
|-----------------------------|----------|----------|--------|----------|------------------|---------------|-------|
| Sample Portion              | Final    | Tare     | Gain   | Volume   | Blank Adjustment | Adjusted Gain |       |
|                             | (g)      | (g)      | (mg)   | (ml)     | (mg)             | (mg)          |       |
| Filter                      | 69.3937  | 0.3451   | 1.2500 | --       | --               | 1.2500        |       |
| Filter Beaker               |          | 69.0474  |        | --       | --               |               |       |
| Probe Wash                  | 121.8109 | 121.8075 | 3.4000 | 134.0000 | 0.3423           | 3.0577        |       |
| Inorganic Impinger Contents | 112.7468 | 112.7446 | 2.2000 | 279.2016 | 1.2703           | 0.9297        |       |
| Organic Impinger Contents   | 1.7472   | 1.7456   | 1.6000 | 118.0000 | 0.7297           | 0.8703        |       |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

|                               |    |                              |           |      |      |
|-------------------------------|----|------------------------------|-----------|------|------|
| <b>Analytical Data</b>        |    | <b>Run</b>                   | R-1 75%-2 |      |      |
| <b>Sample Leakage Evident</b> | NO | <b>Estimated Leak Volume</b> |           | 0.00 | (mg) |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Filter                      | 0916          | 08/11/21 | 14:10 |
| Probe Wash                  | 250-506       | 08/11/21 | 14:10 |
| Inorganic Impinger Contents | 250-510       | 08/11/21 | 14:10 |
| Organic Impinger Contents   | 463           | 08/11/21 | 14:10 |

| Weight Data                                   |          |            | Run     |          | 2    | Start Time        | 13:17 |
|-----------------------------------------------|----------|------------|---------|----------|------|-------------------|-------|
| Filter and Beaker Weight                      | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 66.5723  | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 66.5724  | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Probe Wash and Beaker Weight                  | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 119.5037 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 119.5042 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 115.4424 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 115.4429 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 1.7476   | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 1.7478   | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |

| Blank and Titration Concentrations |        |          |               |        |
|------------------------------------|--------|----------|---------------|--------|
| Blank Type                         | Weight | Volume   | Concentration | Mass   |
|                                    | (g)    | (ml)     | (mg/ml)       | (mg)   |
| Acetone Blank Weight of Solids     | 0.0004 | 137.0000 | 0.002555      | --     |
| DI Water Blank Weight of Solids    | 0.0002 | 224.0000 | 0.000759      | --     |
| Hexane Blank Weight of Solids      | 0.0000 | 123.0000 | 0.000000      | --     |
| 0.1N NH <sub>4</sub> OH Correction | --     | 0.0000   | --            | 0.0000 |

| Gravimetric Concentrations  |          |          | Run    |          | 2                | Start Time    | 13:17 |
|-----------------------------|----------|----------|--------|----------|------------------|---------------|-------|
| Sample Portion              | Final    | Tare     | Gain   | Volume   | Blank Adjustment | Adjusted Gain |       |
|                             | (g)      | (g)      | (mg)   | (ml)     | (mg)             | (mg)          |       |
| Filter                      | 66.5724  | 0.3617   | 0.9000 | --       | --               | 0.9000        |       |
| Filter Beaker               |          | 66.2098  |        | --       | --               |               |       |
| Probe Wash                  | 119.5040 | 119.4984 | 5.5500 | 210.0000 | 0.5365           | 5.0135        |       |
| Inorganic Impinger Contents | 115.4427 | 115.4407 | 2.0000 | 320.5219 | 1.2703           | 0.7297        |       |
| Organic Impinger Contents   | 1.7477   | 1.7463   | 1.4500 | 102.0000 | 0.7297           | 0.7203        |       |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

|                               |    |                              |           |      |
|-------------------------------|----|------------------------------|-----------|------|
| <b>Analytical Data</b>        |    | <b>Run</b>                   | R-1 75%-3 |      |
| <b>Sample Leakage Evident</b> | NO | <b>Estimated Leak Volume</b> | 0.00      | (mg) |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Filter                      | 0917          | 08/11/21 | 14:10 |
| Probe Wash                  | 250-497       | 08/11/21 | 14:10 |
| Inorganic Impinger Contents | 250-748       | 08/11/21 | 14:10 |
| Organic Impinger Contents   | 455           | 08/11/21 | 14:10 |

| Weight Data                                   |          |            | Run     |          | 3    | Start Time        | 15:25 |
|-----------------------------------------------|----------|------------|---------|----------|------|-------------------|-------|
| Filter and Beaker Weight                      | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 49.3830  | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 49.3833  | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Probe Wash and Beaker Weight                  | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 119.3830 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 119.3834 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 125.3623 | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 125.3624 | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 1.7394   | 08/17/21   | 07:43   | 45%      | 66.6 |                   |       |
| Measurement 2                                 | 1.7395   | 08/17/21   | 14:14   | 43%      | 68.9 |                   |       |

| Blank and Titration Concentrations |        |          |               |        |
|------------------------------------|--------|----------|---------------|--------|
| Blank Type                         | Weight | Volume   | Concentration | Mass   |
|                                    | (g)    | (ml)     | (mg/ml)       | (mg)   |
| Acetone Blank Weight of Solids     | 0.0004 | 137.0000 | 0.002555      | --     |
| DI Water Blank Weight of Solids    | 0.0002 | 224.0000 | 0.000759      | --     |
| Hexane Blank Weight of Solids      | 0.0000 | 123.0000 | 0.000000      | --     |
| 0.1N NH <sub>4</sub> OH Correction | --     | 0.0000   | --            | 0.0000 |

| Gravimetric Concentrations  |          |          | Run    |          | 3                | Start Time    | 15:25 |
|-----------------------------|----------|----------|--------|----------|------------------|---------------|-------|
| Sample Portion              | Final    | Tare     | Gain   | Volume   | Blank Adjustment | Adjusted Gain |       |
|                             | (g)      | (g)      | (mg)   | (ml)     | (mg)             | (mg)          |       |
| Filter                      | 49.3832  | 0.3598   | 1.0000 | --       | --               | 1.0000        |       |
| Filter Beaker               |          | 49.0224  |        | --       | --               |               |       |
| Probe Wash                  | 119.3832 | 119.3800 | 3.2500 | 140.0000 | 0.3577           | 2.8923        |       |
| Inorganic Impinger Contents | 125.3624 | 125.3607 | 1.7000 | 319.6203 | 1.2703           | 0.4297        |       |
| Organic Impinger Contents   | 1.7395   | 1.7377   | 1.7500 | 96.0000  | 0.7297           | 1.0203        |       |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| Analytical Data               |    | Run                          | R-1 75%-FB |
|-------------------------------|----|------------------------------|------------|
| <b>Sample Leakage Evident</b> | NO | <b>Estimated Leak Volume</b> | 0.00 (mg)  |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Inorganic Impinger Contents | 250-478       | 08/11/21 | 14:10 |
| Organic Impinger Contents   | 464           | 08/11/21 | 14:10 |

| Weight Data                                   |          |            | Run     |          | R-1 75%-FB | Start Time        |  |
|-----------------------------------------------|----------|------------|---------|----------|------------|-------------------|--|
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp       | Calibration Audit |  |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F         | (g)               |  |
| Measurement 1                                 | 121.8241 | 08/17/21   | 07:43   | 45%      | 66.6       |                   |  |
| Measurement 2                                 | 121.8246 | 08/17/21   | 14:14   | 43%      | 68.9       |                   |  |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp       | Calibration Audit |  |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F         | (g)               |  |
| Measurement 1                                 | 1.7720   | 08/17/21   | 07:43   | 45%      | 66.6       |                   |  |
| Measurement 2                                 | 1.7721   | 08/17/21   | 14:14   | 43%      | 68.9       |                   |  |

| Gravimetric Concentrations  |          |          |        |                                               | Actual Gain |
|-----------------------------|----------|----------|--------|-----------------------------------------------|-------------|
| Sample Portion              | Final    | Tare     | Gain   |                                               | (mg)        |
|                             | (g)      | (g)      | (mg)   |                                               |             |
| Inorganic Impinger Contents | 121.8244 | 121.8220 | 1.2703 | max 2 mg total blank adjustment, proportioned | 2.3500      |
| Organic Impinger Contents   | 1.7721   | 1.7707   | 0.7297 |                                               | 1.3500      |



## **QUALITY ASSURANCE AND QUALITY CONTROL DATA**

**100% Load  
PM Laboratory Data**

# **SAMPLE RECOVERY AND INTEGRITY DATA SHEET**

|                          |                                          |                 |          |
|--------------------------|------------------------------------------|-----------------|----------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center | <b>Date</b>     | 08/31/21 |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   | <b>Operator</b> | TP       |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |                 |          |

| Run History Data          |            |            |            |            |
|---------------------------|------------|------------|------------|------------|
| Run Number                | R-1 100%-1 | R-1 100%-2 | R-1 100%-3 |            |
| <b>Run Start Time</b>     | 09:36      | 12:05      | 14:24      | (hh:mm)    |
| <b>Run Stop Time</b>      | 11:17      | 13:44      | 16:05      | (hh:mm)    |
| <b>Train Prepared By</b>  | PKM        | PKM        | PKM        |            |
| <b>Train Recovered By</b> | PKM        | PKM        | PKM        |            |
| <b>Recovery Date</b>      | 07/30/21   | 07/30/21   | 07/30/21   | (mm/dd/yy) |
| <b>Relinquished By</b>    | PKM        | PKM        | PKM        |            |
| <b>Relinquished Date</b>  | 08/02/21   | 08/02/21   | 08/02/21   | (mm/dd/yy) |

| Equipment Identification Numbers |                |                |                |
|----------------------------------|----------------|----------------|----------------|
| <b>Impinger Case</b>             | samp-BH-0036   | samp-BH-0036   | samp-BH-0036   |
| <b>Sample Box</b>                | samp-cc-0009   | samp-cc-0009   | samp-cc-0009   |
| <b>PM Filter</b>                 | 0523           | 0916           | 0917           |
| <b>CPM Filter</b>                | R-1 100%-1-CPM | R-1 100%-2-CPM | R-1 100%-3-CPM |

Sample Blank Taken ☒ YES

| Moisture Content Data                 |                    |        |        |        |    |
|---------------------------------------|--------------------|--------|--------|--------|----|
| Impingers 1, 2, and 3 - Liquid Weight |                    |        |        |        |    |
| Final Weight                          | (W <sub>f</sub> )  | 1857.9 | 1854.1 | 1950.7 | g  |
| Initial Weight                        | (W <sub>i</sub> )  | 1668.8 | 1669.4 | 1717.6 | g  |
| Net Weight                            | (W <sub>n</sub> )  | 189.1  | 184.7  | 233.1  | g  |
| Comments                              |                    |        |        |        |    |
| Impinger 4 - Silica Gel Weight        |                    |        |        |        |    |
| Final Weight                          | (W <sub>f</sub> )  | 874.3  | 860.1  | 870.7  | g  |
| Initial Weight                        | (W <sub>i</sub> )  | 859.2  | 844.5  | 855.4  | g  |
| Net Weight                            | (W <sub>n</sub> )  | 15.1   | 15.6   | 15.3   | g  |
| Comments                              |                    |        |        |        |    |
| Total Water Collected                 |                    |        |        |        |    |
| Total Weight                          | (W <sub>lc</sub> ) | 204.2  | 200.3  | 248.4  | g  |
| Total Volume                          | (V <sub>lc</sub> ) | 204.6  | 200.7  | 248.8  | ml |



# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| Analytical Data        |    | Run                   | R-1 100%-1 |
|------------------------|----|-----------------------|------------|
| Sample Leakage Evident | NO | Estimated Leak Volume | 0.00 (mg)  |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Filter                      | 1023          | 09/10/21 | 15:42 |
| Probe Wash                  | 250-726       | 09/10/21 | 15:42 |
| Inorganic Impinger Contents | 250-802       | 09/10/21 | 15:42 |
| Organic Impinger Contents   | 0597          | 09/10/21 | 15:42 |

| Weight Data                                   |          |            | Run     |          | 1    | Start Time        | 09:36 |
|-----------------------------------------------|----------|------------|---------|----------|------|-------------------|-------|
| Filter and Beaker Weight                      | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 48.0276  | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 48.0279  | 09/15/21   | 13:55   | 45%      | 68   |                   |       |
| Probe Wash and Beaker Weight                  | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 122.1851 | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 122.1854 | 09/15/21   | 13:55   | 45%      | 68   |                   |       |
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 126.0307 | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 126.0310 | 09/15/21   | 13:55   | 45%      | 68   |                   |       |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 1.7512   | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 1.7513   | 09/15/21   | 13:55   | 45%      | 68   |                   |       |

| Blank and Titration Concentrations |        |          |               |        |
|------------------------------------|--------|----------|---------------|--------|
| Blank Type                         | Weight | Volume   | Concentration | Mass   |
|                                    | (g)    | (ml)     | (mg/ml)       | (mg)   |
| Acetone Blank Weight of Solids     | 0.0000 | 420.0000 | 0.000000      | --     |
| DI Water Blank Weight of Solids    | 0.0001 | 240.0000 | 0.000417      | --     |
| Hexane Blank Weight of Solids      | 0.0002 | 430.0000 | 0.000349      | --     |
| 0.1N NH <sub>4</sub> OH Correction | --     | 0.0000   | --            | 0.0000 |

| Gravimetric Concentrations  |          |          | Run     |          | 1                | Start Time    | 09:36 |
|-----------------------------|----------|----------|---------|----------|------------------|---------------|-------|
| Sample Portion              | Final    | Tare     | Gain    | Volume   | Blank Adjustment | Adjusted Gain |       |
|                             | (g)      | (g)      | (mg)    | (ml)     | (mg)             | (mg)          |       |
| Filter                      | 48.0278  | 0.3602   | -0.4000 | --       | --               | 0.0000        |       |
| Filter Beaker               |          | 47.6680  |         | --       | --               |               |       |
| Probe Wash                  | 122.1853 | 122.1817 | 3.6000  | 140.0000 | 0.0000           | 3.6000        |       |
| Inorganic Impinger Contents | 126.0309 | 126.0276 | 3.2500  | 484.3659 | 1.5904           | 1.6596        |       |
| Organic Impinger Contents   | 1.7513   | 1.7501   | 1.2000  | 80.0000  | 0.4096           | 0.7904        |       |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| Analytical Data        |    | Run                   | R-1 100%-2 |
|------------------------|----|-----------------------|------------|
| Sample Leakage Evident | NO | Estimated Leak Volume | 0.00 (mg)  |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Filter                      | 0806          | 09/10/21 | 15:42 |
| Probe Wash                  | 250-846       | 09/10/21 | 15:42 |
| Inorganic Impinger Contents | 250-857       | 09/10/21 | 15:42 |
| Organic Impinger Contents   | 0594          | 09/10/21 | 15:42 |

| Weight Data                                   |          |            | Run     |          | 2    | Start Time        | 12:05 |
|-----------------------------------------------|----------|------------|---------|----------|------|-------------------|-------|
| Filter and Beaker Weight                      | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 67.0374  | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 67.0376  | 09/15/21   | 13:55   | 45%      | 68   |                   |       |
| Probe Wash and Beaker Weight                  | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 123.8782 | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 123.8785 | 09/15/21   | 13:55   | 45%      | 68   |                   |       |
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 123.3015 | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 123.3018 | 09/15/21   | 13:55   | 45%      | 68   |                   |       |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 1.7514   | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 1.7515   | 09/15/21   | 13:55   | 45%      | 68   |                   |       |

| Blank and Titration Concentrations |        |          |               |        |
|------------------------------------|--------|----------|---------------|--------|
| Blank Type                         | Weight | Volume   | Concentration | Mass   |
|                                    | (g)    | (ml)     | (mg/ml)       | (mg)   |
| Acetone Blank Weight of Solids     | 0.0000 | 420.0000 | 0.000000      | --     |
| DI Water Blank Weight of Solids    | 0.0001 | 240.0000 | 0.000417      | --     |
| Hexane Blank Weight of Solids      | 0.0002 | 430.0000 | 0.000349      | --     |
| 0.1N NH <sub>4</sub> OH Correction | --     | 0.0000   | --            | 0.0000 |

| Gravimetric Concentrations  |          |          | Run     |          | 2                | Start Time    | 12:05 |
|-----------------------------|----------|----------|---------|----------|------------------|---------------|-------|
| Sample Portion              | Final    | Tare     | Gain    | Volume   | Blank Adjustment | Adjusted Gain |       |
|                             | (g)      | (g)      | (mg)    | (ml)     | (mg)             | (mg)          |       |
| Filter                      | 67.0375  | 0.3586   | -0.6500 | --       | --               | 0.0000        |       |
| Filter Beaker               |          | 66.6796  |         | --       | --               |               |       |
| Probe Wash                  | 123.8784 | 123.8773 | 1.0500  | 235.0000 | 0.0000           | 1.0500        |       |
| Inorganic Impinger Contents | 123.3017 | 123.3002 | 1.5000  | 509.0743 | 1.5904           | 0.0000        |       |
| Organic Impinger Contents   | 1.7515   | 1.7505   | 1.0000  | 66.0000  | 0.4096           | 0.5904        |       |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

|                               |    |                              |            |
|-------------------------------|----|------------------------------|------------|
| <b>Analytical Data</b>        |    | <b>Run</b>                   | R-1 100%-3 |
| <b>Sample Leakage Evident</b> | NO | <b>Estimated Leak Volume</b> | 0.00 (mg)  |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Filter                      | 0852          | 09/10/21 | 15:42 |
| Probe Wash                  | 250-357       | 09/10/21 | 15:42 |
| Inorganic Impinger Contents | 250-083       | 09/10/21 | 15:42 |
| Organic Impinger Contents   | 0584          | 09/10/21 | 15:42 |

| Weight Data                                   |          |            | Run     |          | 3    | Start Time        | 14:24 |
|-----------------------------------------------|----------|------------|---------|----------|------|-------------------|-------|
| Filter and Beaker Weight                      | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 68.7259  | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 68.7262  | 09/15/21   | 13:55   | 45%      | 68   |                   |       |
| Probe Wash and Beaker Weight                  | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 113.7084 | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 113.7087 | 09/15/21   | 13:55   | 45%      | 68   |                   |       |
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 101.7787 | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 101.7791 | 09/15/21   | 13:55   | 45%      | 68   |                   |       |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp | Calibration Audit |       |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F   | (g)               |       |
| Measurement 1                                 | 1.7379   | 09/14/21   | 11:15   | 45%      | 68   |                   |       |
| Measurement 2                                 | 1.7380   | 09/15/21   | 13:55   | 45%      | 68   |                   |       |

| Blank and Titration Concentrations |        |          |               |        |
|------------------------------------|--------|----------|---------------|--------|
| Blank Type                         | Weight | Volume   | Concentration | Mass   |
|                                    | (g)    | (ml)     | (mg/ml)       | (mg)   |
| Acetone Blank Weight of Solids     | 0.0000 | 420.0000 | 0.000000      | --     |
| DI Water Blank Weight of Solids    | 0.0001 | 240.0000 | 0.000417      | --     |
| Hexane Blank Weight of Solids      | 0.0002 | 430.0000 | 0.000349      | --     |
| 0.1N NH <sub>4</sub> OH Correction | --     | 0.0000   | --            | 0.0000 |

| Gravimetric Concentrations  |          |          | Run     |          | 3                | Start Time    | 14:24 |
|-----------------------------|----------|----------|---------|----------|------------------|---------------|-------|
| Sample Portion              | Final    | Tare     | Gain    | Volume   | Blank Adjustment | Adjusted Gain |       |
|                             | (g)      | (g)      | (mg)    | (ml)     | (mg)             | (mg)          |       |
| Filter                      | 68.7261  | 0.3657   | -0.3000 | --       | --               | 0.0000        |       |
| Filter Beaker               |          | 68.3607  |         | --       | --               |               |       |
| Probe Wash                  | 113.7086 | 113.7088 | -0.2500 | 190.0000 | -0.2500          | 0.0000        |       |
| Inorganic Impinger Contents | 101.7789 | 101.7746 | 4.3000  | 480.0862 | 1.5904           | 2.7096        |       |
| Organic Impinger Contents   | 1.7380   | 1.7375   | 0.4500  | 60.0000  | 0.4096           | 0.0404        |       |

# SAMPLE ANALYTICAL DATA SHEET

|                          |                                          |
|--------------------------|------------------------------------------|
| <b>Plant Name</b>        | Stewart and Stevenson Integration Center |
| <b>Sampling Location</b> | Caterpillar G3520 TALE                   |
| <b>Project #</b>         | catc-21-houston.tx-start#1               |

| Analytical Data               |    | Run                          | R-1 100%-FB |
|-------------------------------|----|------------------------------|-------------|
| <b>Sample Leakage Evident</b> | NO | <b>Estimated Leak Volume</b> | 0.00 (mg)   |

| Sample Type                 | Sample Number | Date     | Time  |
|-----------------------------|---------------|----------|-------|
| Inorganic Impinger Contents | 250-374       | 09/10/21 | 15:42 |
| Organic Impinger Contents   | 0571          | 09/10/21 | 15:42 |

| Weight Data                                   |          |            | Run     |          | R-1 100%-FB | Start Time        |  |
|-----------------------------------------------|----------|------------|---------|----------|-------------|-------------------|--|
| Inorganic Impinger Contents and Beaker Weight | Weight   | Date       | Time    | Humidity | Temp        | Calibration Audit |  |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F          | (g)               |  |
| Measurement 1                                 | 116.6108 | 09/14/21   | 11:15   | 45%      | 68          |                   |  |
| Measurement 2                                 | 116.6112 | 09/15/21   | 13:55   | 45%      | 68          |                   |  |
| Organic Impinger Contents and Beaker Weight   | Weight   | Date       | Time    | Humidity | Temp        | Calibration Audit |  |
|                                               | (g)      | (mm/dd/yy) | (hh:mm) | (%)      | °F          | (g)               |  |
| Measurement 1                                 | 1.7403   | 09/14/21   | 11:15   | 45%      | 68          |                   |  |
| Measurement 2                                 | 1.7404   | 09/15/21   | 13:55   | 45%      | 68          |                   |  |

| Gravimetric Concentrations  |          |          |        |
|-----------------------------|----------|----------|--------|
| Sample Portion              | Final    | Tare     | Gain   |
|                             | (g)      | (g)      | (mg)   |
| Inorganic Impinger Contents | 116.6110 | 116.6077 | 1.5904 |
| Organic Impinger Contents   | 1.7404   | 1.7395   | 0.4096 |

max 2 mg total blank adjustment, proportioned

| Actual Gain |
|-------------|
| (mg)        |
| 3.3000      |
| 0.8500      |

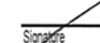
# EQUIPMENT / INSTRUMENTATION IDENTIFICATION

| Equipment / Instrumentation                    | Identification No. |
|------------------------------------------------|--------------------|
| Acetone Lot                                    | 21040287           |
| Hexane Lot                                     | 21030109           |
| Filterable Particulate Matter Oven ID          | LABS-OV-0007       |
| Condensable Particulate Matter Oven ID         | LABS-OV-0008       |
| Sonic Bath ID                                  | LABS-UB-0001       |
| LABS-SC-0004 Scale Weight Set ID (1st weights) | LABS-WT--0001      |
| LABS-SC-0004 Scale Weight Set ID (2nd weights) | LABS-WT--0001      |
| LABS-SC-0004 Scale Weight Set ID (3rd weights) |                    |
| LABS-SC-0004 Scale Weight Set ID (4th weights) |                    |

A - 21040287  
H - 21030109

| Requested Standard Analysis - 5-10 business days after receipt at lab |                                                         |                            |           | Contact Information (deliver results to)                                                                                                                                                                                                                   |        |       |         |
|-----------------------------------------------------------------------|---------------------------------------------------------|----------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|---------|
| <b>SAMPLE DESCRIPTION AND LABELING RECORD</b>                         |                                                         |                            |           | Name: Matt McBride<br>Phone: (918) 307-8865<br>Email: <a href="mailto:mmcbride@airhygiene.com">mmcbride@airhygiene.com</a>                                                                                                                                 |        |       |         |
|                                                                       |                                                         |                            |           |  Air Hygiene International, Inc.<br>1600 W Tacoma Street<br>Broken Arrow, Oklahoma 74012<br>(888) 461-8778<br><a href="http://www.airhygiene.com">www.airhygiene.com</a> |        |       |         |
|                                                                       |                                                         |                            |           |                                                                                                                                                                                                                                                            |        |       |         |
|                                                                       |                                                         |                            |           |                                                                                                                                                                                                                                                            |        |       |         |
| Project Number:                                                       |                                                         | catc-21-houston.tx-start#1 |           | Laboratory Analysis Requested:                                                                                                                                                                                                                             |        |       |         |
| Person Taking Samples:                                                |                                                         | TP                         |           | Gravimetric                                                                                                                                                                                                                                                |        |       |         |
| Sample Number                                                         | Location                                                | Date                       | Volume    | Analysis Method                                                                                                                                                                                                                                            |        |       |         |
|                                                                       |                                                         |                            |           | RM 5                                                                                                                                                                                                                                                       | RM 202 | --    | --      |
| R-1 100%-1-F                                                          | 4 Unit R-1 100% - Run 1 - Filter                        | 08/31/21                   | N/A       | X                                                                                                                                                                                                                                                          |        | 1023  | 100-766 |
| R-1 100%-1-PW                                                         | 5 Unit R-1 100% - Run 1 - Probe Wash                    | 08/31/21                   | As Marked | X                                                                                                                                                                                                                                                          |        | 140mL | 250-726 |
| R-1 100%-1-IC                                                         | 6 Unit R-1 100% - Run 1 - Inorganic Impinger Contents   | 08/31/21                   | As Marked |                                                                                                                                                                                                                                                            | X      | 670mL | 250-802 |
| R-1 100%-1-Hex                                                        | 7 Unit R-1 100% - Run 1 - Organic Impinger Contents     | 08/31/21                   | As Marked |                                                                                                                                                                                                                                                            | X      | 80mL  | 597     |
| R-1 100%-1-CPM                                                        | 8 Unit R-1 100% - Run 1 - CPM Filter                    | 08/31/21                   | N/A       |                                                                                                                                                                                                                                                            | X      |       |         |
| R-1 100%-2-F                                                          | 9 Unit R-1 100% - Run 2 - Filter                        | 08/31/21                   | N/A       | X                                                                                                                                                                                                                                                          |        | 806   | 100-669 |
| R-1 100%-2-PW                                                         | 10 Unit R-1 100% - Run 2 - Probe Wash                   | 08/31/21                   | As Marked | X                                                                                                                                                                                                                                                          |        | 235mL | 250-846 |
| R-1 100%-2-IC                                                         | 11 Unit R-1 100% - Run 2 - Inorganic Impinger Contents  | 08/31/21                   | As Marked |                                                                                                                                                                                                                                                            | X      | 690mL | 250-857 |
| R-1 100%-2-Hex                                                        | 12 Unit R-1 100% - Run 2 - Organic Impinger Contents    | 08/31/21                   | As Marked |                                                                                                                                                                                                                                                            | X      | 66mL  | 594     |
| R-1 100%-2-CPM                                                        | 13 Unit R-1 100% - Run 2 - CPM Filter                   | 08/31/21                   | N/A       |                                                                                                                                                                                                                                                            | X      |       |         |
| R-1 100%-3-F                                                          | 14 Unit R-1 100% - Run 3 - Filter                       | 08/31/21                   | N/A       | X                                                                                                                                                                                                                                                          |        | 852   | 100-745 |
| R-1 100%-3-PW                                                         | 15 Unit R-1 100% - Run 3 - Probe Wash                   | 08/31/21                   | As Marked | X                                                                                                                                                                                                                                                          |        | 190mL | 250-357 |
| R-1 100%-3-IC                                                         | 16 Unit R-1 100% - Run 3 - Inorganic Impinger Contents  | 08/31/21                   | As Marked |                                                                                                                                                                                                                                                            | X      | 710mL | 250-083 |
| R-1 100%-3-Hex                                                        | 17 Unit R-1 100% - Run 3 - Organic Impinger Contents    | 08/31/21                   | As Marked |                                                                                                                                                                                                                                                            | X      | 60mL  | 584     |
| R-1 100%-3-CPM                                                        | 18 Unit R-1 100% - Run 3 - CPM Filter                   | 08/31/21                   | N/A       |                                                                                                                                                                                                                                                            | X      |       |         |
| R-1 100%-FB-IC                                                        | 19 Unit R-1 100% - Run FB - Inorganic Impinger Contents | FB                         | As Marked |                                                                                                                                                                                                                                                            | X      | 385mL | 250-374 |
| R-1 100%-FB-Hex                                                       | 20 Unit R-1 100% - Run FB - Organic Impinger Contents   | FB                         | As Marked |                                                                                                                                                                                                                                                            | X      | 80mL  | 571     |
| R-1 100%-FB-CPM                                                       | 21 Unit R-1 100% - Run FB - CPM Filter                  | FB                         | N/A       |                                                                                                                                                                                                                                                            | X      |       |         |
| R-1 100%-B1-Acetone                                                   | 22 Unit R-1 100% - Blank - Acetone                      | 08/31/21                   | 200       |                                                                                                                                                                                                                                                            | X      | 420mL | 606     |
| R-1 100%-B2-DI Water                                                  | 23 Unit R-1 100% - Blank - DI Water                     | 08/31/21                   | 200       | X                                                                                                                                                                                                                                                          |        | 240mL | 100-658 |
| R-1 100%-B3-Hexane                                                    | 24 Unit R-1 100% - Blank - Hexane                       | 08/31/21                   | 200       |                                                                                                                                                                                                                                                            | X      | 430mL | 610     |

|                                                                                                  |                |                   |                                                                                                  |                |              |
|--------------------------------------------------------------------------------------------------|----------------|-------------------|--------------------------------------------------------------------------------------------------|----------------|--------------|
| <br>Signature | 9/2/21<br>Date | 2:00 @ 10<br>Time | <br>Signature | 9/3/21<br>Date | 9:00<br>Time |
| <br>Signature | Date           | Time              | <br>Signature | Date           | Time         |

catc-21-houston.tx-start#1-EG1-PM-100.xlsm

SD&L

**APPENDIX E**

**FUEL ANALYSIS RECORDS**

**Client:** Catalytic Combustion Corporation  
**Location:** Stewart & Stevenson Integration Center  
**Date:** July 29, 2021  
**Project #:** catc-21-houston.tx-start#1

#### Natural Gas - Fuel Analysis

Standardized to 68 deg F and 14.696 psia - EPA Standards

| Gas Component    |                                 | Mole (%)        | Molecular <sup>1</sup><br>Weight<br>(lb/lb-mole) | Lbs<br>Component<br>per Lb-Mole<br>of Gas | Wt. % of<br>Component | Ideal Gross <sup>1,3</sup><br>Heating Value<br>(Btu/ft <sup>3</sup> ) | Fuel Heat<br>Value [HHV]<br>(Btu/SCF) | Ideal Net <sup>1,3</sup><br>Heating Value<br>(Btu/ft <sup>3</sup> ) | Fuel Heat<br>Value [LHV]<br>(Btu/SCF) |
|------------------|---------------------------------|-----------------|--------------------------------------------------|-------------------------------------------|-----------------------|-----------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------|---------------------------------------|
| Methane          | CH <sub>4</sub>                 | 98.3548         | 16.0430                                          | 15.78                                     | 96.76                 | 994.85                                                                | 978.48                                | 895.75                                                              | 881.02                                |
| Ethane           | C <sub>2</sub> H <sub>6</sub>   | 1.1343          | 30.0700                                          | 0.34                                      | 2.09                  | 1,743.15                                                              | 19.77                                 | 1,594.41                                                            | 18.09                                 |
| Propane          | C <sub>3</sub> H <sub>8</sub>   | 0.0197          | 44.0970                                          | 0.01                                      | 0.05                  | 2,478.35                                                              | 0.49                                  | 2,280.17                                                            | 0.45                                  |
| iso-Butane       | iC <sub>4</sub> H <sub>10</sub> | 0.0005          | 58.1230                                          | 0.00                                      | 0.00                  | 3,203.11                                                              | 0.02                                  | 2,955.38                                                            | 0.01                                  |
| n-Butane         | nC <sub>4</sub> H <sub>10</sub> | 0.0005          | 58.1230                                          | 0.00                                      | 0.00                  | 3,213.35                                                              | 0.02                                  | 2,965.62                                                            | 0.01                                  |
| Iso-Pentane      | iC <sub>5</sub> H <sub>12</sub> | 0.0000          | 72.1500                                          | 0.00                                      | 0.00                  | 3,940.87                                                              | 0.00                                  | 3,643.50                                                            | 0.00                                  |
| n-Pentane        | nC <sub>5</sub> H <sub>12</sub> | 0.0000          | 72.1500                                          | 0.00                                      | 0.00                  | 3,948.75                                                              | 0.00                                  | 3,648.32                                                            | 0.00                                  |
| Hexanes          | C <sub>6</sub> H <sub>14</sub>  | 0.0001          | 86.1770                                          | 0.00                                      | 0.00                  | 4,684.54                                                              | 0.00                                  | 4,337.82                                                            | 0.00                                  |
| Heptanes         | C <sub>7</sub> H <sub>16</sub>  | 0.0000          | 100.2040                                         | 0.00                                      | 0.00                  | 5,419.94                                                              | 0.00                                  | 5,023.77                                                            | 0.00                                  |
| Octanes          | C <sub>8</sub> H <sub>18</sub>  | 0.0000          | 114.2310                                         | 0.00                                      | 0.00                  | 6,155.14                                                              | 0.00                                  | 5,709.23                                                            | 0.00                                  |
| Carbon Dioxide   | CO <sub>2</sub>                 | 0.2558          | 44.0100                                          | 0.11                                      | 0.69                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Nitrogen         | N <sub>2</sub>                  | 0.2239          | 28.0134                                          | 0.06                                      | 0.38                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Hydrogen Sulfide | H <sub>2</sub> S                | 0.0000          | 34.0800                                          | 0.00                                      | 0.00                  | 627.54                                                                | 0.00                                  | 578.00                                                              | 0.00                                  |
| Oxygen           | O <sub>2</sub>                  | 0.0057          | 31.9988                                          | 0.00                                      | 0.01                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Helium           | He                              | 0.0000          | 4.0026                                           | 0.00                                      | 0.00                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Hydrogen         | H <sub>2</sub>                  | 0.0047          | 2.0159                                           | 0.00                                      | 0.00                  | 319.34                                                                | 0.02                                  | 269.82                                                              | 0.01                                  |
| <b>Totals</b>    |                                 | <b>100.0000</b> |                                                  | <b>16.31</b>                              | <b>100.00</b>         | <b>dry</b>                                                            | <b>998.79</b>                         | <b>dry</b>                                                          | <b>899.60</b>                         |
|                  |                                 |                 |                                                  |                                           |                       | <b>wet<sup>2,5</sup></b>                                              | <b>975.76</b>                         | <b>wet<sup>2,5</sup></b>                                            | <b>878.86</b>                         |

| Characteristics of Fuel Gas        |                        |
|------------------------------------|------------------------|
| Molecular Weight of gas =          | 16.307 lb/lb-mole      |
| Btu per lb. of gas <sup>4</sup> =  | 23,595.430 gross (HHV) |
| Btu per lb. of gas <sup>4</sup> =  | 21,252.128 net (LHV)   |
| Density of fuel gas <sup>2</sup> = | 0.0423 lb/cu. ft       |
| Wt % VOC in fuel gas =             | 0.06 %                 |
| Specific Gravity <sup>1</sup> =    | 0.5630                 |

| Component    | Wt%           |
|--------------|---------------|
| carbon       | 74.35         |
| oxygen       | 0.51          |
| hydrogen     | 24.75         |
| nitrogen     | 0.38          |
| helium       | 0.00          |
| sulfur       | 0.00          |
| <b>Total</b> | <b>100.00</b> |

**F-Factor (SCF dry exhaust per MMBtu [HHV]) = 8,631.70**  
 (Based on EPA RM-19) at 68 deg F and 14.696 psia

#### F-Factor Calculation:

$$F\text{-Factor} = 1,000,000 \times ((3.64 \times \%H) + (1.53 \times \%C) + (0.57 \times \%S) + (0.14 \times \%N) - (0.46 \times \%O)) / GCV$$

GCV = Gross Btu per lb. of gas (HHV)

%H, %C, %S, %N, & %O are percent weight values calculated from fuel analysis and have units of (scf/lb)/%

Density of natural gas based on specific gravity multiplied by density of air at 68 deg F and 14.696 psia.

#### References:

<sup>1</sup> ASTM D 3588

<sup>2</sup> Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg

<sup>3</sup> Mark's Standard Handbook for Mechanical Engineers, 10th ed. - Eugene A. Avallone, Theodore Baumeister III

<sup>4</sup> Introduction to Fluid Mechanics, 3rd ed. - William S. Janna

<sup>5</sup> GPA Reference Bulletin 181-86, revised 1986, reprinted 1995



**Client:** Catalytic Combustion Corporation  
**Location:** Stewart & Stevenson Integration Center  
**Date:** July 30, 2021  
**Project #:** catc-21-houston.tx-start#1

#### Natural Gas - Fuel Analysis

Standardized to 68 deg F and 14.696 psia - EPA Standards

| Gas Component    |                                 | Mole (%)       | Molecular <sup>1</sup><br>Weight<br>(lb/lb-mole) | Lbs<br>Component<br>per Lb-Mole<br>of Gas | Wt. % of<br>Component | Ideal Gross <sup>1,3</sup><br>Heating Value<br>(Btu/ft <sup>3</sup> ) | Fuel Heat<br>Value [HHV]<br>(Btu/SCF) | Ideal Net <sup>1,3</sup><br>Heating Value<br>(Btu/ft <sup>3</sup> ) | Fuel Heat<br>Value [LHV]<br>(Btu/SCF) |
|------------------|---------------------------------|----------------|--------------------------------------------------|-------------------------------------------|-----------------------|-----------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------|---------------------------------------|
| Methane          | CH <sub>4</sub>                 | 98.2687        | 16.0430                                          | 15.77                                     | 96.57                 | 994.85                                                                | 977.62                                | 895.75                                                              | 880.25                                |
| Ethane           | C <sub>2</sub> H <sub>6</sub>   | 1.2050         | 30.0700                                          | 0.36                                      | 2.22                  | 1,743.15                                                              | 21.00                                 | 1,594.41                                                            | 19.21                                 |
| Propane          | C <sub>3</sub> H <sub>8</sub>   | 0.0205         | 44.0970                                          | 0.01                                      | 0.06                  | 2,478.35                                                              | 0.51                                  | 2,280.17                                                            | 0.47                                  |
| iso-Butane       | iC <sub>4</sub> H <sub>10</sub> | 0.0003         | 58.1230                                          | 0.00                                      | 0.00                  | 3,203.11                                                              | 0.01                                  | 2,955.38                                                            | 0.01                                  |
| n-Butane         | nC <sub>4</sub> H <sub>10</sub> | 0.0002         | 58.1230                                          | 0.00                                      | 0.00                  | 3,213.35                                                              | 0.01                                  | 2,965.62                                                            | 0.01                                  |
| Iso-Pentane      | iC <sub>5</sub> H <sub>12</sub> | 0.0000         | 72.1500                                          | 0.00                                      | 0.00                  | 3,940.87                                                              | 0.00                                  | 3,643.50                                                            | 0.00                                  |
| n-Pentane        | nC <sub>5</sub> H <sub>12</sub> | 0.0000         | 72.1500                                          | 0.00                                      | 0.00                  | 3,948.75                                                              | 0.00                                  | 3,648.32                                                            | 0.00                                  |
| Hexanes          | C <sub>6</sub> H <sub>14</sub>  | 0.0003         | 86.1770                                          | 0.00                                      | 0.00                  | 4,684.54                                                              | 0.01                                  | 4,337.82                                                            | 0.01                                  |
| Heptanes         | C <sub>7</sub> H <sub>16</sub>  | 0.0000         | 100.2040                                         | 0.00                                      | 0.00                  | 5,419.94                                                              | 0.00                                  | 5,023.77                                                            | 0.00                                  |
| Octanes          | C <sub>8</sub> H <sub>18</sub>  | 0.0000         | 114.2310                                         | 0.00                                      | 0.00                  | 6,155.14                                                              | 0.00                                  | 5,709.23                                                            | 0.00                                  |
| Carbon Dioxide   | CO <sub>2</sub>                 | 0.2992         | 44.0100                                          | 0.13                                      | 0.81                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Nitrogen         | N <sub>2</sub>                  | 0.1976         | 28.0134                                          | 0.06                                      | 0.34                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Hydrogen Sulfide | H <sub>2</sub> S                | 0.0000         | 34.0800                                          | 0.00                                      | 0.00                  | 627.54                                                                | 0.00                                  | 578.00                                                              | 0.00                                  |
| Oxygen           | O <sub>2</sub>                  | 0.0033         | 31.9988                                          | 0.00                                      | 0.01                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Helium           | He                              | 0.0000         | 4.0026                                           | 0.00                                      | 0.00                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Hydrogen         | H <sub>2</sub>                  | 0.0049         | 2.0159                                           | 0.00                                      | 0.00                  | 319.34                                                                | 0.02                                  | 269.82                                                              | 0.01                                  |
| <b>Totals</b>    |                                 | <b>100.000</b> |                                                  | <b>16.33</b>                              | <b>100.00</b>         | <b>dry</b>                                                            | <b>999.18</b>                         | <b>dry</b>                                                          | <b>899.97</b>                         |
|                  |                                 |                |                                                  |                                           |                       | <b>wet<sup>2,5</sup></b>                                              | <b>976.14</b>                         | <b>wet<sup>2,5</sup></b>                                            | <b>879.22</b>                         |

| Characteristics of Fuel Gas        |                        |
|------------------------------------|------------------------|
| Molecular Weight of gas =          | 16.325 lb/lb-mole      |
| Btu per lb. of gas <sup>4</sup> =  | 23,577.669 gross (HHV) |
| Btu per lb. of gas <sup>4</sup> =  | 21,236.549 net (LHV)   |
| Density of fuel gas <sup>2</sup> = | 0.0424 lb/cu. ft       |
| Wt % VOC in fuel gas =             | 0.06 %                 |
| Specific Gravity <sup>1</sup> =    | 0.5637                 |

| Component    | Wt%           |
|--------------|---------------|
| carbon       | 74.34         |
| oxygen       | 0.59          |
| hydrogen     | 24.73         |
| nitrogen     | 0.34          |
| helium       | 0.00          |
| sulfur       | 0.00          |
| <b>Total</b> | <b>100.00</b> |

**F-Factor (SCF dry exhaust per MMBtu [HHV]) = 8,632.09**  
 (Based on EPA RM-19) at 68 deg F and 14.696 psia

#### F-Factor Calculation:

$$F\text{-Factor} = 1,000,000 * ((3.64 * \%H) + (1.53 * \%C) + (0.57 * \%S) + (0.14 * \%N) - (0.46 * \%O)) / GCV$$

GCV = Gross Btu per lb. of gas (HHV)

%H, %C, %S, %N, & %O are percent weight values calculated from fuel analysis and have units of (scf/lb)/%

Density of natural gas based on specific gravity multiplied by density of air at 68 deg F and 14.696 psia.

#### References:

<sup>1</sup> ASTM D 3588

<sup>2</sup> Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg

<sup>3</sup> Mark's Standard Handbook for Mechanical Engineers, 10th ed. - Eugene A. Avallone, Theodore Baumeister III

<sup>4</sup> Introduction to Fluid Mechanics, 3rd ed. - William S. Janna

<sup>5</sup> GPA Reference Bulletin 181-86, revised 1986, reprinted 1995

**Client:** Catalytic Combustion Corporation  
**Location:** Stewart & Stevenson Integration Center  
**Date:** August 31, 2021  
**Project #:** catc-21-houston.tx-start#1

#### Natural Gas - Fuel Analysis

Standardized to 68 deg F and 14.696 psia - EPA Standards

| Gas Component    |                                 | Mole (%)        | Molecular <sup>1</sup><br>Weight<br>(lb/lb-mole) | Lbs<br>Component<br>per Lb-Mole<br>of Gas | Wt. % of<br>Component | Ideal Gross <sup>1,3</sup><br>Heating Value<br>(Btu/ft <sup>3</sup> ) | Fuel Heat<br>Value [HHV]<br>(Btu/SCF) | Ideal Net <sup>1,3</sup><br>Heating Value<br>(Btu/ft <sup>3</sup> ) | Fuel Heat<br>Value [LHV]<br>(Btu/SCF) |
|------------------|---------------------------------|-----------------|--------------------------------------------------|-------------------------------------------|-----------------------|-----------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------|---------------------------------------|
| Methane          | CH <sub>4</sub>                 | 98.4117         | 16.0430                                          | 15.79                                     | 96.85                 | 994.85                                                                | 979.04                                | 895.75                                                              | 881.53                                |
| Ethane           | C <sub>2</sub> H <sub>6</sub>   | 1.0600          | 30.0700                                          | 0.32                                      | 1.96                  | 1,743.15                                                              | 18.48                                 | 1,594.41                                                            | 16.90                                 |
| Propane          | C <sub>3</sub> H <sub>8</sub>   | 0.0198          | 44.0970                                          | 0.01                                      | 0.05                  | 2,478.35                                                              | 0.49                                  | 2,280.17                                                            | 0.45                                  |
| iso-Butane       | iC <sub>4</sub> H <sub>10</sub> | 0.0003          | 58.1230                                          | 0.00                                      | 0.00                  | 3,203.11                                                              | 0.01                                  | 2,955.38                                                            | 0.01                                  |
| n-Butane         | nC <sub>4</sub> H <sub>10</sub> | 0.0002          | 58.1230                                          | 0.00                                      | 0.00                  | 3,213.35                                                              | 0.01                                  | 2,965.62                                                            | 0.01                                  |
| Iso-Pentane      | iC <sub>5</sub> H <sub>12</sub> | 0.0000          | 72.1500                                          | 0.00                                      | 0.00                  | 3,940.87                                                              | 0.00                                  | 3,643.50                                                            | 0.00                                  |
| n-Pentane        | nC <sub>5</sub> H <sub>12</sub> | 0.0000          | 72.1500                                          | 0.00                                      | 0.00                  | 3,948.75                                                              | 0.00                                  | 3,648.32                                                            | 0.00                                  |
| Hexanes          | C <sub>6</sub> H <sub>14</sub>  | 0.0000          | 86.1770                                          | 0.00                                      | 0.00                  | 4,684.54                                                              | 0.00                                  | 4,337.82                                                            | 0.00                                  |
| Heptanes         | C <sub>7</sub> H <sub>16</sub>  | 0.0000          | 100.2040                                         | 0.00                                      | 0.00                  | 5,419.94                                                              | 0.00                                  | 5,023.77                                                            | 0.00                                  |
| Octanes          | C <sub>8</sub> H <sub>18</sub>  | 0.0000          | 114.2310                                         | 0.00                                      | 0.00                  | 6,155.14                                                              | 0.00                                  | 5,709.23                                                            | 0.00                                  |
| Carbon Dioxide   | CO <sub>2</sub>                 | 0.2813          | 44.0100                                          | 0.12                                      | 0.76                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Nitrogen         | N <sub>2</sub>                  | 0.2106          | 28.0134                                          | 0.06                                      | 0.36                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Hydrogen Sulfide | H <sub>2</sub> S                | 0.0000          | 34.0800                                          | 0.00                                      | 0.00                  | 627.54                                                                | 0.00                                  | 578.00                                                              | 0.00                                  |
| Oxygen           | O <sub>2</sub>                  | 0.0115          | 31.9988                                          | 0.00                                      | 0.02                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Helium           | He                              | 0.0000          | 4.0026                                           | 0.00                                      | 0.00                  | 0.00                                                                  | 0.00                                  | 0.00                                                                | 0.00                                  |
| Hydrogen         | H <sub>2</sub>                  | 0.0046          | 2.0159                                           | 0.00                                      | 0.00                  | 319.34                                                                | 0.01                                  | 269.82                                                              | 0.01                                  |
| <b>Totals</b>    |                                 | <b>100.0000</b> |                                                  | <b>16.30</b>                              | <b>100.00</b>         | <b>dry</b>                                                            | <b>998.04</b>                         | <b>dry</b>                                                          | <b>898.91</b>                         |
|                  |                                 |                 |                                                  |                                           |                       | <b>wet<sup>2,5</sup></b>                                              | <b>975.03</b>                         | <b>wet<sup>2,5</sup></b>                                            | <b>878.18</b>                         |

| Characteristics of Fuel Gas        |                        |
|------------------------------------|------------------------|
| Molecular Weight of gas =          | 16.303 lb/lb-mole      |
| Btu per lb. of gas <sup>4</sup> =  | 23,583.835 gross (HHV) |
| Btu per lb. of gas <sup>4</sup> =  | 21,241.243 net (LHV)   |
| Density of fuel gas <sup>2</sup> = | 0.0423 lb/cu. ft       |
| Wt % VOC in fuel gas =             | 0.06 %                 |
| Specific Gravity <sup>1</sup> =    | 0.5629                 |

| Component    | Wt%           |
|--------------|---------------|
| carbon       | 74.32         |
| oxygen       | 0.57          |
| hydrogen     | 24.74         |
| nitrogen     | 0.36          |
| helium       | 0.00          |
| sulfur       | 0.00          |
| <b>Total</b> | <b>100.00</b> |

**F-Factor (SCF dry exhaust per MMBtu [HHV]) = 8,631.42**  
 (Based on EPA RM-19) at 68 deg F and 14.696 psia

#### F-Factor Calculation:

$$F\text{-Factor} = 1,000,000 \times ((3.64 \times \%H) + (1.53 \times \%C) + (0.57 \times \%S) + (0.14 \times \%N) - (0.46 \times \%O)) / GCV$$

GCV = Gross Btu per lb. of gas (HHV)

%H, %C, %S, %N, & %O are percent weight values calculated from fuel analysis and have units of (scf/lb)/%

Density of natural gas based on specific gravity multiplied by density of air at 68 deg F and 14.696 psia.

#### References:

<sup>1</sup> ASTM D 3588

<sup>2</sup> Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg

<sup>3</sup> Mark's Standard Handbook for Mechanical Engineers, 10th ed. - Eugene A. Avallone, Theodore Baumeister III

<sup>4</sup> Introduction to Fluid Mechanics, 3rd ed. - William S. Janna

<sup>5</sup> GPA Reference Bulletin 181-86, revised 1986, reprinted 1995



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10630 FALLSTONE RD. HOUSTON, TEXAS 77099  
P.O. BOX 741905, HOUSTON, TEXAS 77274

TEL: (281) 495-2400

FAX: (281) 495-2410

|                 |                                                |                    |                 |
|-----------------|------------------------------------------------|--------------------|-----------------|
| CLIENT:         | Air Hygiene International                      | REQUESTED BY:      | Dr. Sean Barnes |
| CLIENT PROJECT: | catc-21-houston-start#1                        | PURCHASE ORDER NO: | PENDING         |
| LABORATORY NO:  | 95248-001                                      | REPORT DATE:       | August 06, 2021 |
| SAMPLE:         | Natural Gas (Primary # 4651) (4651) 2021-07-29 |                    |                 |

## Composition of Natural Gas by Gas Chromatography (TCD/FID), GPA 2261

|                | <u>Results, Mol %</u> |
|----------------|-----------------------|
| Hydrogen       | 0.0047                |
| Oxygen         | 0.0057                |
| Nitrogen       | 0.2239                |
| Carbon Dioxide | 0.2558                |
| Methane        | 98.3548               |
| Ethane         | 1.1343                |
| Propane        | 0.0197                |
| iso-Butane     | 0.0005                |
| n-Butane       | 0.0005                |
| iso-Pentane    | 0.0000                |
| n-Pentane      | 0.0000                |
| Hexane Plus    | 0.0001                |
| <b>TOTAL</b>   | <b>100.0000</b>       |

## Calorific Value and Specific Gravity, Calculated at 14.696 psia and 60°F, ASTM D 3588.e

|                            | <u>Results</u> |
|----------------------------|----------------|
| NET (Dry basis), BTU/scf   | 913.3          |
| Gross (Dry basis), BTU/scf | 1,014          |
| NET (Dry basis), BTU/lb    | 21,257         |
| Gross (Dry basis), BTU/lb  | 23,599         |

## Calorific Value and Specific Gravity, Calculated at 14.696 psia and 68°F, ASTM D 3588.e

|                            | <u>Results</u> |
|----------------------------|----------------|
| NET (Dry basis), BTU/scf   | 899.5          |
| Gross (Dry basis), BTU/scf | 998.6          |
| NET (Dry basis), BTU/lb    | 21,257         |
| Gross (Dry basis), BTU/lb  | 23,599         |

Cert # L19-636,C2018-02457

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|                        |                                                |                           |                 |
|------------------------|------------------------------------------------|---------------------------|-----------------|
| <b>CLIENT:</b>         | Air Hygiene International                      | <b>REQUESTED BY:</b>      | Dr. Sean Barnes |
| <b>CLIENT PROJECT:</b> | catc-21-houston-start#1                        | <b>PURCHASE ORDER NO:</b> | PENDING         |
| <b>LABORATORY NO:</b>  | 95248-001                                      | <b>REPORT DATE:</b>       | August 06, 2021 |
| <b>SAMPLE:</b>         | Natural Gas (Primary # 4651) (4651) 2021-07-29 |                           |                 |

Respectfully submitted  
For Texas OilTech Laboratories, L.P.

Mr. Ikenna "Ike" Ezeji  
Laboratory Director

Cert # L19-636,C2018-02457

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|                 |                                                 |                    |                 |
|-----------------|-------------------------------------------------|--------------------|-----------------|
| CLIENT:         | Air Hygiene International                       | REQUESTED BY:      | Dr. Sean Barnes |
| CLIENT PROJECT: | catc-21-houston-start#1                         | PURCHASE ORDER NO: | PENDING         |
| LABORATORY NO:  | 95248-003                                       | REPORT DATE:       | August 06, 2021 |
| SAMPLE:         | Natural Gas (Primary # 4893) (4893 ) 2021-07-30 |                    |                 |

## Composition of Natural Gas by Gas Chromatography (TCD/FID), GPA 2261

|                | <u>Results, Mol %</u> |
|----------------|-----------------------|
| Hydrogen       | 0.0049                |
| Oxygen         | 0.0033                |
| Nitrogen       | 0.1976                |
| Carbon Dioxide | 0.2992                |
| Methane        | 98.2687               |
| Ethane         | 1.2050                |
| Propane        | 0.0205                |
| iso-Butane     | 0.0003                |
| n-Butane       | 0.0002                |
| iso-Pentane    | 0.0000                |
| n-Pentane      | 0.0000                |
| Hexane Plus    | 0.0003                |
| <b>TOTAL</b>   | <b>100.0000</b>       |

## Calorific Value and Specific Gravity, Calculated at 14.696 psia and 60°F, ASTM D 3588.e

|                            | <u>Results</u> |
|----------------------------|----------------|
| NET (Dry basis), BTU/scf   | 913.7          |
| Gross (Dry basis), BTU/scf | 1,014          |
| NET (Dry basis), BTU/lb    | 21,241         |
| Gross (Dry basis), BTU/lb  | 23,581         |

## Calorific Value and Specific Gravity, Calculated at 14.696 psia and 68°F, ASTM D 3588.e

|                            | <u>Results</u> |
|----------------------------|----------------|
| NET (Dry basis), BTU/scf   | 899.8          |
| Gross (Dry basis), BTU/scf | 999.0          |
| NET (Dry basis), BTU/lb    | 21,241         |
| Gross (Dry basis), BTU/lb  | 23,581         |

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**FAX: (281) 495-2410**

|                        |                                                 |                           |                 |
|------------------------|-------------------------------------------------|---------------------------|-----------------|
| <b>CLIENT:</b>         | Air Hygiene International                       | <b>REQUESTED BY:</b>      | Dr. Sean Barnes |
| <b>CLIENT PROJECT:</b> | catc-21-houston-start#1                         | <b>PURCHASE ORDER NO:</b> | PENDING         |
| <b>LABORATORY NO:</b>  | 95248-003 Page 2 of 2                           | <b>REPORT DATE:</b>       | August 06, 2021 |
| <b>SAMPLE:</b>         | Natural Gas (Primary # 4893) (4893 ) 2021-07-30 |                           |                 |

Respectfully submitted  
For Texas OilTech Laboratories, L.P.

Mr. Ikenna "Ike" Ezeji  
Laboratory Director

Cert # L19-636,C2018-02457

Quality Management System Certified to ISO 9001:2015, and ISO/IEC 17025:2017

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**Conversion Factors (Gas Analysis) to adjust BTU/ft<sup>3</sup> and Sulfur content @60°F and 68°F**

NET (Dry Basis) BTU/scf @60°F, factor= 1

NET (Dry Basis) BTU/scf @68°F, factor= 0.984839

Gross (Dry Basis) BTU/scf @60°F, factor = 1

Gross (Dry Basis) BTU/scf @68°F, factor = 0.984839

NET (Dry Basis) BTU/lb @60°F, factor = 1

NET (Dry Basis) BTU/lb @68°F, factor = 1

GROSS (Dry Basis) BTU/lb @60°F, factor= 1

GROSS (Dry Basis) BTU/lb @68°F, factor= 1

Sulfur Total Volatile, ASTM D 6667 @60°F, wt% or ppmwt, factor= 1

Sulfur Total Volatile, ASTM D 6667 @68°F, wt% or ppmwt, factor= 0.984839

Sulfur Total Volatile, ASTM D 6667 @60°F, grains/100scf = ppmwt @60°F x 0.0300

Sulfur Total Volatile, ASTM D 6667 @68°F, grains/100scf = ppmwt @60°F x 0.0295

**Conversion Factors (Liquid Fuel Analysis)**

Liquid Fuel BTU/lb @60°F= Liquid fuel BTU/lb @68°F



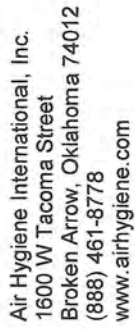
Cert. No.: 0005085, 17025

Quality Management System Certified to ISO 9001:2008, and ISO 17025:2005

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pmcgovern@airhygiene.com

Relinquished by: (Signature)





# Certificate of Analysis

SINCE 1985

Quality Controlled Through Analysis

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P.O. BOX 741905, HOUSTON, TEXAS 77274

TEL: (281) 495-2400

FAX: (281) 495-2410

|                 |                                     |                    |                    |
|-----------------|-------------------------------------|--------------------|--------------------|
| CLIENT:         | Air Hygiene International           | REQUESTED BY:      | Dr. Sean Barnes    |
| CLIENT PROJECT: | catc-21-Houston-Tx-Start#1          | PURCHASE ORDER NO: | 21011220           |
| LABORATORY NO:  | 95477-001                           | REPORT DATE:       | September 08, 2021 |
| SAMPLE:         | Primary Fuel line (3713) 2021-08-31 |                    |                    |

## TEST

## RESULT

### Composition of Natural Gas by Gas Chromatography (TCD/FID), GPA 2261

|                | <u>Results, Mol %</u> |
|----------------|-----------------------|
| Hydrogen       | 0.0046                |
| Oxygen         | 0.0115                |
| Nitrogen       | 0.2106                |
| Carbon Dioxide | 0.2813                |
| Methane        | 98.4117               |
| Ethane         | 1.0600                |
| Propane        | 0.0198                |
| iso-Butane     | 0.0003                |
| n-Butane       | 0.0002                |
| iso-Pentane    | 0.0000                |
| n-Pentane      | 0.0000                |
| Hexane Plus    | 0.0000                |
| <b>TOTAL</b>   | <b>100.0000</b>       |

### Calorific Value and Specific Gravity, Calculated at 14.696 psia and 60°F, ASTM D 3588.e

|                            | <u>Results</u> |
|----------------------------|----------------|
| NET (Dry basis), BTU/scf   | 912.6          |
| Gross (Dry basis), BTU/scf | 1,013          |
| NET (Dry basis), BTU/lb    | 21,246         |
| Gross (Dry basis), BTU/lb  | 23,587         |

### Calorific Value and Specific Gravity, Calculated at 14.696 psia and 68°F, ASTM D 3588.e

|                            | <u>Results</u> |
|----------------------------|----------------|
| NET (Dry basis), BTU/scf   | 898.8          |
| Gross (Dry basis), BTU/scf | 997.9          |
| NET (Dry basis), BTU/lb    | 21,246         |
| Gross (Dry basis), BTU/lb  | 23,587         |

Respectfully submitted  
For Texas OilTech Laboratories, L.P.

Mr. Ikenna "Ike" Ezeji  
Laboratory Director

Cert # L19-636,C2018-02457

Quality Management System Certified to ISO 9001:2015, and ISO/IEC 17025:2017

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**TEL: (281) 495-2400**

**FAX: (281) 495-2410**

**Conversion Factors (Gas Analysis) to adjust BTU/ft<sup>3</sup> and Sulfur content @60°F and 68°F**

NET (Dry Basis) BTU/scf @60°F, factor= 1

NET (Dry Basis) BTU/scf @68°F, factor= 0.984839

Gross (Dry Basis) BTU/scf @60°F, factor = 1

Gross (Dry Basis) BTU/scf @68°F, factor = 0.984839

NET (Dry Basis) BTU/lb @60°F, factor = 1

NET (Dry Basis) BTU/lb @68°F, factor = 1

GROSS (Dry Basis) BTU/lb @60°F, factor= 1

GROSS (Dry Basis) BTU/lb @68°F, factor= 1

Sulfur Total Volatile, ASTM D 6667 @60°F, wt% or ppmwt, factor= 1

Sulfur Total Volatile, ASTM D 6667 @68°F, wt% or ppmwt, factor= 0.984839

Sulfur Total Volatile, ASTM D 6667 @60°F, grains/100scf = ppmwt @60°F x 0.0300

Sulfur Total Volatile, ASTM D 6667 @68°F, grains/100scf = ppmwt @60°F x 0.0295

**Conversion Factors (Liquid Fuel Analysis)**

Liquid Fuel BTU/lb @60°F= Liquid fuel BTU/lb @68°F

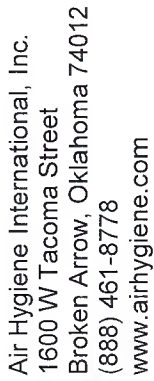


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## SAMPLE DESCRIPTION AND CHAIN OF CUSTODY RECORD

Project Number: catc-21-houston.tx-start#1

Laboratory Analysis Requested: Fuel analysis

Person Taking Samples: MM

GPA-2261-M

| Sample Number | Location                          | Date   | Volume | Analysis Method |  |  |
|---------------|-----------------------------------|--------|--------|-----------------|--|--|
|               |                                   |        |        | GPA-2261-M      |  |  |
| 3713          | Primary Fuel Line                 | 31-Aug | 2000   | X               |  |  |
| 4108          | Primary Fuel Line (Backup Sample) | 31-Aug | 2000   | X (If needed)   |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |
|               |                                   |        |        |                 |  |  |

Relinquished by: (Signature)

Date: 9/2/2021 Time: 21:00

Received by: (Signature) 

Date: 9/3/21

Time: 9:00

Relinquished by: (Signature)

Time:

Received by: (Signature)

Date: 9/7/21

Time: 9:10

**APPENDIX F**

**STRATIFICATION TEST DATA**

| Source Information |                                          |
|--------------------|------------------------------------------|
| <b>Company</b>     | Catalytic Combustion                     |
| <b>Plant Name</b>  | Stewart and Stevenson Integration Center |
| <b>Equipment</b>   | Caterpillar engine                       |
| <b>Location</b>    | Houston, Texas                           |

| Test Information                 |                            |
|----------------------------------|----------------------------|
| <b>Date</b>                      | 07/29/21                   |
| <b>Project #</b>                 | catc-21-houston.tx-start#1 |
| <b>Unit Number</b>               | G3520 TALE                 |
| <b>Load</b>                      | 50%                        |
| <b>Number of Ports Available</b> | 2                          |
| <b>Number of Ports Used</b>      | 2                          |

| Stack and Test Type                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="radio"/> Isokinetic Traverse (Wet Chemistry Testing)<br><input type="radio"/> Velocity Traverse (Flow and Flow RATA Test)<br><input checked="" type="radio"/> <b>Stratification Traverse (Compliance Test)</b><br><input type="radio"/> Stratification Traverse (RATA) | <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> RM 20<br/> <input type="checkbox"/> Part 60<br/> <input type="checkbox"/> Part 75 </div> <div style="text-align: center;"> <b>Circular<br/>Stack</b> </div> </div> |

Created with Traverse-AHI v20200108

catc-21-houston.tx-start#1-EG1-Strat

# METHOD 1 - STRATIFICATION TEST FOR A CIRCULAR SOURCE

|                   |                                          |                             |                            |
|-------------------|------------------------------------------|-----------------------------|----------------------------|
| <b>Company</b>    | Catalytic Combustion                     | <b>Date</b>                 | 07/29/21                   |
| <b>Plant Name</b> | Stewart and Stevenson Integration Center | <b>Project #</b>            | catc-21-houston.tx-start#1 |
| <b>Equipment</b>  | Caterpillar engine                       | <b># of Ports Available</b> | 2                          |
| <b>Location</b>   | Houston, Texas                           | <b># of Ports Used</b>      | 2                          |

| Circular Stack or Duct Diameter |                    |       |                 |
|---------------------------------|--------------------|-------|-----------------|
| Distance to Far Wall of Stack   | (L <sub>fw</sub> ) | 32.00 | in.             |
| Distance to Near Wall of Stack  | (L <sub>nw</sub> ) | 0.125 | in.             |
| Diameter of Stack               | (D)                | 31.88 | in.             |
| Area of Stack                   | (A <sub>s</sub> )  | 5.54  | ft <sup>2</sup> |

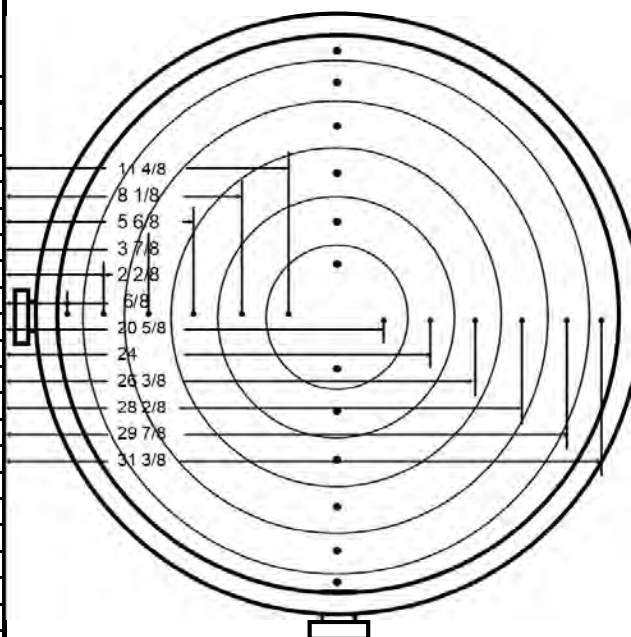
| Distance from Disturbances to Port |                   |       |           |
|------------------------------------|-------------------|-------|-----------|
| Distance Upstream                  | (A)               | 16.00 | in.       |
| Diameters Upstream                 | (A <sub>D</sub> ) | 0.50  | diameters |
| Distance Downstream                | (B)               | 64.00 | in.       |
| Diameters Downstream               | (B <sub>D</sub> ) | 2.01  | diameters |

| Number of Traverse Points Required                                                                            |                      |                                |                      |                     |            |
|---------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------|----------------------|---------------------|------------|
| Diameters to                                                                                                  |                      | Minimum Number of <sup>1</sup> |                      | Minimum Number of   |            |
| Flow Disturbance                                                                                              |                      | Traverse Points                |                      | Traverse Points     |            |
| Down (B <sub>D</sub> )                                                                                        | Up (A <sub>D</sub> ) | Particulate                    | Velocity             | Comp Stratification |            |
| Stream                                                                                                        | Stream               | Points                         | Points               | Criteria            | Points     |
| 2.00-4.99                                                                                                     | 0.50-1.24            | 24                             | 16                   | RM 7E 8.1.2         | 12 RM1 pts |
| 5.00-5.99                                                                                                     | 1.25-1.49            | 20                             | 16                   | Alt 7E 8.1.2        | 3 points   |
| 6.00-6.99                                                                                                     | 1.50-1.74            | 16                             | 12                   | 12 points           |            |
| 7.00-7.99                                                                                                     | 1.75-1.99            | 12                             | 12                   |                     |            |
| >= 8.00                                                                                                       | >=2.00               | 8 or 12 <sup>2</sup>           | 8 or 12 <sup>2</sup> | Minimum Number of   |            |
| Upstream Spec                                                                                                 |                      | 24                             | 16                   | Traverse Points     |            |
| Downstream Spec                                                                                               |                      | 24                             | 16                   | RATA Stratification |            |
| Traverse Pts Required                                                                                         |                      | 24                             | 16                   | Criteria            | Points     |
| <sup>1</sup> Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest. |                      |                                |                      | Part75/60           | 12 RM1 pts |
|                                                                                                               |                      |                                |                      | 75 abrv (a)         | 3 points   |
|                                                                                                               |                      |                                |                      | 75 abrv (b)         | 6 points   |
| <sup>2</sup> 8 for Circular Stacks 12 to 24 inches<br>12 for Circular Stacks over 24 inches                   |                      |                                |                      |                     |            |
|                                                                                                               |                      |                                |                      |                     |            |

| Number of Traverse Points Used |          |    |            |                         |
|--------------------------------|----------|----|------------|-------------------------|
| 2                              | Ports by | 12 | Pts / port | Stratification Traverse |
| 24                             | Pts Used | 12 | Required   | (Compliance Test)       |

| Traverse Point Locations |                           |                           |                                     |
|--------------------------|---------------------------|---------------------------|-------------------------------------|
| Traverse Point Number    | Percent of Stack Diameter | Distance from Inside Wall | Distance Including Reference Length |
|                          | %                         | in.                       | in.                                 |
| 1                        | 2.1%                      | 5/8                       | 6/8                                 |
| 2                        | 6.7%                      | 2 1/8                     | 2 2/8                               |
| 3                        | 11.8%                     | 3 6/8                     | 3 7/8                               |
| 4                        | 17.7%                     | 5 5/8                     | 5 6/8                               |
| 5                        | 25.0%                     | 8                         | 8 1/8                               |
| 6                        | 35.6%                     | 11 3/8                    | 11 4/8                              |
| 7                        | 64.4%                     | 20 4/8                    | 20 5/8                              |
| 8                        | 75.0%                     | 23 7/8                    | 24                                  |
| 9                        | 82.3%                     | 26 2/8                    | 26 3/8                              |
| 10                       | 88.2%                     | 28 1/8                    | 28 2/8                              |
| 11                       | 93.3%                     | 29 6/8                    | 29 7/8                              |
| 12                       | 97.9%                     | 31 2/8                    | 31 3/8                              |
| 13                       |                           |                           |                                     |
| 14                       |                           |                           |                                     |
| 15                       |                           |                           |                                     |
| 16                       |                           |                           |                                     |
| 17                       |                           |                           |                                     |
| 18                       |                           |                           |                                     |
| 19                       |                           |                           |                                     |
| 20                       |                           |                           |                                     |
| 21                       |                           |                           |                                     |
| 22                       |                           |                           |                                     |
| 23                       |                           |                           |                                     |
| 24                       |                           |                           |                                     |

Adjust Sample Points Out of Boundary Layer



# STRATIFICATION TRAVERSE (COMPLIANCE TEST) RESULTS

|                   |                                          |                             |                            |
|-------------------|------------------------------------------|-----------------------------|----------------------------|
| <b>Company</b>    | Catalytic Combustion                     | <b>Date</b>                 | 07/29/21                   |
| <b>Plant Name</b> | Stewart and Stevenson Integration Center | <b>Project #</b>            | catc-21-houston.tx-start#1 |
| <b>Equipment</b>  | Caterpillar engine                       | <b># of Ports Available</b> | 2                          |
| <b>Location</b>   | Houston, Texas                           | <b># of Ports Used</b>      | 2                          |

| Stack Dimensions                   |                   |       |                 | Traverse Data    |                 |                |                   |
|------------------------------------|-------------------|-------|-----------------|------------------|-----------------|----------------|-------------------|
| <b>Diameter or Length of Stack</b> | (D)               | 31.88 | in.             | 2                | <b>Ports by</b> | 12             | <b>Pts / port</b> |
| <b>Width of Stack</b>              | (W)               |       | in.             | 24               | <b>Pts Used</b> | 12             | <b>Required</b>   |
| <b>Area of Stack</b>               | (A <sub>s</sub> ) | 5.54  | ft <sup>2</sup> | <b>Run Start</b> | 11:00:23        | <b>Run End</b> | 12:10:23          |

| Traverse Point | Time Per Point | Point Start Time | Point Stop Time (Reading) | O <sub>2</sub> | Percent Difference | NOx  | Percent Difference |
|----------------|----------------|------------------|---------------------------|----------------|--------------------|------|--------------------|
|                | min.           | hh:mm:ss         | hh:mm:ss                  | %              | %                  | ppm  | %                  |
| B-12           | 2.50           | 11:00:23         | 11:02:53                  | 8.90           | 0.44%              | 4.85 | 4.17%              |
| B-11           | 2.50           | 11:02:53         | 11:05:23                  | 8.89           | 0.55%              | 4.62 | 0.77%              |
| B-10           | 2.50           | 11:05:23         | 11:07:53                  | 8.88           | 0.67%              | 4.59 | 1.42%              |
| B-9            | 2.50           | 11:07:53         | 11:10:23                  | 8.88           | 0.67%              | 4.84 | 3.95%              |
| B-8            | 2.50           | 11:10:23         | 11:12:53                  | 8.88           | 0.67%              | 4.27 | 8.29%              |
| B-7            | 2.50           | 11:12:53         | 11:15:23                  | 8.87           | 0.78%              | 4.74 | 1.80%              |
| B-6            | 2.50           | 11:15:23         | 11:17:53                  | 8.88           | 0.67%              | 4.36 | 6.36%              |
| B-5            | 2.50           | 11:17:53         | 11:20:23                  | 8.90           | 0.44%              | 4.02 | 13.66%             |
| B-4            | 2.50           | 11:20:23         | 11:22:53                  | 8.88           | 0.67%              | 3.77 | 19.03%             |
| B-3            | 2.50           | 11:22:53         | 11:25:23                  | 8.87           | 0.78%              | 4.04 | 13.23%             |
| B-2            | 2.50           | 11:25:23         | 11:27:53                  | 8.92           | 0.22%              | 3.65 | 21.61%             |
| B-1            | 2.50           | 11:27:53         | 11:30:23                  | 8.90           | 0.44%              | 3.47 | <b>25.47%</b>      |
| A-12           | 2.50           | 11:40:23         | 11:42:53                  | 9.00           | 0.68%              | 5.32 | 14.26%             |
| A-11           | 2.50           | 11:42:53         | 11:45:23                  | 8.96           | 0.23%              | 5.01 | 7.60%              |
| A-10           | 2.50           | 11:45:23         | 11:47:53                  | 8.95           | 0.12%              | 4.54 | 2.49%              |
| A-9            | 2.50           | 11:47:53         | 11:50:23                  | 8.94           | 0.00%              | 4.76 | 2.23%              |
| A-8            | 2.50           | 11:50:23         | 11:52:53                  | 8.91           | 0.33%              | 4.53 | 2.71%              |
| A-7            | 2.50           | 11:52:53         | 11:55:23                  | 8.89           | 0.55%              | 4.26 | 8.51%              |
| A-6            | 2.50           | 11:55:23         | 11:57:53                  | 8.92           | 0.22%              | 4.79 | 2.88%              |
| A-5            | 2.50           | 11:57:53         | 12:00:23                  | 8.88           | 0.67%              | 4.64 | 0.34%              |
| A-4            | 2.50           | 12:00:23         | 12:02:53                  | 8.88           | 0.67%              | 5.47 | 17.48%             |
| A-3            | 2.50           | 12:02:53         | 12:05:23                  | 9.09           | 1.68%              | 5.74 | 23.28%             |
| A-2            | 2.50           | 12:05:23         | 12:07:53                  | 9.14           | 2.24%              | 5.80 | 24.66%             |
| A-1            | 2.50           | 12:07:53         | 12:10:23                  | 9.34           | <b>4.48%</b>       | 5.66 | 21.56%             |
| <b>Average</b> |                |                  |                           | 8.94           |                    | 4.66 |                    |

side

front

|                                                           |                        |   | O <sub>2</sub>                 |                | NOx                          |                | <b>AND criteria</b>                                                                                                                         |
|-----------------------------------------------------------|------------------------|---|--------------------------------|----------------|------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           |                        |   | <b>Criteria</b>                | <b>Results</b> | <b>Criteria</b>              | <b>Results</b> |                                                                                                                                             |
| <b>Strat Method 7E</b>                                    | Non-Stratified %       | ≤ | 5%                             | Non (%)        | 5%                           |                | Under Method 7E criteria at least one measured pollutant or diluent demonstrates a stratified stack with subsequent testing from 12 points. |
|                                                           | Non-Stratified Δ       | ≤ | 0.3                            |                | 0.5                          |                |                                                                                                                                             |
|                                                           | Minimally-Stratified % | ≤ | 10%                            |                | 10%                          |                |                                                                                                                                             |
|                                                           | Minimally-Stratified Δ | ≤ | 0.5                            |                | 1                            |                |                                                                                                                                             |
|                                                           | Stratified             | > | 10%                            |                | 10%                          | Strat (%)      |                                                                                                                                             |
| <b>Outcome Location</b>                                   |                        |   | 1 point<br>closest to the mean |                | 12 points<br>Method 1 points |                |                                                                                                                                             |
| <b>Maximum Concentration</b>                              |                        |   | 9.34                           |                | 5.80                         |                |                                                                                                                                             |
| <b>Upscale Δ = Max Concentration - Average</b>            |                        |   | 0.40                           | Mini           | 1.15                         | Strat          |                                                                                                                                             |
| <b>Upscale % Difference</b>                               |                        |   | 4.48%                          | Non            | 24.66%                       | Strat          |                                                                                                                                             |
| <b>Minimum Concentration</b>                              |                        |   | 8.87                           |                | 3.47                         |                |                                                                                                                                             |
| <b>Downscale Δ = Average - Min Concentration</b>          |                        |   | 0.07                           | Non            | 1.19                         | Strat          |                                                                                                                                             |
| <b>Downscale % Difference</b>                             |                        |   | 0.78%                          | Non            | 25.47%                       | Strat          |                                                                                                                                             |
| <b>First Point on List Closest to Average</b>             |                        |   | A-8                            |                | A-4                          |                |                                                                                                                                             |
| <b>Port Averages with Maximum Concentration Indicator</b> | <b>Port A Average</b>  |   | 9.00                           | <max           | 5.07                         | <max           |                                                                                                                                             |
|                                                           | <b>Port B Average</b>  |   | 8.89                           |                | 4.13                         |                |                                                                                                                                             |
|                                                           | <b>Port C Average</b>  |   |                                |                |                              |                |                                                                                                                                             |
|                                                           | <b>Port D Average</b>  |   |                                |                |                              |                |                                                                                                                                             |
|                                                           | <b>Port E Average</b>  |   |                                |                |                              |                |                                                                                                                                             |
|                                                           | <b>Port F Average</b>  |   |                                |                |                              |                |                                                                                                                                             |
|                                                           | <b>Port G Average</b>  |   |                                |                |                              |                |                                                                                                                                             |



# STRAT TEST DETERMINED SAMPLE POINTS FOR CIRCULAR STACK

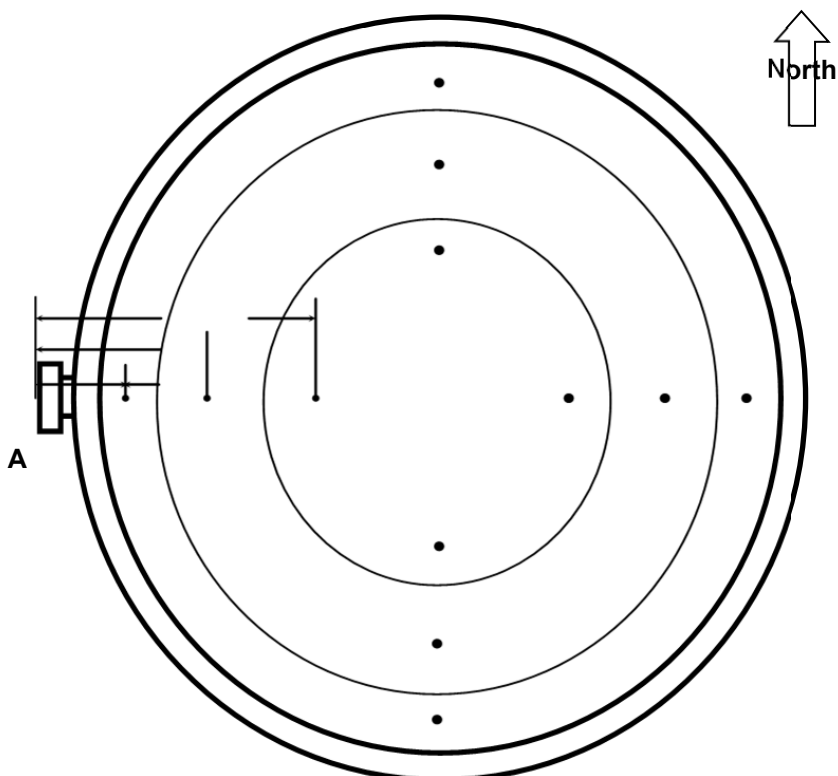
|                   |                                          |                             |                            |
|-------------------|------------------------------------------|-----------------------------|----------------------------|
| <b>Company</b>    | Catalytic Combustion                     | <b>Date</b>                 | 07/29/21                   |
| <b>Plant Name</b> | Stewart and Stevenson Integration Center | <b>Project #</b>            | catc-21-houston.tx-start#1 |
| <b>Equipment</b>  | Caterpillar engine                       | <b># of Ports Available</b> | 2                          |
| <b>Location</b>   | Houston, Texas                           | <b># of Ports Used</b>      | 2                          |

| Stack Dimensions                   |                   |       |                 | Traverse Data    |                 |                |                   |
|------------------------------------|-------------------|-------|-----------------|------------------|-----------------|----------------|-------------------|
| <b>Diameter or Length of Stack</b> | (D)               | 31.88 | in.             | 2                | <b>Ports by</b> | 12             | <b>Pts / port</b> |
| <b>Width of Stack</b>              | (W)               |       | in.             | 24               | <b>Pts Used</b> | 12             | <b>Required</b>   |
| <b>Area of Stack</b>               | (A <sub>s</sub> ) | 5.54  | ft <sup>2</sup> | <b>Run Start</b> | 11:00:23        | <b>Run End</b> | 12:10:23          |

## 40 CFR 60, Appendix A, Method 7E Criteria

| Stratification Results                                                                                                                      |                              | Traverse Point Number | Percent of Stack Diameter | Distance from Inside Wall | Distance Including Reference Length |
|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------|---------------------------|---------------------------|-------------------------------------|
| <b>Maximum Percent Difference</b>                                                                                                           | 25.47 % for NO <sub>x</sub>  |                       |                           |                           |                                     |
| <b>Maximum Pollutant Conc. Diff.</b>                                                                                                        | 1.19 ppm for NO <sub>x</sub> |                       |                           |                           |                                     |
| <b>Maximum Diluent Conc. Diff.</b>                                                                                                          | 0.40 % for O <sub>2</sub>    |                       |                           |                           |                                     |
| Stratification Conclusions                                                                                                                  |                              |                       | %                         | in.                       | in.                                 |
| <b>Comparison</b>                                                                                                                           | all diluents/pollutants      | 1                     |                           |                           |                                     |
| <b>Stack Diameter</b>                                                                                                                       | D ≤ 93.6 in.                 | 2                     |                           |                           |                                     |
| Under Method 7E criteria at least one measured pollutant or diluent demonstrates a stratified stack with subsequent testing from 12 points. |                              | 3                     |                           |                           |                                     |

|                                                   |                                                               |
|---------------------------------------------------|---------------------------------------------------------------|
| <input type="checkbox"/> Moisture, for MW         | <input type="checkbox"/> 6.5.6(b)(2) alt. points do not apply |
| <input type="checkbox"/> Moisture, for wet-to-dry |                                                               |
| <input checked="" type="checkbox"/> Gas           |                                                               |



**APPENDIX G**

**EQUIPMENT CALIBRATION RECORDS**

## S-TYPE PITOT TUBE CALIBRATION SHEET

Reference USEPA Reference Method 2 (40CFR60, App. A, Meth. 2)

|                                       |                                                  |
|---------------------------------------|--------------------------------------------------|
| PITOT SERIAL# <u>A5708</u>            | CALIBRATION DATE: <u>17-Nov-14</u>               |
| PITOT TYPE: <u>S</u>                  | BAROMETRIC PRESSURE: <u>29.40</u> in Hg          |
| STD. PITOT TYPE: <u>HEMISPHERICAL</u> | STATIC PRESSURE: <u>-0.6</u> in H <sub>2</sub> O |
| Cp(std): <u>0.990</u>                 | BLOCKAGE %: <u>&lt;2%</u>                        |
| PROBE SERIAL# <u>N/A</u>              | CORRECTION FACTOR: <u>1.00</u>                   |

| SIDE "A" CALIBRATION |                               |                             |       |                                           |
|----------------------|-------------------------------|-----------------------------|-------|-------------------------------------------|
| RUN NO.              | Δ Pstd<br>in H <sub>2</sub> O | Δ Ps<br>in H <sub>2</sub> O | Cp(s) | DEVIATION<br>Cp(s) - avg.Cp(s)            |
| 1                    | 0.550                         | 0.793                       | 0.824 | 0.001                                     |
| 2                    | 0.550                         | 0.798                       | 0.822 | -0.001                                    |
| 3                    | 0.550                         | 0.795                       | 0.823 | 0.000                                     |
| <b>"A" AVERAGE</b>   |                               |                             | 0.823 | 0.0013<br><small>(must be ≤ 0.01)</small> |

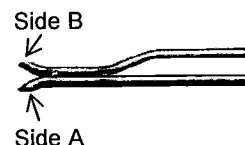
| SIDE "B" CALIBRATION |                               |                             |       |                                           |
|----------------------|-------------------------------|-----------------------------|-------|-------------------------------------------|
| RUN NO.              | Δ Pstd<br>in H <sub>2</sub> O | Δ Ps<br>in H <sub>2</sub> O | Cp(s) | DEVIATION<br>Cp(s) - avg.Cp(s)            |
| 1                    | 0.551                         | 0.793                       | 0.825 | 0.002                                     |
| 2                    | 0.550                         | 0.797                       | 0.822 | 0.000                                     |
| 3                    | 0.551                         | 0.802                       | 0.821 | -0.002                                    |
| <b>"B" AVERAGE</b>   |                               |                             | 0.823 | 0.0023<br><small>(must be ≤ 0.01)</small> |

### ACCEPTANCE CRITERIA

AVERAGE 0.0005 AVG. Cp (A) - AVG. Cp (B) must be ≤ 0.01

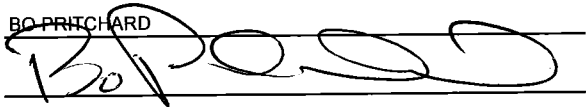
If the Average and both Deviation Averages "A" & "B" are ≤ 0.01, then the OVERALL AVERAGE below may be used.  
\* If NOT, use the "A" Average OR "B" Average.

OVERALL AVERAGE 0.8230



I certify that the above pitot tube was tested in accordance with the US EPA Method 2 standards.  
See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.

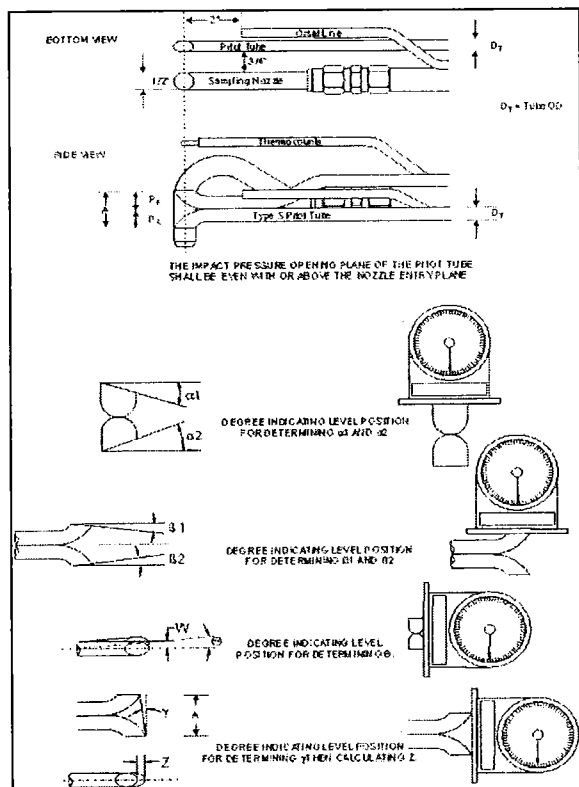
Print Name: BO PRITCHARD

Signature: 

Date 11/17/2014



## Type S Pitot Tube Inspection Form



### PITOT TUBE/PROBE # 5708

| Parameter           | Value | Allowable Range                    | Check |
|---------------------|-------|------------------------------------|-------|
| Assembly Level?     | yes   | Yes                                | OK    |
| Ports Damaged?      | no    | No                                 | OK    |
| $\alpha 1$          | 0     | $-10^\circ < \alpha 1 < +10^\circ$ | OK    |
| $\alpha 2$          | 0     | $-10^\circ < \alpha 2 < +10^\circ$ | OK    |
| 1                   | 0     | $-5^\circ < \beta 1 < +5^\circ$    | OK    |
| 1                   | 1     | $-5^\circ < \beta 2 < +5^\circ$    | OK    |
| $\gamma$            | 0     |                                    |       |
| $\theta$            | 1     |                                    |       |
| $Z = A \tan \gamma$ | 0.000 | $Z \leq .125"$                     | OK    |
| $W = A \tan \theta$ | 0.015 | $W \leq .031"$                     | OK    |
| $D_t$               | 0.375 | .188" to .375"                     | OK    |
| $A/2D_t$            | 1.136 | $1.05 \leq P_A/D_t \leq 1.5$       | OK    |
| A                   | 0.852 | $2.1D_t \leq A \leq 3D_t$          | OK    |

### Certification

I certify that pitot tube/probe number 5708 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

Certified by:

*Bob [Signature]* 11-12-14  
Personnel (Signature/Date)

## S-TYPE PITOT TUBE CALIBRATION SHEET

Reference USEPA Reference Method 2 (40CFR60, App. A, Meth. 2)

PITOT SERIAL# A6223  
PITOT TYPE: S  
STD. PITOT TYPE: ELLIPSOIDAL  
Cp(std): 0.990  
PROBE SERIAL# N/A

CALIBRATION DATE: 11-Aug-15  
BAROMETRIC PRESSURE: 29.65 in Hg  
STATIC PRESSURE: -0.6 in H<sub>2</sub>O  
BLOCKAGE %: N/A  
CORRECTION FACTOR: 1.00

| SIDE "A" CALIBRATION |                               |                             |       |                                |
|----------------------|-------------------------------|-----------------------------|-------|--------------------------------|
| RUN NO.              | Δ Pstd<br>in H <sub>2</sub> O | Δ Ps<br>in H <sub>2</sub> O | Cp(s) | DEVIATION<br>Cp(s) - avg.Cp(s) |
| 1                    | 0.560                         | 0.808                       | 0.824 | -0.002                         |
| 2                    | 0.560                         | 0.806                       | 0.825 | -0.001                         |
| 3                    | 0.561                         | 0.802                       | 0.828 | 0.002                          |

|             |       |        |
|-------------|-------|--------|
| "A" AVERAGE | 0.826 | 0.0020 |
|-------------|-------|--------|

(must be ≤ 0.01)

| SIDE "B" CALIBRATION |                               |                             |       |                                |
|----------------------|-------------------------------|-----------------------------|-------|--------------------------------|
| RUN NO.              | Δ Pstd<br>in H <sub>2</sub> O | Δ Ps<br>in H <sub>2</sub> O | Cp(s) | DEVIATION<br>Cp(s) - avg.Cp(s) |
| 1                    | 0.559                         | 0.823                       | 0.816 | -0.001                         |
| 2                    | 0.559                         | 0.822                       | 0.816 | -0.001                         |
| 3                    | 0.561                         | 0.819                       | 0.819 | 0.002                          |

|             |       |        |
|-------------|-------|--------|
| "B" AVERAGE | 0.817 | 0.0019 |
|-------------|-------|--------|

(must be ≤ 0.01)

### ACCEPTANCE CRITERIA

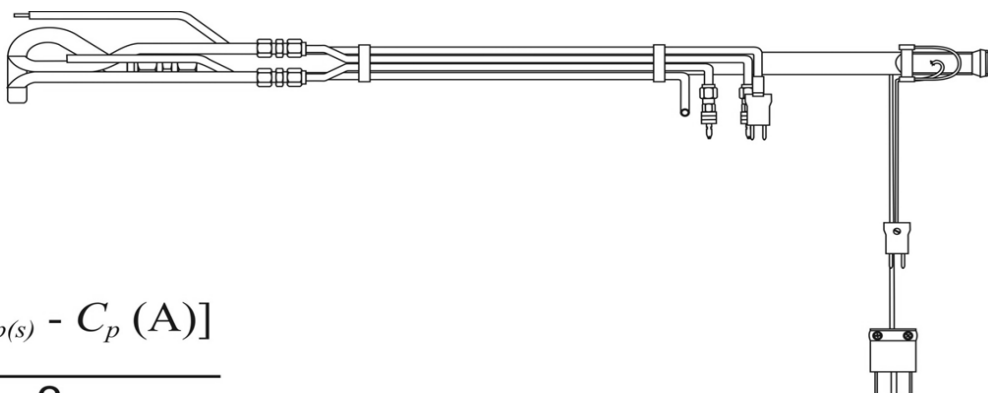
AVERAGE 0.0086 AVG. Cp (A) - AVG. Cp (B) must be ≤ 0.01

If the Average and both Deviation Averages "A" & "B" are ≤ 0.01, then the OVERALL AVERAGE below may be used.

\* If NOT, use the "A" Average OR "B" Average.

OVERALL AVERAGE 0.8215

$$C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta p_{std}}{\Delta p_s}}$$



$$\text{Deviation} = C_{p(s)} - \overline{C_p(A)}$$

$$\text{Avg Dev} = \sigma(A) = \frac{\sum_1^3 [C_{p(s)} - C_p(A)]}{3}$$

Method 2 Section 10.1.4.3 For a probe assembly constructed such that its pitot tube is always used in the same orientation, only one side of the pitot tube need be calibrated (the side which will face the flow). The pitot tube must still meet the alignment specifications of Figure 2-2 or 2-3, however, and must have an average deviation (σ) value of 0.01 or less (see section 10.1.4.4).

I certify that the above pitot tube was tested in accordance with the US EPA Method 2 standards.  
See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.

Print Name:

BO PRITCHARD

Date 8/11/2015

Signature:

B. Pritchard

## S-TYPE PITOT TUBE CALIBRATION SHEET

*Reference USEPA Reference Method 2 (40CFR60, App. A, Meth. 2)*

PITOT SERIAL# A6904  
PITOT TYPE: S  
STD. PITOT TYPE: ELLIPSOIDAL  
Cp(std): 0.990  
PROBE SERIAL# N/A

CALIBRATION DATE: 27-May-16  
BAROMETRIC PRESSURE: 30.16 in Hg  
STATIC PRESSURE: -0.6 in H<sub>2</sub>O  
BLOCKAGE %: N/A  
CORRECTION FACTOR: 1.00

| SIDE "A" CALIBRATION |                                         |                                     |       |                                |
|----------------------|-----------------------------------------|-------------------------------------|-------|--------------------------------|
| RUN NO.              | $\Delta P_{std}$<br>in H <sub>2</sub> O | $\Delta P_s$<br>in H <sub>2</sub> O | Cp(s) | DEVIATION<br>Cp(s) - avg.Cp(s) |
| 1                    | 0.565                                   | 0.804                               | 0.830 | 0.001                          |
| 2                    | 0.561                                   | 0.803                               | 0.827 | -0.002                         |
| 3                    | 0.562                                   | 0.800                               | 0.830 | 0.001                          |

|             |       |        |
|-------------|-------|--------|
| "A" AVERAGE | 0.829 | 0.0014 |
|-------------|-------|--------|

(must be  $\leq 0.01$ )

| SIDE "B" CALIBRATION |                                         |                                     |       |                                |
|----------------------|-----------------------------------------|-------------------------------------|-------|--------------------------------|
| RUN NO.              | $\Delta P_{std}$<br>in H <sub>2</sub> O | $\Delta P_s$<br>in H <sub>2</sub> O | Cp(s) | DEVIATION<br>Cp(s) - avg.Cp(s) |
| 1                    | 0.565                                   | 0.804                               | 0.830 | -0.001                         |
| 2                    | 0.566                                   | 0.803                               | 0.831 | 0.000                          |
| 3                    | 0.565                                   | 0.801                               | 0.831 | 0.001                          |

|             |       |        |
|-------------|-------|--------|
| "B" AVERAGE | 0.831 | 0.0008 |
|-------------|-------|--------|

(must be  $\leq 0.01$ )

### ACCEPTANCE CRITERIA

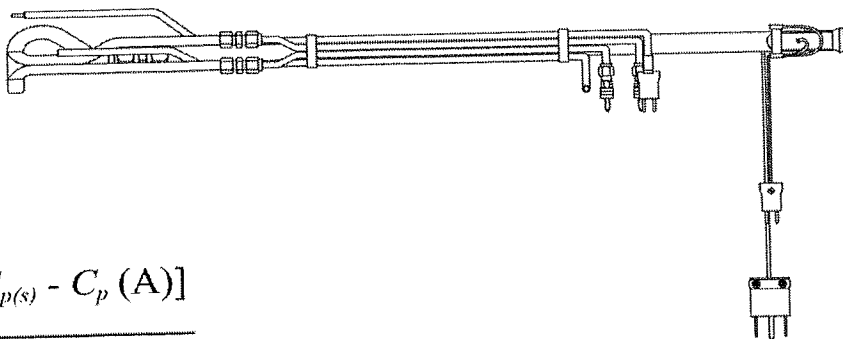
AVERAGE -0.0018 AVG. Cp (A) - AVG. Cp (B) must be  $\leq 0.01$

If the Average and both Deviation Averages "A" & "B" are  $\leq 0.01$ , then the **OVERALL AVERAGE** below may be used.

\* If NOT, use the "A" Average OR "B" Average.

**OVERALL AVERAGE** 0.8300

$$C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta p_{std}}{\Delta p_s}}$$



$$\text{Deviation} = C_{p(s)} - \overline{C_p(A)}$$

$$\text{Avg Dev} = \sigma(A) = \frac{\sum_{i=1}^3 [C_{p(s)} - C_p(A)]}{3}$$

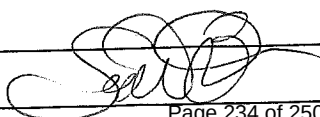
Method 2 Section 10.1.4.3 For a probe assembly constructed such that its pitot tube is always used in the same orientation, only one side of the pitot tube need be calibrated (the side which will face the flow). The pitot tube must still meet the alignment specifications of Figure 2-2 or 2-3, however, and must have an average deviation ( $\sigma$ ) value of 0.01 or less (see section 10.1.4.4).

I certify that the above pitot tube was tested in accordance with the US EPA Method 2 standards.  
See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.

Print Name:

Scott Bulger

Signature:



Date

5/27/2016

# METERING SYSTEM DRY GAS METER CALIBRATION SHEET

EPA Reference Method

Metering System Pre-Test Calibration

Air Hygiene Asset ID: samp-cp-0021

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0021 Calibration 11-11-20.xls}Original (5 point)

Make: apex  
Model #: 522  
Serial #: 1204012

Date: 11/11/20  
Barometric Pressure: 29.28 (in. Hg)  
Theoretical Critical Vacuum: 13.81 (in. Hg)

## DRY GAS METER READINGS

| $\Delta H$<br>(in. H <sub>2</sub> O) | Time<br>(min) | Volume                        |                             |                             | Initial Temperature |                |
|--------------------------------------|---------------|-------------------------------|-----------------------------|-----------------------------|---------------------|----------------|
|                                      |               | Initial<br>(ft <sup>3</sup> ) | Final<br>(ft <sup>3</sup> ) | Total<br>(ft <sup>3</sup> ) | Inlet<br>(°F)       | Outlet<br>(°F) |
| 0.33                                 | 17.00         | 490.230                       | 495.820                     | 5.590                       | 76.0                | 76.0           |
| 0.67                                 | 12.00         | 495.820                       | 501.510                     | 5.690                       | 77.0                | 77.0           |
| 1.10                                 | 10.00         | 501.510                       | 507.780                     | 6.270                       | 77.0                | 77.0           |
| 2.00                                 | 10.00         | 507.780                       | 515.930                     | 8.150                       | 78.0                | 78.0           |
| 3.50                                 | 10.00         | 515.930                       | 527.070                     | 11.140                      | 79.0                | 79.0           |

| Final Temperature |                | Orifice<br>Serial#<br>(number) | K' Orifice<br>Coefficient<br>(see above) | Actual<br>Vacuum<br>(in. Hg) | Ambient Temperature |               |                 |
|-------------------|----------------|--------------------------------|------------------------------------------|------------------------------|---------------------|---------------|-----------------|
| Inlet<br>(°F)     | Outlet<br>(°F) |                                |                                          |                              | Initial<br>(°F)     | Final<br>(°F) | Average<br>(°F) |
| 77.0              | 77.0           | 214                            | 0.2433                                   | 16.0                         | 73.2                | 73.5          | 73.4            |
| 77.0              | 77.0           | 240                            | 0.3500                                   | 16.0                         | 73.5                | 73.4          | 73.5            |
| 78.0              | 78.0           | 255                            | 0.4634                                   | 16.0                         | 73.4                | 73.8          | 73.6            |
| 79.0              | 79.0           | 263                            | 0.5993                                   | 16.0                         | 73.8                | 74.1          | 74.0            |
| 80.0              | 80.0           | 273                            | 0.8208                                   | 16.0                         | 74.1                | 74.0          | 74.1            |

## RESULTS

| DRY GAS METER                                        |                                            | ORIFICE                                               |                                             |                                                |
|------------------------------------------------------|--------------------------------------------|-------------------------------------------------------|---------------------------------------------|------------------------------------------------|
| VOLUME<br>CORRECTED<br>Vm(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vm(std)<br>(liters) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(liters) | VOLUME<br>NOMINAL<br>Vcr<br>(ft <sup>3</sup> ) |
| 5.386                                                | 152.53                                     | 5.244                                                 | 148.5                                       | 5.415                                          |
| 5.482                                                | 155.25                                     | 5.324                                                 | 150.8                                       | 5.499                                          |
| 6.042                                                | 171.10                                     | 5.874                                                 | 166.3                                       | 6.068                                          |
| 7.856                                                | 222.49                                     | 7.594                                                 | 215.1                                       | 7.850                                          |
| 10.759                                               | 304.69                                     | 10.400                                                | 294.5                                       | 10.753                                         |
| DRY GAS METER<br>CALIBRATION FACTOR<br>Y             |                                            | ORIFICE<br>CALIBRATION FACTOR<br>$\Delta H@$          |                                             |                                                |
| Variation<br>(number)                                | Value<br>(number)                          | Value<br>(in. H <sub>2</sub> O)                       | Value<br>(mm H <sub>2</sub> O)              | Variation<br>(in. H <sub>2</sub> O)            |
| 0.004                                                | 0.974                                      | 1.879                                                 | 47.72                                       | 0.067                                          |
| 0.001                                                | 0.971                                      | 1.842                                                 | 46.79                                       | 0.030                                          |
| 0.002                                                | 0.972                                      | 1.724                                                 | 43.79                                       | -0.088                                         |
| -0.003                                               | 0.967                                      | 1.872                                                 | 47.55                                       | 0.060                                          |
| -0.003                                               | 0.967                                      | 1.743                                                 | 44.28                                       | -0.069                                         |
| <b>AVERAGE:</b>                                      | <b>0.970</b>                               | <b>1.812</b>                                          | <b>46.02</b>                                | <b>PASSED</b>                                  |

Notes:

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/- 0.02. For Orifice Calibration Factor  $\Delta H@$ , the orifice differential pressure in inches of H<sub>2</sub>O that equates to 0.75 cfm of air at 68 °F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/- 0.2. For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units, (ft)<sup>3</sup>\*(deg R)<sup>0.5</sup>/((in.Hg)\*(min)).

SIGNATURE: \_\_\_\_\_

*Craig McCarty*

DATE: 11/11/20 11/11/20

# METERING SYSTEM THERMOCOUPLE CALIBRATION SHEET

## EPA Reference Method

### Metering System Pre-Test Calibration

Air Hygiene Asset ID: samp-cp-0021

Filename: \\AHI-FILES\VR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0021 Calibration 11-11-20.xls}Original (5 point)

Make: apex  
Model #: 522  
Serial #: 1204012

Date: 11/11/20  
Barometric Pressure: 29.28 (in. Hg)  
Temperature (ASTM cal): 72.00 (°F)

| Thermocouple | 100 (°F) |         | 600 (°F) |         | 1200 (°F) |         |
|--------------|----------|---------|----------|---------|-----------|---------|
|              | Reading  | % Error | Reading  | % Error | Reading   | % Error |
| Stack        | 101.00   | 0.50    | 602.00   | 0.33    | 1206.00   | 0.50    |
| Probe        | 101.00   | 0.50    | 602.00   | 0.33    | 1206.00   | 0.50    |
| Filter       | 101.00   | 0.50    | 602.00   | 0.33    | 1206.00   | 0.50    |
| Dryer        | 101.00   | 0.50    | 602.00   | 0.33    | 1206.00   | 0.50    |
| Aux.         | 101.00   | 0.50    | 602.00   | 0.33    | 1206.00   | 0.50    |

Note: Calibrated against an ALTEK Thermocouple Source Series 22, ID: samp-tc-0004

Direct temperature output calibrated to ASTM and IPTS standards as outlined in ALTEK Data Sheet 22.

| Thermocouple | 72.00 (°F) |       | Responded to heating/cooling with the anticipated outcome? |
|--------------|------------|-------|------------------------------------------------------------|
|              | Reading    | (±°F) |                                                            |
| DGM In       | 72.0       | 0.00  | yes                                                        |
| DGM Out      | 72.0       | 0.00  | yes                                                        |

Note: Calibrated against Reference Thermometer ID: a070800

SIGNATURE: Craig McCarty

DATE: 11/11/20 11/11/20

#### Standard for Calibration of Console Thermocouple Systems

40 CFR, Part 60

Appendix A, Method 5

10.3.2 The temperature data recorded in the field shall be considered valid. If, during calibration, the absolute temperature measured with the sensor being calibrated and the reference sensor **agree within 1.5 percent**, the temperature data taken in the field shall be considered valid.

#### Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).



# PROBE (STACK), HOTBOX (FILTER), AND GOOSENECK (EXIT) THERMOCOUPLE CALIBRATION SHEET

EPA Reference Method

Metering System Pre-Test Calibration

Air Hygiene Asset ID(s):

Probe: samp-hp-0086

Hotbox: samp-bh-0012

Gooseneck: samp-ad-0046

Filename: \\AHI-FILES\VR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\([SAMP-CP-0021 Calibration 11-11-20.xls]Original (5 point)

Barometric Pressure:

29.26

| Thermo-couples |      | Temps | Signature            | Date     |          |
|----------------|------|-------|----------------------|----------|----------|
|                |      | (°F)  |                      |          |          |
| Stack          | Ref  | 72.00 | <i>Craig McCarty</i> | 11/11/20 | 11/11/20 |
|                | Read | 72.00 |                      |          |          |
|                | ±°F  | 0.00  |                      |          |          |
| Probe          | Ref  | 72.00 | <i>Craig McCarty</i> | 11/11/20 | 11/11/20 |
|                | Read | 72.00 |                      |          |          |
|                | ±°F  | 0.00  |                      |          |          |
| Filter         | Ref  | 72.00 | <i>Craig McCarty</i> | 11/11/20 | 11/11/20 |
|                | Read | 72.00 |                      |          |          |
|                | ±°F  | 0.00  |                      |          |          |
| Cond.          | Ref  | 72.00 | <i>Craig McCarty</i> | 11/11/20 | 11/11/20 |
|                | Read | 72.00 |                      |          |          |
|                | ±°F  | 0.00  |                      |          |          |
| CPM            | Ref  | 72.00 | <i>Craig McCarty</i> | 11/11/20 | 11/11/20 |
|                | Read | 72.00 |                      |          |          |
|                | ±°F  | 0.00  |                      |          |          |
| Exit           | Ref  | 72.00 | <i>Craig McCarty</i> | 11/11/20 | 11/11/20 |
|                | Read | 72.00 |                      |          |          |
|                | ±°F  | 0.00  |                      |          |          |

Note: Calibrated against Reference Thermometer ID: a070800

| Thermocouple | Responded to heating/cooling with the anticipated outcome? |
|--------------|------------------------------------------------------------|
| Stack        | yes                                                        |
| Probe        | yes                                                        |
| Filter       | yes                                                        |
| Cond.        | yes                                                        |
| CPM          | yes                                                        |
| Exit         | yes                                                        |

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

# METERING SYSTEM DRY GAS METER CALIBRATION SHEET

## EPA Reference Method

### Metering System Post-Test Calibration

Air Hygiene Asset ID: samp-cp-0021

Filename: \\AHL-FILES\VR\public\Shared\QAQC\Calibrations\PM-Equipment\IM-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0021 Calibration 11-11-20.xls}9-7-21 (3 point)

Make: Apex  
Model #: XC-522  
Serial #: 1204012

Date: 09/08/21  
Barometric Pressure: 29.22 (in. Hg)  
Theoretical Critical Vacuum: 13.78 (in. Hg)

#### DRY GAS METER READINGS

| ΔH<br>(in. H2O)   |                | Time<br>(min)                  | Volume                                   |                              |                     | Initial Temperature |                 |
|-------------------|----------------|--------------------------------|------------------------------------------|------------------------------|---------------------|---------------------|-----------------|
|                   |                |                                | Initial<br>(ft³)                         | Final<br>(ft³)               | Total<br>(ft³)      | Inlet<br>(°F)       | Outlet<br>(°F)  |
| 1.90              |                | 10.00                          | 111.800                                  | 119.800                      | 8.000               | 72.0                | 72.0            |
| 1.90              |                | 10.00                          | 119.800                                  | 127.800                      | 8.000               | 72.0                | 72.0            |
| 1.90              |                | 10.00                          | 127.800                                  | 135.810                      | 8.010               | 73.0                | 73.0            |
|                   |                |                                |                                          |                              |                     |                     |                 |
| Final Temperature |                | Orifice<br>Serial#<br>(number) | K' Orifice<br>Coefficient<br>(see above) | Actual<br>Vacuum<br>(in. Hg) | Ambient Temperature |                     |                 |
| Inlet<br>(°F)     | Outlet<br>(°F) |                                |                                          |                              | Initial<br>(°F)     | Final<br>(°F)       | Average<br>(°F) |
| 72.0              | 72.0           | 163                            | 0.5930                                   | 16.0                         | 72.2                | 72.7                | 72.5            |
| 73.0              | 73.0           | 163                            | 0.5930                                   | 16.0                         | 72.7                | 73.1                | 72.9            |
| 74.0              | 74.0           | 163                            | 0.5930                                   | 16.0                         | 73.1                | 73.7                | 73.4            |

#### RESULTS

| DRY GAS METER                                        |                                            | ORIFICE                                               |                                             |                                                |
|------------------------------------------------------|--------------------------------------------|-------------------------------------------------------|---------------------------------------------|------------------------------------------------|
| VOLUME<br>CORRECTED<br>Vm(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vm(std)<br>(liters) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(liters) | VOLUME<br>NOMINAL<br>Vcr<br>(ft <sup>3</sup> ) |
| 7.788                                                | 220.56                                     | 7.509                                                 | 212.7                                       | 7.757                                          |
| 7.781                                                | 220.35                                     | 7.506                                                 | 212.6                                       | 7.760                                          |
| 7.776                                                | 220.21                                     | 7.503                                                 | 212.5                                       | 7.764                                          |
| DRY GAS METER<br>CALIBRATION FACTOR<br>Y             |                                            | ORIFICE<br>CALIBRATION FACTOR<br>$\Delta H@$          |                                             |                                                |
| Variation<br>(number)                                | Value<br>(number)                          | Value<br>(in. H <sub>2</sub> O)                       | Value<br>(mm H <sub>2</sub> O)              | Variation<br>(in. H <sub>2</sub> O)            |
| 0.000                                                | 0.964                                      | 1.837                                                 | 46.66                                       | 0.001                                          |
| 0.000                                                | 0.965                                      | 1.837                                                 | 46.66                                       | 0.001                                          |
| 0.000                                                | 0.965                                      | 1.835                                                 | 46.61                                       | -0.001                                         |
| <b>AVERAGE:</b>                                      | <b>0.965</b>                               | <b>1.836</b>                                          | 46.64                                       | <b>PASSED</b>                                  |
| <b>LAST 5-PT:</b>                                    | <b>0.970</b>                               | <b>1.812</b>                                          | <b>PASSED</b>                               | 5-PT Date:                                     |
| <b>% DIFF:</b>                                       | <b>0.6%</b>                                | <b>1.3%</b>                                           |                                             | 11/11/20                                       |

#### 40 CFR - CHAPTER I - PART 60

##### Appendix A, Method 5

##### 10.3.2 Calibration After Use

After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test)...Calculate the average value of the DGM calibration factor. If the value has changed by more than 5 percent, recalibrate the meter over the full range of orifice settings, as detailed in Section 10.3.1.

##### 10.3.3 Acceptable Variation in Calibration

If the DGM coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for the test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

Notes: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/- 0.02. For Orifice Calibration Factor  $\Delta H@$ , the orifice differential pressure in inches of H<sub>2</sub>O that equates to 0.75 cfm of air at 68 °F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/- 0.2. For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units, (ft)<sup>3</sup>\*(deg R)<sup>0.5</sup>/((in.Hg)\*(min)).

SIGNATURE: Craig McCarty

DATE: 09/08/21 09/08/21

# METERING SYSTEM THERMOCOUPLE CALIBRATION SHEET

## EPA Reference Method

### Metering System Post-Test Calibration

Air Hygiene Asset ID: samp-cp-0021

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0021 Calibration 11-11-20.xls}9-7-21 (3 point)

Make: Apex  
Model #: XC-522  
Serial #: 1204012

Date: 09/08/21  
Barometric Pressure: 29.22 (in. Hg)  
Temperature (ASTM cal): 73.70 (°F)

| Thermocouple | 100 (°F) |         | 600 (°F) |         | 1200 (°F) |         |
|--------------|----------|---------|----------|---------|-----------|---------|
|              | Reading  | % Error | Reading  | % Error | Reading   | % Error |
| Stack        | 101.00   | 0.50    | 604.00   | 0.67    | 1206.00   | 0.50    |
| Probe        | 101.00   | 0.50    | 604.00   | 0.67    | 1206.00   | 0.50    |
| Filter       | 101.00   | 0.50    | 604.00   | 0.67    | 1206.00   | 0.50    |
| Dryer        | 101.00   | 0.50    | 604.00   | 0.67    | 1206.00   | 0.50    |
| Aux.         | 101.00   | 0.50    | 604.00   | 0.67    | 1206.00   | 0.50    |

Note: Calibrated against an ALTEK Thermocouple Source Series 22, ID: samp-tc-0004

Direct temperature output calibrated to ASTM and IPTS standards as outlined in ALTEK Data Sheet 22.

| Thermocouple | 73.70 (°F) |       | Responded to heating/cooling with the anticipated outcome? |
|--------------|------------|-------|------------------------------------------------------------|
|              | Reading    | (±°F) |                                                            |
| DGM In       | 74.0       | 0.30  | yes                                                        |
| DGM Out      | 74.0       | 0.30  | yes                                                        |

Note: Calibrated against Reference Thermometer ID: a070717

SIGNATURE: \_\_\_\_\_

*Craig McCarty*

DATE: 09/08/21 09/08/21

#### Standard for Calibration of Console Thermocouple Systems

40 CFR, Part 60

Appendix A, Method 5

10.3.2 The temperature data recorded in the field shall be considered valid. If, during calibration, the absolute temperature measured with the sensor being calibrated and the reference sensor **agree within 1.5 percent**, the temperature data taken in the field shall be considered valid.

#### Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

# PROBE (STACK), HOTBOX (FILTER), AND GOOSENECK (EXIT) THERMOCOUPLE CALIBRATION SHEET

EPA Reference Method

Metering System Post-Test Calibration

Air Hygiene Asset ID(s):

Probe: samp-hp-0086

Hotbox: samp-bh-0012

Gooseneck: samp-ad-0046

Filename: \\AHI-FILES\VR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0021 Calibration 11-11-20.xls}9-7-21 (3 point)

Barometric Pressure:

29.22

| Thermo-couples |      | Temps | Signature            |  | Date            |          |
|----------------|------|-------|----------------------|--|-----------------|----------|
|                |      | (°F)  |                      |  |                 |          |
| Stack          | Ref  | 73.20 | <i>Craig McCarty</i> |  | <i>09/08/21</i> | 09/08/21 |
|                | Read | 74.00 |                      |  |                 |          |
|                | ±°F  | 0.80  |                      |  |                 |          |
| Probe          | Ref  | 73.20 | <i>Craig McCarty</i> |  | <i>09/08/21</i> | 09/08/21 |
|                | Read | 74.00 |                      |  |                 |          |
|                | ±°F  | 0.80  |                      |  |                 |          |
| Filter         | Ref  | 73.20 | <i>Craig McCarty</i> |  | <i>09/08/21</i> | 09/08/21 |
|                | Read | 74.00 |                      |  |                 |          |
|                | ±°F  | 0.80  |                      |  |                 |          |
| Cond.          | Ref  | 73.20 | <i>Craig McCarty</i> |  | <i>09/08/21</i> | 09/08/21 |
|                | Read | 74.00 |                      |  |                 |          |
|                | ±°F  | 0.80  |                      |  |                 |          |
| CPM            | Ref  | 73.20 | <i>Craig McCarty</i> |  | <i>09/08/21</i> | 09/08/21 |
|                | Read | 74.00 |                      |  |                 |          |
|                | ±°F  | 0.80  |                      |  |                 |          |
| Exit           | Ref  | 73.20 | <i>Craig McCarty</i> |  | <i>09/08/21</i> | 09/08/21 |
|                | Read | 74.00 |                      |  |                 |          |
|                | ±°F  | 0.80  |                      |  |                 |          |

Note: Calibrated against Reference Thermometer ID: a070717

| Thermocouple | Responded to heating/cooling with the anticipated outcome? |
|--------------|------------------------------------------------------------|
| Stack        | yes                                                        |
| Probe        | yes                                                        |
| Filter       | yes                                                        |
| Cond.        | yes                                                        |
| CPM          | yes                                                        |
| Exit         | yes                                                        |

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

# METERING SYSTEM DRY GAS METER CALIBRATION SHEET

EPA Reference Method

Metering System Pre-Test Calibration

Air Hygiene Assett ID: samp-cp-0022

Filename: \\AHL-FILES\SVR\public\Shared\QAQC\Calibrations\PM-Equipment\IM-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0022 Calibration 7-14-21.xls}Original (5 point)

Make: apex

Date: 07/14/21

Model #: 522

Barometric Pressure: 29.29 (in. Hg)

Serial #:

Theoretical Critical Vacuum: 13.82 (in. Hg)

## DRY GAS METER READINGS

| $\Delta H$<br>(in. H <sub>2</sub> O) | Time<br>(min) | Volume                        |                             |                             | Initial Temperature |                |
|--------------------------------------|---------------|-------------------------------|-----------------------------|-----------------------------|---------------------|----------------|
|                                      |               | Initial<br>(ft <sup>3</sup> ) | Final<br>(ft <sup>3</sup> ) | Total<br>(ft <sup>3</sup> ) | Inlet<br>(°F)       | Outlet<br>(°F) |
| 0.31                                 | 17.00         | 23.400                        | 28.710                      | 5.310                       | 75.0                | 75.0           |
| 0.62                                 | 12.00         | 28.710                        | 34.060                      | 5.350                       | 75.0                | 75.0           |
| 1.10                                 | 10.00         | 34.060                        | 40.120                      | 6.060                       | 76.0                | 76.0           |
| 1.90                                 | 10.00         | 40.120                        | 48.000                      | 7.880                       | 77.0                | 77.0           |
| 3.50                                 | 10.00         | 48.000                        | 58.830                      | 10.830                      | 78.0                | 78.0           |

| Final Temperature |                | Orifice<br>Serial#<br>(number) | K' Orifice<br>Coefficient<br>(see above) | Actual<br>Vacuum<br>(in. Hg) | Ambient Temperature |               |                 |
|-------------------|----------------|--------------------------------|------------------------------------------|------------------------------|---------------------|---------------|-----------------|
| Inlet<br>(°F)     | Outlet<br>(°F) |                                |                                          |                              | Initial<br>(°F)     | Final<br>(°F) | Average<br>(°F) |
| 75.0              | 75.0           | 140                            | 0.2355                                   | 16.0                         | 76.7                | 76.9          | 76.8            |
| 76.0              | 76.0           | 148                            | 0.3374                                   | 16.0                         | 76.9                | 77.2          | 77.1            |
| 77.0              | 77.0           | 155                            | 0.4565                                   | 16.0                         | 77.0                | 77.4          | 77.2            |
| 78.0              | 78.0           | 163                            | 0.5930                                   | 16.0                         | 77.4                | 77.6          | 77.5            |
| 80.0              | 80.0           | 173                            | 0.8149                                   | 15.0                         | 77.6                | 77.8          | 77.7            |

## RESULTS

| DRY GAS METER                                        |                                            | ORIFICE                                               |                                             |                                                |
|------------------------------------------------------|--------------------------------------------|-------------------------------------------------------|---------------------------------------------|------------------------------------------------|
| VOLUME<br>CORRECTED<br>Vm(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vm(std)<br>(liters) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(liters) | VOLUME<br>NOMINAL<br>Vcr<br>(ft <sup>3</sup> ) |
| 5.132                                                | 145.34                                     | 5.061                                                 | 143.3                                       | 5.258                                          |
| 5.170                                                | 146.41                                     | 5.117                                                 | 144.9                                       | 5.319                                          |
| 5.852                                                | 165.73                                     | 5.769                                                 | 163.4                                       | 5.998                                          |
| 7.611                                                | 215.54                                     | 7.492                                                 | 212.2                                       | 7.794                                          |
| 10.473                                               | 296.59                                     | 10.293                                                | 291.5                                       | 10.712                                         |

| DRY GAS METER<br>CALIBRATION FACTOR<br>Y |                   | ORIFICE<br>CALIBRATION FACTOR<br>$\Delta H@$ |                                |                                     |
|------------------------------------------|-------------------|----------------------------------------------|--------------------------------|-------------------------------------|
| Variation<br>(number)                    | Value<br>(number) | Value<br>(in. H <sub>2</sub> O)              | Value<br>(mm H <sub>2</sub> O) | Variation<br>(in. H <sub>2</sub> O) |
| 0.000                                    | 0.986             | 1.901                                        | 48.28                          | 0.069                               |
| 0.004                                    | 0.990             | 1.851                                        | 47.02                          | 0.020                               |
| 0.000                                    | 0.986             | 1.791                                        | 45.50                          | -0.040                              |
| -0.001                                   | 0.984             | 1.831                                        | 46.51                          | 0.000                               |
| -0.003                                   | 0.983             | 1.782                                        | 45.26                          | -0.049                              |
| <b>AVERAGE:</b>                          | <b>0.986</b>      | <b>1.831</b>                                 | <b>46.51</b>                   | <b>PASSED</b>                       |

Notes:

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/- 0.02. For Orifice Calibration Factor  $\Delta H@$ , the orifice differential pressure in inches of H<sub>2</sub>O that equates to 0.75 cfm of air at 68 °F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/- 0.2. For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units, (ft)<sup>3</sup>\*(deg R)<sup>0.5</sup>/((in.Hg)\*(min)).

SIGNATURE: \_\_\_\_\_

*Craig McCarty*

DATE: 07/14/21 07/14/21

# METERING SYSTEM THERMOCOUPLE CALIBRATION SHEET

## EPA Reference Method

### Metering System Pre-Test Calibration

Air Hygiene Asset ID: samp-cp-0022

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0022 Calibration 7-14-21.xls}Original (5 point)

Make: apex  
Model #: 522  
Serial #:

Date: 07/14/21  
Barometric Pressure: 29.29 (in. Hg)  
Temperature (ASTM cal): 76.70 (°F)

| Thermocouple | 100 (°F) |         | 600 (°F) |         | 1200 (°F) |         |
|--------------|----------|---------|----------|---------|-----------|---------|
|              | Reading  | % Error | Reading  | % Error | Reading   | % Error |
| Stack        | 100.00   | 0.00    | 599.00   | 0.17    | 1199.00   | 0.08    |
| Probe        | 100.00   | 0.00    | 599.00   | 0.17    | 1199.00   | 0.08    |
| Filter       | 100.00   | 0.00    | 599.00   | 0.17    | 1199.00   | 0.08    |
| Dryer        | 100.00   | 0.00    | 599.00   | 0.17    | 1199.00   | 0.08    |
| Aux.         | 100.00   | 0.00    | 599.00   | 0.17    | 1199.00   | 0.08    |

Note: Calibrated against an ALTEK Thermocouple Source Series 22, ID: samp-tc-0004

Direct temperature output calibrated to ASTM and IPTS standards as outlined in ALTEK Data Sheet 22.

| Thermocouple | 76.70 (°F) |       | Responded to heating/cooling with the anticipated outcome? |
|--------------|------------|-------|------------------------------------------------------------|
|              | Reading    | (±°F) |                                                            |
| DGM In       | 75.0       | 1.70  | yes                                                        |
| DGM Out      | 75.0       | 1.70  | yes                                                        |

Note: Calibrated against Reference Thermometer ID: a070717

SIGNATURE: \_\_\_\_\_

*Craig McCarty*

DATE: 07/14/21 07/14/21

#### Standard for Calibration of Console Thermocouple Systems

40 CFR, Part 60

Appendix A, Method 5

10.3.2 The temperature data recorded in the field shall be considered valid. If, during calibration, the absolute temperature measured with the sensor being calibrated and the reference sensor **agree within 1.5 percent**, the temperature data taken in the field shall be considered valid.

#### Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

# PROBE (STACK), HOTBOX (FILTER), AND GOOSENECK (EXIT) THERMOCOUPLE CALIBRATION SHEET

EPA Reference Method

Metering System Pre-Test Calibration

Air Hygiene Asset ID(s):

Probe: samp-hp-0086

Hotbox: samp-bh-0012

Gooseneck: samp-ad-0046

Filename: \\AHI-FILES\VR\public\Shared\QAQC\Calibrations\PM-Equipment\IM-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0022 Calibration 7-14-21.xls}Original (5 point)

Barometric Pressure:

29.29

| Thermo-couples |      | Temps | Signature            |  | Date     |          |
|----------------|------|-------|----------------------|--|----------|----------|
|                |      | (°F)  |                      |  |          |          |
| Stack          | Ref  | 76.80 | <i>Craig McCarty</i> |  | 07/14/21 | 07/14/21 |
|                | Read | 77.00 |                      |  |          |          |
|                | ±°F  | 0.20  |                      |  |          |          |
| Probe          | Ref  | 76.80 | <i>Craig McCarty</i> |  | 07/14/21 | 07/14/21 |
|                | Read | 77.00 |                      |  |          |          |
|                | ±°F  | 0.20  |                      |  |          |          |
| Filter         | Ref  | 76.80 | <i>Craig McCarty</i> |  | 07/14/21 | 07/14/21 |
|                | Read | 77.00 |                      |  |          |          |
|                | ±°F  | 0.20  |                      |  |          |          |
| Cond.          | Ref  | 76.80 | <i>Craig McCarty</i> |  | 07/14/21 | 07/14/21 |
|                | Read | 77.00 |                      |  |          |          |
|                | ±°F  | 0.20  |                      |  |          |          |
| CPM            | Ref  | 76.80 | <i>Craig McCarty</i> |  | 07/14/21 | 07/14/21 |
|                | Read | 77.00 |                      |  |          |          |
|                | ±°F  | 0.20  |                      |  |          |          |
| Exit           | Ref  | 76.80 | <i>Craig McCarty</i> |  | 07/14/21 | 07/14/21 |
|                | Read | 77.00 |                      |  |          |          |
|                | ±°F  | 0.20  |                      |  |          |          |

Note: Calibrated against Reference Thermometer ID: a070717

| Thermocouple | Responded to heating/cooling with the anticipated outcome? |
|--------------|------------------------------------------------------------|
| Stack        | yes                                                        |
| Probe        | yes                                                        |
| Filter       | yes                                                        |
| Cond.        | yes                                                        |
| CPM          | yes                                                        |
| Exit         | yes                                                        |

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

# METERING SYSTEM DRY GAS METER CALIBRATION SHEET

## EPA Reference Method

### Metering System Post-Test Calibration

Air Hygiene Asset ID: samp-cp-0022

Filename: \\AHL-FILES\SVR\public\Shared\QAQC\Calibrations\PM-Equipment\IM-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0022 Calibration 7-14-21.xls}8-18-21 (3 point)

Make: Apex  
Model #: XC-522  
Serial #: 1204013

Date: 08/18/21  
Barometric Pressure: 29.20 (in. Hg)  
Theoretical Critical Vacuum: 13.77 (in. Hg)

#### DRY GAS METER READINGS

| ΔH<br>(in. H2O)   |                | Time<br>(min)                  | Volume                                   |                              |                     | Initial Temperature |                 |
|-------------------|----------------|--------------------------------|------------------------------------------|------------------------------|---------------------|---------------------|-----------------|
|                   |                |                                | Initial<br>(ft³)                         | Final<br>(ft³)               | Total<br>(ft³)      | Inlet<br>(°F)       | Outlet<br>(°F)  |
| 1.90              |                | 10.00                          | 862.800                                  | 870.790                      | 7.990               | 78.0                | 78.0            |
| 1.90              |                | 10.00                          | 870.790                                  | 878.790                      | 8.000               | 77.0                | 77.0            |
| 1.90              |                | 10.00                          | 878.790                                  | 886.800                      | 8.010               | 78.0                | 78.0            |
|                   |                |                                |                                          |                              |                     |                     |                 |
| Final Temperature |                | Orifice<br>Serial#<br>(number) | K' Orifice<br>Coefficient<br>(see above) | Actual<br>Vacuum<br>(in. Hg) | Ambient Temperature |                     |                 |
| Inlet<br>(°F)     | Outlet<br>(°F) |                                |                                          |                              | Initial<br>(°F)     | Final<br>(°F)       | Average<br>(°F) |
| 77.0              | 77.0           | 163                            | 0.5930                                   | 16.0                         | 74.0                | 73.9                | 74.0            |
| 78.0              | 78.0           | 163                            | 0.5930                                   | 16.0                         | 73.9                | 74.1                | 74.0            |
| 78.0              | 78.0           | 163                            | 0.5930                                   | 16.0                         | 74.1                | 74.1                | 74.1            |

#### RESULTS

| DRY GAS METER                                        |                                            | ORIFICE                                               |                                             |                                                |
|------------------------------------------------------|--------------------------------------------|-------------------------------------------------------|---------------------------------------------|------------------------------------------------|
| VOLUME<br>CORRECTED<br>Vm(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vm(std)<br>(liters) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(liters) | VOLUME<br>NOMINAL<br>Vcr<br>(ft <sup>3</sup> ) |
| 7.693                                                | 217.88                                     | 7.494                                                 | 212.2                                       | 7.768                                          |
| 7.703                                                | 218.15                                     | 7.493                                                 | 212.2                                       | 7.768                                          |
| 7.706                                                | 218.22                                     | 7.492                                                 | 212.2                                       | 7.769                                          |
| DRY GAS METER<br>CALIBRATION FACTOR<br>Y             |                                            | ORIFICE<br>CALIBRATION FACTOR<br>$\Delta H@$          |                                             |                                                |
| Variation<br>(number)                                | Value<br>(number)                          | Value<br>(in. H <sub>2</sub> O)                       | Value<br>(mm H <sub>2</sub> O)              | Variation<br>(in. H <sub>2</sub> O)            |
| 0.001                                                | 0.974                                      | 1.825                                                 | 46.35                                       | 0.000                                          |
| 0.000                                                | 0.973                                      | 1.825                                                 | 46.35                                       | 0.001                                          |
| -0.001                                               | 0.972                                      | 1.823                                                 | 46.32                                       | -0.001                                         |
| <b>AVERAGE:</b>                                      | <b>0.973</b>                               | <b>1.824</b>                                          | 46.34                                       | <b>PASSED</b>                                  |
| <b>LAST 5-PT:</b>                                    | <b>0.986</b>                               | <b>1.831</b>                                          | <b>PASSED</b>                               | 5-PT Date:                                     |
| <b>% DIFF:</b>                                       | <b>1.3%</b>                                | <b>0.4%</b>                                           |                                             | 07/14/21                                       |

#### 40 CFR - CHAPTER I - PART 60

##### Appendix A, Method 5

##### 10.3.2 Calibration After Use

After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test)...Calculate the average value of the DGM calibration factor. If the value has changed by more than 5 percent, recalibrate the meter over the full range of orifice settings, as detailed in Section 10.3.1.

##### 10.3.3 Acceptable Variation in Calibration

If the DGM coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for the test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

Notes: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/- 0.02. For Orifice Calibration Factor  $\Delta H@$ , the orifice differential pressure in inches of H<sub>2</sub>O that equates to 0.75 cfm of air at 68 °F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/- 0.2. For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units, (ft)<sup>3</sup>\*(deg R)<sup>0.5</sup>/((in.Hg)\*(min)).

SIGNATURE: Craig McCarty

DATE: 08/18/21 08/18/21



# METERING SYSTEM THERMOCOUPLE CALIBRATION SHEET

## EPA Reference Method

### Metering System Post-Test Calibration

Air Hygiene Asset ID: samp-cp-0022

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0022 Calibration 7-14-21.xls}8-18-21 (3 point)

Make: Apex  
Model #: XC-522  
Serial #: 1204013

Date: 08/18/21  
Barometric Pressure: 29.19 (in. Hg)  
Temperature (ASTM cal): 74.00 (°F)

| Thermocouple | 100 (°F) |         | 600 (°F) |         | 1200 (°F) |         |
|--------------|----------|---------|----------|---------|-----------|---------|
|              | Reading  | % Error | Reading  | % Error | Reading   | % Error |
| Stack        | 100.00   | 0.00    | 599.00   | 0.17    | 1198.00   | 0.17    |
| Probe        | 100.00   | 0.00    | 599.00   | 0.17    | 1198.00   | 0.17    |
| Filter       | 100.00   | 0.00    | 599.00   | 0.17    | 1198.00   | 0.17    |
| Dryer        | 100.00   | 0.00    | 599.00   | 0.17    | 1198.00   | 0.17    |
| Aux.         | 100.00   | 0.00    | 599.00   | 0.17    | 1198.00   | 0.17    |

Note: Calibrated against an ALTEK Thermocouple Source Series 22, ID: samp-tc-0004

Direct temperature output calibrated to ASTM and IPTS standards as outlined in ALTEK Data Sheet 22.

| Thermocouple | 74.00 (°F) |       | Responded to heating/cooling with the anticipated outcome? |
|--------------|------------|-------|------------------------------------------------------------|
|              | Reading    | (±°F) |                                                            |
| DGM In       | 75.0       | 1.00  | yes                                                        |
| DGM Out      | 75.0       | 1.00  | yes                                                        |

Note: Calibrated against Reference Thermometer ID: a070717

SIGNATURE: Craig McCarty

DATE: 08/18/21 08/18/21

#### Standard for Calibration of Console Thermocouple Systems

40 CFR, Part 60

Appendix A, Method 5

10.3.2 The temperature data recorded in the field shall be considered valid. If, during calibration, the absolute temperature measured with the sensor being calibrated and the reference sensor **agree within 1.5 percent**, the temperature data taken in the field shall be considered valid.

#### Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

# PROBE (STACK), HOTBOX (FILTER), AND GOOSENECK (EXIT) THERMOCOUPLE CALIBRATION SHEET

EPA Reference Method

Metering System Post-Test Calibration

Air Hygiene Asset ID(s):

Probe: samp-hp-0086

Hotbox: samp-bh-0012

Gooseneck: samp-ad-0046

Filename: \\AHI-FILES\VR\public\Shared\QAQC\Calibrations\PM-Equipment\IM-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0022 Calibration 7-14-21.xls}8-18-21 (3 point)

Barometric Pressure:

29.19

| Thermo-couples |      | Temps | Signature            | Date     |          |
|----------------|------|-------|----------------------|----------|----------|
|                |      | (°F)  |                      |          |          |
| Stack          | Ref  | 74.00 | <i>Craig McCarty</i> | 08/18/21 | 08/18/21 |
|                | Read | 74.00 |                      |          |          |
|                | ±°F  | 0.00  |                      |          |          |
| Probe          | Ref  | 74.00 | <i>Craig McCarty</i> | 08/18/21 | 08/18/21 |
|                | Read | 74.00 |                      |          |          |
|                | ±°F  | 0.00  |                      |          |          |
| Filter         | Ref  | 74.00 | <i>Craig McCarty</i> | 08/18/21 | 08/18/21 |
|                | Read | 74.00 |                      |          |          |
|                | ±°F  | 0.00  |                      |          |          |
| Cond.          | Ref  | 74.00 | <i>Craig McCarty</i> | 08/18/21 | 08/18/21 |
|                | Read | 75.00 |                      |          |          |
|                | ±°F  | 1.00  |                      |          |          |
| CPM            | Ref  | 74.00 | <i>Craig McCarty</i> | 08/18/21 | 08/18/21 |
|                | Read | 75.00 |                      |          |          |
|                | ±°F  | 1.00  |                      |          |          |
| Exit           | Ref  | 74.00 | <i>Craig McCarty</i> | 08/18/21 | 08/18/21 |
|                | Read | 74.00 |                      |          |          |
|                | ±°F  | 0.00  |                      |          |          |

Note: Calibrated against Reference Thermometer ID: a070717

| Thermocouple | Responded to heating/cooling with the anticipated outcome? |
|--------------|------------------------------------------------------------|
| Stack        | yes                                                        |
| Probe        | yes                                                        |
| Filter       | yes                                                        |
| Cond.        | yes                                                        |
| CPM          | yes                                                        |
| Exit         | yes                                                        |

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

**Field Balance Weight Verification**  
**Annual 500g Field Balance Stock Weight vs. 500g ISO 17025 Traceable Weight**  
**Air Hygiene Asset ID: samp-sc-0025**

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\Field Balance Weights\2021[samp-sc-0025\_225.xlsm]Balance  
 Make: Ohaus ISO 17025 Weight ID LABS-WT-0005  
 Model #: Scout Pro SP2001-US ISO S/N 1000128090  
 Serial #: 7130410278 ISO Cal Due 8/4/2021  
 Field Weight #: sc-0025  
 Trailer #: 221

| ISO 17025 Certified Weight<br>(g)                                                                | Field Balance Weight<br>(g) | ± g                                       |
|--------------------------------------------------------------------------------------------------|-----------------------------|-------------------------------------------|
| 500.00                                                                                           | 499.60                      | 0.40                                      |
| <br>(signature) |                             | must be <0.5<br><u>01/19/21</u><br>(date) |

| ISO 17025 Certified Weight<br>(g)                                                                | Field Balance Weight<br>(g) | ± g                                       |
|--------------------------------------------------------------------------------------------------|-----------------------------|-------------------------------------------|
| 500.00                                                                                           | 500.10                      | 0.10                                      |
| <br>(signature) |                             | must be <0.5<br><u>01/19/21</u><br>(date) |

| ISO 17025 Certified Weight<br>(g)                                                                  | Field Balance Weight<br>(g) | ± g                                       |
|----------------------------------------------------------------------------------------------------|-----------------------------|-------------------------------------------|
| 500.00                                                                                             | 500.00                      | 0.00                                      |
| <br>(signature) |                             | must be <0.5<br><u>01/19/21</u><br>(date) |

Note: Calibrated against ISO 17025 Certified weight LABS-WT-0005

EPA Method 4 - Section 10.3, EPA Method 5 - Section 10.7, EPA Method 202 - Section 10.3: Field Balance Calibration Check. Check the calibration of the balance used to weigh impingers with a weight that is at least 500g or within 50g of a loaded impinger. The weight must be ASTM E617-13 "Standard Specification for Laboratory Weights and Precision Mass Standards" Class 6 (or better). Daily before used, the field balance must measure within ±0.5g of the certified mass. If the daily balance calibration check fails, perform corrective measures and repeat the check before using balance.

ISO 17025 Certified 500g Weight is certified annually. Certified weight is used to verify Class 6 or better weight that accompanies each field balance on the balance it will be used. Acceptance criteria is certified weight must be within ±0.5g of Class 6 or better weight.

**Field Balance Weight Verification**  
**Annual 500g Field Balance Stock Weight vs. 500g ISO 17025 Traceable Weight**  
**Air Hygiene Asset ID: samp-sc-0015**

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\Field Balance Weights\2021\samp-sc-7130100125\_Extra.xlsm]Balance  
 Make: Ohaus ISO 17025 Weight ID LABS-WT-0005  
 Model #: Scout Pro SP2001-US ISO S/N 1000128090  
 Serial #: 7130100125 ISO Cal Due 8/4/2021  
 Field Weight #:  
 Trailer #: extra

| ISO 17025 Certified Weight<br>(g) | Field Balance Weight<br>(g) | ± g             |
|-----------------------------------|-----------------------------|-----------------|
| 500.00                            | 500.00                      | 0.00            |
| <i>Sean Barnes</i>                |                             | must be <0.5    |
| (signature)                       |                             | 01/19/21 (date) |

| ISO 17025 Certified Weight<br>(g) | Field Balance Weight<br>(g) | ± g             |
|-----------------------------------|-----------------------------|-----------------|
| 500.00                            | 499.70                      | 0.30            |
| <i>Sean Barnes</i>                |                             | must be <0.5    |
| (signature)                       |                             | 01/19/21 (date) |

| ISO 17025 Certified Weight<br>(g) | Field Balance Weight<br>(g) | ± g             |
|-----------------------------------|-----------------------------|-----------------|
| 500.00                            | 499.80                      | 0.20            |
| <i>Sean Barnes</i>                |                             | must be <0.5    |
| (signature)                       |                             | 01/19/21 (date) |

Note: Calibrated against ISO 17025 Certified weight LABS-WT-0005

EPA Method 4 - Section 10.3, EPA Method 5 - Section 10.7, EPA Method 202 - Section 10.3: Field Balance Calibration Check. Check the calibration of the balance used to weigh impingers with a weight that is at least 500g or within 50g of a loaded impinger. The weight must be ASTM E617-13 "Standard Specification for Laboratory Weights and Precision Mass Standards" Class 6 (or better). Daily before used, the field balance must measure within ±0.5g of the certified mass. If the daily balance calibration check fails, perform corrective measures and repeat the check before using balance.

ISO 17025 Certified 500g Weight is certified annually. Certified weight is used to verify Class 6 or better weight that accompanies each field balance on the balance it will be used. Acceptance criteria is certified weight must be within ±0.5g of Class 6 or better weight.

**WEATHER STATION CALIBRATION SHEET**  
**Temperature, Barometric Pressure, and Relative Humidity Periodic Calibration**  
**Air Hygiene Asset ID: samp-we-0014**

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\Weather Stations\2021\SAMP-WE-0014\_224-012221.xlsm]112013  
 Make: Kestrel ISO 17025 Weather Station ID SAMP-WE-0033  
 Model #: 4000 ISO 17025 S/N A026334  
 Serial #: 671144 ISO 17025 Cal Due 7/22/2021

| ASTM Temp<br>(deg F) (±1.5°)                                                                                            | Thermo.<br>(deg F) | ± deg F | ASTM Barometer<br>(in. Hg) (±0.1 in Hg) | Barometric<br>(in. Hg) | ± in. Hg | Time  |
|-------------------------------------------------------------------------------------------------------------------------|--------------------|---------|-----------------------------------------|------------------------|----------|-------|
| 68.60                                                                                                                   | 67.90              | 0.70    | 29.31                                   | 29.30                  | 0.01     | 12:05 |
| <div> <div>Sean Barnes</div> <div>Sean Karpas</div> <div>01/22/21</div> <div>(signature)</div> <div>(date)</div> </div> |                    |         |                                         |                        |          |       |

| ASTM Temp<br>(deg F) (±1.5°)                                                                                            | Thermo.<br>(deg F) | ± deg F | ASTM Barometer<br>(in. Hg) (±0.1 in Hg) | Barometric<br>(in. Hg) | ± in. Hg | Time  |
|-------------------------------------------------------------------------------------------------------------------------|--------------------|---------|-----------------------------------------|------------------------|----------|-------|
| 69.30                                                                                                                   | 69.20              | 0.10    | 29.28                                   | 29.30                  | 0.02     | 12:35 |
| <div> <div>Sean Barnes</div> <div>Sean Karpas</div> <div>01/22/21</div> <div>(signature)</div> <div>(date)</div> </div> |                    |         |                                         |                        |          |       |

| ASTM Temp<br>(deg F) (±1.5°)                                                                                            | Thermo.<br>(deg F) | ± deg F | ASTM Barometer<br>(in. Hg) (±0.1 in Hg) | Barometric<br>(in. Hg) | ± in. Hg | Time  |
|-------------------------------------------------------------------------------------------------------------------------|--------------------|---------|-----------------------------------------|------------------------|----------|-------|
| 68.90                                                                                                                   | 69.00              | 0.10    | 29.27                                   | 29.29                  | 0.02     | 12:55 |
| <div> <div>Sean Barnes</div> <div>Sean Karpas</div> <div>01/22/21</div> <div>(signature)</div> <div>(date)</div> </div> |                    |         |                                         |                        |          |       |

| ASTM Temp<br>(deg F) (±1.5°)                                                                                            | Thermo.<br>(deg F) | ± deg F | ASTM Barometer<br>(in. Hg) (±0.1 in Hg) | Barometric<br>(in. Hg) | ± in. Hg | Time  |
|-------------------------------------------------------------------------------------------------------------------------|--------------------|---------|-----------------------------------------|------------------------|----------|-------|
| 68.70                                                                                                                   | 68.80              | 0.10    | 29.27                                   | 29.28                  | 0.01     | 13:20 |
| <div> <div>Sean Barnes</div> <div>Sean Karpas</div> <div>01/22/21</div> <div>(signature)</div> <div>(date)</div> </div> |                    |         |                                         |                        |          |       |

Note: Verified against ISO 17025 Traceable Barometer and Thermometer (SAMP-WE-0033).

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end of report**

## **APPENDIX C. EMISSION CALCULATIONS**

---

**Mine Development  
Plan I PTE**



**Mine Development  
Project Summary**

**Table A-1a. Project Emission Summary**

| Change                                                                         | Fugitive? (Y/N) | PM     | PM <sub>10</sub> | PM <sub>2.5</sub> | NO <sub>x</sub> | SO <sub>2</sub> | CO     | VOC    | Lead Compounds | Max Single HAP (Acetaldehyde) | Total HAPs | CO <sub>2</sub> e |
|--------------------------------------------------------------------------------|-----------------|--------|------------------|-------------------|-----------------|-----------------|--------|--------|----------------|-------------------------------|------------|-------------------|
| <b>Project Emissions</b>                                                       |                 |        |                  |                   |                 |                 |        |        |                |                               |            |                   |
| Permitted NG Engines PTE <sup>1</sup>                                          | N               | 38.13  | 38.13            | 38.13             | 163.88          | 1.22            | 72.84  | 84.33  | 0.00           | 39.80                         | 68.00      | 1,133,794         |
| Proposed NG Engines PTE                                                        |                 | 52.42  | 52.42            | 52.42             | 113.02          | 2.76            | 23.19  | 58.16  | 0.00           | 27.46                         | 40.98      | 781,927           |
| Change to PTE - NG Engines                                                     |                 | 14.28  | 14.28            | 14.28             | -50.86          | 1.54            | -49.65 | -26.17 | 0.00           | -12.34                        | -27.02     | -351,867          |
| Permitted Diesel Engine PTE                                                    | N               | 0.99   | 0.99             | 0.99              | 40.47           | 3.12            | 79.19  | 16.77  | 0.00           | 0.01                          | 0.44       | 43,135            |
| Proposed Diesel Engine PTE                                                     |                 | 1.09   | 1.09             | 1.09              | 40.45           | 2.63            | 79.03  | 17.12  | 0.00           | 0.01                          | 0.51       | 50,247            |
| Change to PTE - Diesel Engines                                                 |                 | 0.10   | 0.10             | 0.10              | -0.02           | -0.49           | -0.16  | 0.35   | 0.00           | 9.49E-04                      | 6.97E-02   | 7,112             |
| Permitted Aboveground Road PTE                                                 | Y               | 181.79 | 46.90            | 4.69              | --              | --              | --     | --     | 1.85E-02       | --                            | 1.69E-01   | --                |
| Proposed Aboveground Road PTE                                                  |                 | 179.95 | 46.42            | 4.64              | --              | --              | --     | --     | 1.84E-02       | --                            | 1.67E-01   | --                |
| Change to PTE - Aboveground Roads                                              |                 | -1.84  | -0.48            | -0.05             | --              | --              | --     | --     | -1.43E-04      | --                            | -2.00E-03  | --                |
| Permitted Tailings Operations PTE                                              | Y               | 27.66  | 10.97            | 2.36              | --              | --              | --     | --     | 0.118          | --                            | 1.36       | --                |
| Proposed Tailings Operations PTE                                               |                 | 26.67  | 10.71            | 2.26              | --              | --              | --     | --     | 0.114          | --                            | 1.31       | --                |
| Change to PTE - Tailings Operations                                            |                 | -0.99  | -0.26            | -0.10             | --              | --              | --     | --     | -4.20E-03      | --                            | -0.05      | --                |
| Project Non-Fugitive PTE                                                       |                 | 14.39  | 14.39            | 14.39             | -50.88          | 1.05            | -49.81 | -25.82 | 0.00E+00       | -12.33                        | -26.95     | -344,755          |
| Project Fugitive PTE                                                           |                 | -2.83  | -0.73            | -0.15             | 0.00            | 0.00            | 0.00   | 0.00   | -4.34E-03      | 0.00                          | -0.05      | 0.00              |
| <b>Permitting Threshold Comparison</b>                                         |                 |        |                  |                   |                 |                 |        |        |                |                               |            |                   |
| Minor New Source Review (mNSR) Thresholds <sup>1</sup>                         |                 | --     | 7.50             | 5.00              | 20.00           | 20.00           | 50.00  | 20.00  | 0.30           | --                            | --         | --                |
| Does Project Non-Fugitive PTE exceed mNSR Thresholds?                          |                 | --     | Yes              | Yes               | No              | No              | No     | No     | No             | --                            | --         | --                |
| Permitted Non-Fugitive PTE <sup>2</sup>                                        |                 | 212.39 | 92.33            | 54.59             | 205.61          | 6.87            | 220.37 | 107.94 | 1.85           | 39.84                         | 73.53      | 1,176,929         |
| Permitted Non-Fugitive PTE + Project Non-Fugitive PTE Increases                |                 | 226.78 | 106.71           | 68.97             | 154.74          | 7.92            | 170.56 | 82.11  | 1.85           | 27.50                         | 46.58      | 832,174           |
| Class I Title V Major Source Thresholds <sup>1</sup>                           |                 | 100    | 100              | 100               | 100             | 100             | 100    | 100    | 10             | 10                            | 25         | --                |
| Does Non-Fugitive PTE exceed Class I Title V Major Source Thresholds?          |                 | Yes    | Yes              | No                | Yes             | No              | Yes    | No     | No             | Yes                           | Yes        | --                |
| Class I PSD Major Source Thresholds                                            |                 | 250    | 250              | 250               | 250             | 250             | 250    | 250    | --             | --                            | --         | 100,000           |
| Does Non-Fugitive PTE exceed Class I PSD Major Source Thresholds? <sup>3</sup> |                 | No     | No               | No                | No              | No              | No     | No     | --             | --                            | --         | No                |

1. Per Arizona Administrative Code (A.A.C.)

R18-2-101.110 - For "Potential to emit" (PTE)

R18-2-101.75 - For "Major Source"

R18-2-101.101 - For "Permitting Exemption Thresholds" which is the mNSR Threshold per R18-2-334.A.3

2. Permitted PTE is based on post MPR No. 109292 PTE.

3. Sources exceeding 100,000 tons of CO<sub>2</sub>e are only subject to PSD if they also trigger PSD for another regulated NSR pollutant. The Hermosa Project does not trigger PSD for any other NSR pollutant. While CO<sub>2</sub>e is not included under the definition of "regulated NSR pollutant" at A.A.C. R18-2-101.124, GHGs are considered a "regulated NSR pollutant" under the federal Prevention of Significant Deterioration (PSD) program at 40 C.F.R. § 52.21(b)(50). South32 is therefore providing estimates of GHG (i.e., CO<sub>2</sub>e) emissions for purposes of demonstrating non-applicability of the federal PSD program for GHGs, which ADEQ implements via a delegation agreement with EPA.

**Mine Development  
Summary**

**Table A-1b. Total Site-Wide Emissions**

| Pollutant                      | Regulated NSR Pollutant? <sup>2</sup> | Estimated Potential Emissions (tpy) <sup>1,2</sup> |                         |
|--------------------------------|---------------------------------------|----------------------------------------------------|-------------------------|
|                                |                                       | Non-Fugitive                                       | Non-Fugitive & Fugitive |
| PM                             | Yes                                   | 228.47                                             | 459.80                  |
| PM <sub>10</sub>               | Yes                                   | 108.03                                             | 176.02                  |
| PM <sub>2.5</sub>              | Yes                                   | 69.82                                              | 78.64                   |
| NO <sub>x</sub>                | Yes                                   | 154.74                                             | 154.74                  |
| SO <sub>x</sub>                | Yes                                   | 7.92                                               | 7.92                    |
| CO                             | Yes                                   | 170.56                                             | 170.56                  |
| VOC                            | Yes                                   | 82.11                                              | 99.23                   |
| Lead compounds                 | No                                    | 1.15                                               | 1.59                    |
| Elemental Lead                 | Yes                                   | 1.15                                               | 1.59                    |
| Total HAPs                     | No                                    | 50.81                                              | 53.77                   |
| HCN                            | No                                    | 5.38                                               | 5.41                    |
| H <sub>2</sub> S               | Yes                                   | 10.12                                              | 10.12                   |
| CO <sub>2</sub> e <sup>4</sup> | -                                     | 833,346                                            | 833,346                 |

1. PM, PM<sub>10</sub>, and PM<sub>2.5</sub> include both filterable and condensable fractions, which conservatively overestimates PM emissions from an NSR perspective.

2. Per Arizona Administrative Code (A.A.C.)

R18-2-101.110 - For "Potential to emit"

R18-2-101.124 - For "Regulated NSR Pollutant"

**Table A-1c. Total Emissions - Source Specific**

| Emission Point Number | Emissions Activity                                                                                                    | Include? Yes/No | Source Type <sup>1</sup> | Underground/A boveground? | Controlled Emissions Summary - Annual |                  |                   |                |                 |       |                 |     |            |                  |                   |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|---------------------------|---------------------------------------|------------------|-------------------|----------------|-----------------|-------|-----------------|-----|------------|------------------|-------------------|
|                       |                                                                                                                       |                 |                          |                           | PM                                    | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | NO <sub>x</sub> | CO    | SO <sub>x</sub> | VOC | Total HAPs | H <sub>2</sub> S | CO <sub>2</sub> e |
| DRILL-1               | Drilling                                                                                                              | Yes             | Non-fugitive             | Underground               | 0.06                                  | 0.03             | 0.03              | 3.01E-03       | --              | --    | --              | --  | 0.01       | --               | --                |
| BLAST-1               | Blasting                                                                                                              | Yes             | Non-fugitive             | Underground               | 0.55                                  | 0.28             | 0.11              | 0.03           | 1.13            | 60.75 | 2.25            | --  | 0.05       | 9.00             | 1,042.15          |
| CRUSH-1               | Primary Crushing                                                                                                      | Yes             | Non-fugitive             | Underground               | 0.35                                  | 0.16             | 0.19              | 0.02           | --              | --    | --              | --  | 0.03       | --               | --                |
| BREAK-1               | Clark Rock Breaker                                                                                                    | Yes             | Non-fugitive             | Aboveground               | 3.99E-03                              | 1.89E-03         | 2.85E-04          | 7.01E-05       | --              | --    | --              | --  | 7.74E-04   | --               | --                |
| BREAK-2               | Underground Waste Rock Breaker                                                                                        | Yes             | Non-fugitive             | Underground               | 0.01                                  | 2.45E-03         | 3.70E-04          | 1.83E-05       | --              | --    | --              | --  | 4.92E-05   | --               | --                |
| BREAK-3 - BREAK-7     | Various Underground Ore Rock Breakers                                                                                 | Yes             | Non-fugitive             | Underground               | 0.05                                  | 0.02             | 3.64E-03          | 2.40E-03       | --              | --    | --              | --  | 4.69E-03   | --               | --                |
| BREAK-8               | Underground Crusher Rock Breaker                                                                                      | Yes             | Non-fugitive             | Underground               | 0.14                                  | 0.06             | 0.01              | 0.01           | --              | --    | --              | --  | 0.01       | --               | --                |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                       | Yes             | Non-fugitive             | Aboveground               | 2.47                                  | 1.17             | 0.18              | 0.10           | --              | --    | --              | --  | 0.19       | --               | --                |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                        | Yes             | Fugitive                 | Aboveground               | 0.96                                  | 0.46             | 0.07              | 0.01           | --              | --    | --              | --  | 0.01       | --               | --                |
| DP-21                 | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                              | Yes             | Fugitive                 | Aboveground               | 0.36                                  | 0.17             | 0.03              | 0.02           | --              | --    | --              | --  | 0.03       | --               | --                |
| DP-22                 | Transfer from face to loader                                                                                          | Yes             | Non-Fugitive             | Underground               | 0.02                                  | 0.01             | 0.01              | 7.08E-04       | --              | --    | --              | --  | 1.39E-03   | --               | --                |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                         | Yes             | Non-Fugitive             | Underground               | 0.02                                  | 0.01             | 0.01              | 7.08E-04       | --              | --    | --              | --  | 1.39E-03   | --               | --                |
| DP-24                 | Drop from loader or haul truck through grizzly to ore pass                                                            | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 0.01             | 0.01              | 6.69E-04       | --              | --    | --              | --  | 1.28E-03   | --               | --                |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                       | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 0.01             | 0.01              | 6.69E-04       | --              | --    | --              | --  | 1.28E-03   | --               | --                |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                   | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 0.01             | 0.01              | 6.95E-04       | --              | --    | --              | --  | 1.36E-03   | --               | --                |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 0.01             | 0.01              | 6.95E-04       | --              | --    | --              | --  | 1.36E-03   | --               | --                |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                      | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 0.01             | 0.01              | 6.95E-04       | --              | --    | --              | --  | 1.36E-03   | --               | --                |
| DP-29                 | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3              | Yes             | Non-Fugitive             | Underground               | 0.10                                  | 0.05             | 0.05              | 4.88E-03       | --              | --    | --              | --  | 0.01       | --               | --                |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                     | Yes             | Non-Fugitive             | Underground               | 0.03                                  | 0.01             | 0.01              | 8.87E-05       | --              | --    | --              | --  | 2.38E-04   | --               | --                |
| DP-31                 | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor                           | Yes             | Non-Fugitive             | Underground               | 0.02                                  | 0.01             | 0.01              | 1.05E-03       | --              | --    | --              | --  | 2.06E-03   | --               | --                |
| DP-32                 | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                                 | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 2.56E-03         | 2.56E-03          | 1.92E-05       | --              | --    | --              | --  | 5.14E-05   | --               | --                |
| DP-33                 | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes                           | Yes             | Non-Fugitive             | Underground               | 0.03                                  | 0.01             | 0.01              | 1.07E-03       | --              | --    | --              | --  | 2.11E-03   | --               | --                |
| DP-34                 | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                                   | Yes             | Non-Fugitive             | Underground               | 0.03                                  | 0.01             | 0.01              | 1.07E-03       | --              | --    | --              | --  | 2.11E-03   | --               | --                |
| DP-82                 | Drop on West Rock Stockpile                                                                                           | Yes             | Fugitive                 | Aboveground               | 0.67                                  | 0.32             | 0.05              | 2.37E-03       | --              | --    | --              | --  | 0.01       | --               | --                |
| DP-83                 | Drop on East Ore Stockpile                                                                                            | Yes             | Fugitive                 | Aboveground               | 0.36                                  | 0.17             | 0.03              | 0.02           | --              | --    | --              | --  | 0.03       | --               | --                |
| DP-84                 | Drop on TSF                                                                                                           | Yes             | Fugitive                 | Aboveground               | 1.25                                  | 0.59             | 0.09              | 0.01           | --              | --    | --              | --  | 0.06       | --               | --                |

**Mine Development  
Summary**

| Emission Point Number | Emissions Activity                                                                                   | Include? Yes/No | Source Type <sup>1</sup> | Underground/Aboveground? | Controlled Emissions Summary - Annual |                  |                   |                |                 |    |                 |          |          |    | Total HAPs | H <sub>2</sub> S | CO <sub>2</sub> e |
|-----------------------|------------------------------------------------------------------------------------------------------|-----------------|--------------------------|--------------------------|---------------------------------------|------------------|-------------------|----------------|-----------------|----|-----------------|----------|----------|----|------------|------------------|-------------------|
|                       |                                                                                                      |                 |                          |                          | PM                                    | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | NO <sub>x</sub> | CO | SO <sub>x</sub> | VOC      |          |    |            |                  |                   |
| DP-94                 | Transfer from Agg Stockpile to Loader                                                                | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DP-95                 | Transfer of Agg Material from Loader to Haul Truck                                                   | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DP-96                 | Transfer of Shotcrete Aggregate from Stockpile to Loader                                             | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DP-97                 | Transfer from East Ore Stockpile to Loader                                                           | Yes             | Fugitive                 | Aboveground              | 0.36                                  | 0.17             | 0.03              | 0.02           | --              | -- | --              | --       | 0.03     | -- | --         | --               | --                |
| DP-98                 | Transfer from Loader to Haul Truck                                                                   | Yes             | Fugitive                 | Aboveground              | 0.36                                  | 0.17             | 0.03              | 0.02           | --              | -- | --              | --       | 0.03     | -- | --         | --               | --                |
| DP-99                 | Transfer from Waste Chute Stockpile to Loader                                                        | Yes             | Fugitive                 | Aboveground              | 3.21                                  | 1.52             | 0.23              | 0.02           | --              | -- | --              | --       | 0.04     | -- | --         | --               | --                |
| DP-100                | Transfer from Loader to Haul Truck                                                                   | Yes             | Fugitive                 | Aboveground              | 3.21                                  | 1.52             | 0.23              | 0.02           | --              | -- | --              | --       | 0.04     | -- | --         | --               | --                |
| DP-138                | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                               | Yes             | Fugitive                 | Aboveground              | 7.92E-05                              | 3.75E-05         | 5.68E-06          | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DP-139                | Drop of Dry Cationic Flocculant via Manual Addition                                                  | Yes             | Fugitive                 | Aboveground              | 3.57E-08                              | 1.69E-08         | 2.56E-09          | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DP-143                | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module | Yes             | Fugitive                 | Aboveground              | 9.97E-04                              | 4.71E-04         | 7.14E-05          | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DP-144                | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                 | Yes             | Fugitive                 | Aboveground              | 2.26E-03                              | 1.07E-03         | 1.62E-04          | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DP-145                | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module | Yes             | Fugitive                 | Aboveground              | 1.09E-03                              | 5.13E-04         | 7.77E-05          | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DP-148                | Drop of Anionic Flocculant (Hydrex 6161)                                                             | Yes             | Fugitive                 | Aboveground              | 1.18E-05                              | 5.58E-06         | 8.45E-07          | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DP-149                | Drop of Sodium Bicarbonate                                                                           | Yes             | Fugitive                 | Aboveground              | 1.18E-05                              | 5.58E-06         | 8.45E-07          | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-1                  | 21210-CX-00002 Main Shaft Ore Discharge Dust Collector 7                                             | Yes             | Non-fugitive             | Aboveground              | 0.24                                  | 0.24             | 0.24              | 0.01           | --              | -- | --              | --       | 0.02     | -- | --         | --               | --                |
| DC-2                  | 21210-CX-00001 Coarse Ore Overland Conveyor Dust Collector 7                                         | Yes             | Non-fugitive             | Aboveground              | 0.38                                  | 0.38             | 0.38              | 0.02           | --              | -- | --              | --       | 0.03     | -- | --         | --               | --                |
| DC-3                  | 21210-CX-00003 Transfer Tower Silo Dust Collector 4                                                  | Yes             | Non-fugitive             | Aboveground              | 2.25                                  | 2.25             | 2.25              | 0.09           | --              | -- | --              | --       | 0.17     | -- | --         | --               | --                |
| DC-4                  | 21510-CX-00001 Coarse Ore Silo Dust Collector 4                                                      | Yes             | Non-fugitive             | Aboveground              | 0.83                                  | 0.83             | 0.83              | 0.04           | --              | -- | --              | --       | 0.08     | -- | --         | --               | --                |
| DC-5                  | 21710-CX-00002 Silo Discharge Dust Collector 5                                                       | Yes             | Non-fugitive             | Aboveground              | 0.81                                  | 0.81             | 0.81              | 0.04           | --              | -- | --              | --       | 0.08     | -- | --         | --               | --                |
| DC-12                 | 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector                                               | Yes             | Non-fugitive             | Aboveground              | 0.30                                  | 0.30             | 0.30              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-13                 | 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector                                             | Yes             | Non-fugitive             | Aboveground              | 0.30                                  | 0.30             | 0.30              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-14                 | 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector                                             | Yes             | Non-fugitive             | Aboveground              | 0.30                                  | 0.30             | 0.30              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-15                 | 22620-CX-00004 Caustic Mix Tank Dust Collector                                                       | Yes             | Non-fugitive             | Aboveground              | 0.30                                  | 0.30             | 0.30              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-16                 | 22210-CX-00001 Pebble Crusher Dust Collector 4                                                       | Yes             | Non-fugitive             | Aboveground              | 0.93                                  | 0.93             | 0.93              | 0.04           | --              | -- | --              | --       | 0.09     | -- | --         | --               | --                |
| DC-PPBS1              | 18610-SI-00001 Paste Plant Binder Storage Silo 1 6                                                   | Yes             | Non-fugitive             | Aboveground              | 0.14                                  | 0.14             | 0.14              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-PPBS2              | 18610-SI-00002 Paste Plant Binder Storage Silo 2 6                                                   | Yes             | Non-fugitive             | Aboveground              | 0.14                                  | 0.14             | 0.14              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-PPBS3              | 18610-SI-10003 Paste Plant Binder Dosage Silo 3 6                                                    | Yes             | Non-fugitive             | Aboveground              | 0.28                                  | 0.28             | 0.28              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-PPBS4              | 18610-SI-20004 Paste Plant Binder Dosage Silo 4 6                                                    | Yes             | Non-fugitive             | Aboveground              | 0.28                                  | 0.28             | 0.28              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-PPM1M              | 18610-DC-20002 Paste Plant Module 1 Mixer 6                                                          | Yes             | Non-fugitive             | Aboveground              | 0.56                                  | 0.56             | 0.56              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-PPM2M              | 18610-DC-20002 Paste Plant Module 2 Mixer 6                                                          | Yes             | Non-fugitive             | Aboveground              | 0.56                                  | 0.56             | 0.56              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-7                  | Coarse Ore Dust Collection System,23100-FAN-0001                                                     | Yes             | Non-fugitive             | Aboveground              | 0.12                                  | 0.12             | 0.12              | 2.11E-03       | --              | -- | --              | --       | 0.02     | -- | --         | --               | --                |
| DC-8                  | Coarse Ore Dust Collection System,23100-FAN-0002                                                     | Yes             | Non-fugitive             | Aboveground              | 0.12                                  | 0.12             | 0.12              | 2.11E-03       | --              | -- | --              | --       | 0.02     | -- | --         | --               | --                |
| DC-CPPBS1             | Paste Plant Binder Silo 1 6                                                                          | Yes             | Non-fugitive             | Aboveground              | 0.14                                  | 0.14             | 0.14              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-CPPBS2             | Paste Plant Binder Silo 2 6                                                                          | Yes             | Non-fugitive             | Aboveground              | 0.14                                  | 0.14             | 0.14              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-CPPBS3             | Paste Plant Binder Silo 3 6                                                                          | Yes             | Non-fugitive             | Aboveground              | 0.28                                  | 0.28             | 0.28              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-CPPBS4             | Paste Plant Binder Silo 4 6                                                                          | Yes             | Non-fugitive             | Aboveground              | 0.28                                  | 0.28             | 0.28              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-CPPM1M             | Paste Plant Module 1 Mixer 6                                                                         | Yes             | Non-fugitive             | Aboveground              | 0.56                                  | 0.56             | 0.56              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-CPPM2M             | Paste Plant Module 2 Mixer 6                                                                         | Yes             | Non-fugitive             | Aboveground              | 0.56                                  | 0.56             | 0.56              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| DC-10                 | Coarse Ore Dust Collection System,23100-DCD-0005                                                     | Yes             | Non-fugitive             | Aboveground              | 0.12                                  | 0.12             | 0.12              | 2.11E-03       | --              | -- | --              | --       | 0.02     | -- | --         | --               | --                |
| WTP1LS                | Waste Water Treatment Plant #1 Lime Silo                                                             | Yes             | Non-fugitive             | Aboveground              | 0.19                                  | 0.19             | 0.19              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| WTP2 DC               | Sodium Sulfate Indoor Dust Collector 5                                                               | Yes             | Non-fugitive             | Aboveground              | 0.01                                  | 0.01             | 0.01              | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| TNK-040               | F549/MIBC                                                                                            | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | -- | --              | 0.29     | 0.26     | -- | --         | --               | --                |
| TNK-041               | 3407-A                                                                                               | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | -- | --              | 1.48E-03 | 9.52E-05 | -- | --         | --               | --                |
| TNK-044               | Solvay 5100                                                                                          | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | -- | --              | 0.01     | 3.67E-05 | -- | --         | --               | --                |
| TNK-045               | Copper Sulphate                                                                                      | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |
| TNK-046               | Copper Sulphate                                                                                      | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | -- | --              | --       | --       | -- | --         | --               | --                |

**Mine Development  
Summary**

| Emission Point Number | Emissions Activity                              | Include? Yes/No | Source Type <sup>1</sup> | Underground/Aboveground? | Controlled Emissions Summary - Annual |                  |                   |                |                 |      |                 |          |            |      | H <sub>2</sub> S | CO <sub>2</sub> e |
|-----------------------|-------------------------------------------------|-----------------|--------------------------|--------------------------|---------------------------------------|------------------|-------------------|----------------|-----------------|------|-----------------|----------|------------|------|------------------|-------------------|
|                       |                                                 |                 |                          |                          | PM                                    | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | NO <sub>x</sub> | CO   | SO <sub>2</sub> | VOC      | Total HAPs |      |                  |                   |
| TNK-047               | Zinc Sulphate                                   | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-048               | Zinc Sulphate                                   | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-051               | Zinc Cyanide                                    | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-052               | Zinc Cyanide                                    | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-053               | SMBS                                            | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-054               | SMBS                                            | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-057               | Tailings Flocculant(SNF AN910-VHM)              | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-058               | Tailings Flocculant(SNF AN910-VHM)              | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-059               | Tailings Flocculant(SNF AN910-VHM)              | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-060               | 3418-A                                          | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 1.90E-04 | --         | --   | --               |                   |
| TNK-061               | Shaft ANE                                       | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 2.38E-04 | --         | --   | --               |                   |
| TSF_1                 | Tailing Storage Facility                        | Yes             | Fugitive                 | Aboveground              | 16.45                                 | 8.23             | 1.23              | 0.07           | --              | --   | --              | --       | 0.81       | --   | --               |                   |
| WRS                   | West Rock Stockpile                             | Yes             | Fugitive                 | Aboveground              | 0.67                                  | 0.34             | 0.05              | 2.37E-03       | --              | --   | --              | --       | 0.01       | --   | --               |                   |
| EOS                   | East Ore Stockpile                              | Yes             | Fugitive                 | Aboveground              | 0.74                                  | 0.37             | 0.06              | 0.04           | --              | --   | --              | --       | 0.07       | --   | --               |                   |
| TAGG                  | Taylor Agg Stockpile                            | Yes             | Fugitive                 | Aboveground              | 4.53E-04                              | 2.27E-04         | 3.40E-05          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TSHOT                 | Taylor Shotcrete Stockpile                      | Yes             | Fugitive                 | Aboveground              | 8.06E-04                              | 4.03E-04         | 6.04E-05          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| HRS                   | Hardshell Rock Stockpile                        | Yes             | Fugitive                 | Aboveground              | 3.95                                  | 1.98             | 0.30              | 0.02           | --              | --   | --              | --       | 0.05       | --   | --               |                   |
| ORE                   | Clark Ore Stockpile                             | Yes             | Fugitive                 | Aboveground              | 0.12                                  | 0.06             | 0.01              | 2.12E-03       | --              | --   | --              | --       | 0.02       | --   | --               |                   |
| ROM                   | Clark ROM Stockpile                             | Yes             | Fugitive                 | Aboveground              | 0.04                                  | 0.02             | 2.68E-03          | 6.29E-04       | --              | --   | --              | --       | 0.01       | --   | --               |                   |
| AGG                   | Clark Agg Stockpile                             | Yes             | Fugitive                 | Aboveground              | 4.53E-04                              | 2.27E-04         | 3.40E-05          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| SHOT                  | Clark Shotcrete Stockpile                       | Yes             | Fugitive                 | Aboveground              | 8.06E-04                              | 4.03E-04         | 6.04E-05          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| CHUTE                 | Waste Chute Stockpile                           | Yes             | Fugitive                 | Aboveground              | 2.59E-03                              | 1.30E-03         | 1.94E-04          | 1.49E-05       | --              | --   | --              | --       | 3.54E-05   | --   | --               |                   |
| WTP2CT                | Cooling Towers                                  | Yes             | Fugitive                 | Aboveground              | 0.02                                  | 0.02             | 4.07E-04          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| PRODREF               | Refrigeration Plant <sup>3</sup>                | Yes             | Non-fugitive             | Aboveground              | 0.05                                  | 0.03             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| BBREF                 | Refrigeration Plant <sup>3</sup>                | Yes             | Non-fugitive             | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| MILLREF               | Primary Mill Cooling Tower                      | Yes             | Non-fugitive             | Aboveground              | 3.51E-03                              | 1.83E-03         | 6.37E-04          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| SCRUBBER-1            | Tank Exhaust HCN Scrubber                       | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | 5.38       | --   | --               |                   |
| Tanks Exhaust         | Process Tanks Exhaust                           | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | 0.03       | --   | --               |                   |
| CBP1_11               | Taylor Concrete Batch Plant <sup>2</sup>        | Yes             | Non-fugitive             | Aboveground              | 0.79                                  | 0.32             | 0.32              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| CCBP1_11              | Clark Concrete Batch Plant                      | Yes             | Non-fugitive             | Aboveground              | 0.04                                  | 0.02             | 0.02              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| DOZER-WRS             | Dozer Emissions                                 | Yes             | Fugitive                 | Aboveground              | 1.09                                  | 0.14             | 0.11              | 3.84E-03       | --              | --   | --              | --       | 0.01       | --   | --               |                   |
| DOZER-HRS             | Dozer Emissions                                 | Yes             | Fugitive                 | Aboveground              | 1.09                                  | 0.14             | 0.11              | 0.01           | --              | --   | --              | --       | 0.01       | --   | --               |                   |
| DOZER-TSF             | Dozer Emissions                                 | Yes             | Fugitive                 | Aboveground              | 8.96                                  | 1.89             | 0.94              | 0.04           | --              | --   | --              | --       | 0.44       | --   | --               |                   |
| DOZER-EOS             | Dozer Emissions                                 | Yes             | Fugitive                 | Aboveground              | 1.09                                  | 0.14             | 0.11              | 0.05           | --              | --   | --              | --       | 0.10       | --   | --               |                   |
| MEVAP1                | Mechanical Evaporator                           | Yes             | Fugitive                 | Aboveground              | --                                    | 0.04             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| MEVAP2                | Mechanical Evaporator                           | Yes             | Fugitive                 | Aboveground              | --                                    | 0.04             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| MEVAP3                | Mechanical Evaporator                           | Yes             | Fugitive                 | Aboveground              | --                                    | 0.04             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| 22310-FC-00001        | Lead Rougher                                    | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.06     | --         | --   | --               |                   |
| 22310-FC-00004        | Lead Rougher Scavenger                          | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.06     | --         | --   | --               |                   |
| 22310-FC-00008        | Lead Cleaner Scalper                            | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.19     | --         | --   | --               |                   |
| 22310-FC-00007        | Lead Cleaner                                    | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.16     | --         | --   | --               |                   |
| 22310-FC-00009        | Lead Cleaner Scavenger                          | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.15     | --         | --   | --               |                   |
| 22310-FC-00005        | Zinc Rougher                                    | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.12     | --         | --   | --               |                   |
| 22310-FC-00006        | Zinc Rougher Scavenger                          | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.11     | --         | --   | --               |                   |
| 22310-FC-00011        | Zinc Cleaner Scalper                            | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.12     | --         | --   | --               |                   |
| 22310-FC-00010        | Zinc Cleaner                                    | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.10     | --         | --   | --               |                   |
| 22310-FC-00012        | Zinc Cleaner Scavenger                          | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.09     | --         | --   | --               |                   |
| 22430-TN-00001        | Lead Concentrate Tank                           | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 6.02     | --         | --   | --               |                   |
| 22430-TN-00002        | Zinc Concentrate Tank                           | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 7.60     | --         | --   | --               |                   |
| 22310-TN-00003        | Lead Conditioning Tank                          | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.50     | --         | --   | --               |                   |
| 22310-TN-00001        | Zinc Conditioning Tank No. 1                    | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.28     | --         | --   | --               |                   |
| 22310-TN-00002        | Zinc Conditioning Tank No. 2                    | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.28     | --         | --   | --               |                   |
| DRILL-2               | Drilling                                        | Yes             | Non-fugitive             | Underground              | 0.02                                  | 0.01             | 0.01              | 3.39E-04       | --              | --   | --              | --       | 3.74E-03   | --   | --               |                   |
| BLAST-2               | Blasting                                        | Yes             | Non-fugitive             | Underground              | 0.31                                  | 0.16             | 0.04              | 0.01           | 0.14            | 7.59 | 0.28            | --       | 0.06       | 1.12 | 130.15           |                   |
| DP-103                | Dump into Primary Crusher Feed Hopper           | Yes             | Fugitive                 | Aboveground              | 0.29                                  | 0.14             | 0.02              | 0.01           | --              | --   | --              | --       | 0.06       | --   | --               |                   |
| DP-104                | Drop from silo to trucks                        | Yes             | Fugitive                 | Aboveground              | 0.96                                  | 0.46             | 0.07              | 0.02           | --              | --   | --              | --       | 0.19       | --   | --               |                   |
| DP-105                | Transfer of Ore from Ore Stockpile to Loader    | Yes             | Fugitive                 | Aboveground              | 0.58                                  | 0.27             | 0.04              | 0.01           | --              | --   | --              | --       | 0.11       | --   | --               |                   |
| DP-106                | Transfer of Ore Mined from Loader to Haul Truck | Yes             | Fugitive                 | Aboveground              | 0.58                                  | 0.27             | 0.04              | 0.01           | --              | --   | --              | --       | 0.11       | --   | --               |                   |
| DP-107                | Transfer from ROM Stockpile to Loader           | Yes             | Fugitive                 | Aboveground              | 0.16                                  | 0.08             | 0.01              | 2.79E-03       | --              | --   | --              | --       | 0.03       | --   | --               |                   |
| DP-109                | Transfer from Agg Stockpile to Loader           | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |

**Mine Development  
Summary**

| Emission Point Number                                | Emissions Activity                                            | Include? Yes/No | Source Type <sup>1</sup> | Underground/Aboveground? | Controlled Emissions Summary - Annual |                  |                   |                |                 |        |                 |          |            |                  |                  |
|------------------------------------------------------|---------------------------------------------------------------|-----------------|--------------------------|--------------------------|---------------------------------------|------------------|-------------------|----------------|-----------------|--------|-----------------|----------|------------|------------------|------------------|
|                                                      |                                                               |                 |                          |                          | PM                                    | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | NO <sub>x</sub> | CO     | SO <sub>2</sub> | VOC      | Total HAPs | H <sub>2</sub> S | CO <sub>2e</sub> |
| DP-110                                               | Transfer of Agg Material from Loader to Haul Truck            | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | --     | --              | --       | --         | --               | --               |
| DP-111                                               | Transfer of Shotcrete Aggregate from Stockpile to Loader      | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | --     | --              | --       | --         | --               | --               |
| DP-113                                               | Hardshell Rock Storage                                        | Yes             | Fugitive                 | Aboveground              | 2.60                                  | 1.23             | 0.19              | 0.01           | --              | --     | --              | --       | 0.06       | --               | --               |
| DP-114                                               | Ore Stockpile                                                 | Yes             | Fugitive                 | Aboveground              | 0.58                                  | 0.27             | 0.04              | 0.01           | --              | --     | --              | --       | 0.11       | --               | --               |
| DP-115                                               | ROM Stockpile                                                 | Yes             | Fugitive                 | Aboveground              | 0.16                                  | 0.08             | 0.01              | 2.79E-03       | --              | --     | --              | --       | 0.03       | --               | --               |
| DP-124                                               | Transfer of Development Ore from Face to Loader               | Yes             | Non-fugitive             | Underground              | 9.01E-04                              | 4.26E-04         | 2.67E-04          | 1.16E-05       | --              | --     | --              | --       | 9.79E-05   | --               | --               |
| DP-125                                               | Transfer of Development Ore from Loader to Stockpile          | Yes             | Non-fugitive             | Underground              | 9.01E-04                              | 4.26E-04         | 2.67E-04          | 1.16E-05       | --              | --     | --              | --       | 9.79E-05   | --               | --               |
| DP-126                                               | Transfer of Development Ore from Stockpile to Loader          | Yes             | Non-fugitive             | Underground              | 9.01E-04                              | 4.26E-04         | 2.67E-04          | 1.16E-05       | --              | --     | --              | --       | 9.79E-05   | --               | --               |
| DP-127                                               | Transfer of Development Ore Mined from Loader to Haul Truck   | Yes             | Non-fugitive             | Underground              | 9.01E-04                              | 4.26E-04         | 2.67E-04          | 1.16E-05       | --              | --     | --              | --       | 9.79E-05   | --               | --               |
| DP-129                                               | Transfer of Development Waste Mined from Face to Loader       | Yes             | Non-fugitive             | Underground              | 4.67E-03                              | 2.21E-03         | 1.38E-03          | 2.65E-05       | --              | --     | --              | --       | 1.08E-04   | --               | --               |
| DP-130                                               | Transfer of Development Waste Mined from Loader to Stockpile  | Yes             | Non-fugitive             | Underground              | 4.67E-03                              | 2.21E-03         | 1.38E-03          | 2.65E-05       | --              | --     | --              | --       | 1.08E-04   | --               | --               |
| DP-131                                               | Transfer of Development Waste Mined from Stockpile to Loader  | Yes             | Non-fugitive             | Underground              | 4.67E-03                              | 2.21E-03         | 1.38E-03          | 2.65E-05       | --              | --     | --              | --       | 1.08E-04   | --               | --               |
| DP-132                                               | Transfer of Development Waste Mined from Loader to Haul Truck | Yes             | Non-fugitive             | Underground              | 4.67E-03                              | 2.21E-03         | 1.38E-03          | 2.65E-05       | --              | --     | --              | --       | 1.08E-04   | --               | --               |
| DP-134                                               | Transfer of Stope Ore from Stope to Loader                    | Yes             | Non-fugitive             | Underground              | 2.57E-03                              | 1.21E-03         | 7.62E-04          | 4.52E-05       | --              | --     | --              | --       | 4.99E-04   | --               | --               |
| DP-135                                               | Transfer of Stope Ore from Loader to Stockpile                | Yes             | Non-fugitive             | Underground              | 2.57E-03                              | 1.21E-03         | 7.62E-04          | 4.52E-05       | --              | --     | --              | --       | 4.99E-04   | --               | --               |
| DP-136                                               | Transfer of Stope Ore from Stockpile to Loader                | Yes             | Non-fugitive             | Underground              | 2.57E-03                              | 1.21E-03         | 7.62E-04          | 4.52E-05       | --              | --     | --              | --       | 4.99E-04   | --               | --               |
| DP-137                                               | Transfer of Stope Ore from Loader to Haul Truck               | Yes             | Non-fugitive             | Underground              | 2.57E-03                              | 1.21E-03         | 7.62E-04          | 4.52E-05       | --              | --     | --              | --       | 4.99E-04   | --               | --               |
| PP-1                                                 | Truck Pneumatic Loadout to Silo 1                             | Yes             | Non-fugitive             | Aboveground              | 4.24E-02                              | 1.46E-02         | 3.04E-03          | 0.00E+00       | --              | --     | --              | --       | --         | --               | --               |
| PP-2                                                 | Truck Pneumatic Loadout to Silo 2                             | Yes             | Non-fugitive             | Aboveground              | 4.24E-02                              | 1.46E-02         | 3.04E-03          | 0.00E+00       | --              | --     | --              | --       | --         | --               | --               |
| PP-3                                                 | Truck Pneumatic Loadout to Silo 1                             | Yes             | Non-fugitive             | Aboveground              | 2.12E-02                              | 7.29E-03         | 1.52E-03          | 0.00E+00       | --              | --     | --              | --       | --         | --               | --               |
| PP-4                                                 | Truck Pneumatic Loadout to Silo 2                             | Yes             | Non-fugitive             | Aboveground              | 2.12E-02                              | 7.29E-03         | 1.52E-03          | 0.00E+00       | --              | --     | --              | --       | --         | --               | --               |
| ROADS                                                | Road Emissions                                                | Yes             | Fugitive                 | Aboveground              | 179.95                                | 46.42            | 4.64              | 0.02           | --              | --     | --              | --       | 0.17       | --               | --               |
| UGTROADS                                             | Underground Taylor Roads                                      | Yes             | Non-fugitive             | Underground              | 77.04                                 | 19.88            | 1.99              | 0.273          | --              | --     | --              | --       | 0.73       | --               | --               |
| UGCROADS                                             | Underground Clark Roads                                       | Yes             | Non-fugitive             | Underground              | 81.39                                 | 21.00            | 2.10              | 0.461          | --              | --     | --              | --       | 1.88       | --               | --               |
| ENGINE 0013 - 0056                                   | CAT 3520 DSL 2600 kW                                          | Yes             | Non-fugitive             | Aboveground              | 52.42                                 | 52.42            | 52.42             | --             | 113.02          | 23.19  | 2.76            | 58.16    | 40.98      | --               | 781,926.73       |
| ENGINE 0007 - 0012                                   | CAT C18, 589 bkW                                              | Yes             | Non-fugitive             | Aboveground              | 0.68                                  | 0.68             | 0.68              | --             | 7.80            | 40.00  | 8.28E-04        | 15.00    | 0.47       | --               | 47,547.05        |
| ENGINE 0002 - 0006                                   | CAT C175 3000 kW                                              | Yes             | Non-fugitive             | Aboveground              | 0.36                                  | 0.36             | 0.36              | --             | 31.83           | 31.83  | 0.07            | 1.73     | 0.01       | --               | 1,267.09         |
| ENGINE 0001                                          | C200D2RE                                                      | Yes             | Non-fugitive             | Aboveground              | 0.04                                  | 0.04             | 0.04              | --             | 0.82            | 7.20   | 2.56            | 0.39     | 0.03       | --               | 1,432.87         |
| AGGDF-T                                              | Aboveground Gasoline Dispensing Facility - Taylor             | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.85     | 0.15       | --               | --               |
| AGGDF-C                                              | Aboveground Gasoline Dispensing Facility - Clark              | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.41     | 0.08       | --               | --               |
| T-01                                                 | Unleaded Gasoline (S32)                                       | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.38     | 0.01       | --               | --               |
| T-02                                                 | Diesel (Red Dyed S32)                                         | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 1.64E-03 | 1.51E-04   | --               | --               |
| T-03                                                 | Diesel (Red Dyed S32)                                         | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 1.64E-03 | 1.51E-04   | --               | --               |
| T-04                                                 | Diesel (Red Dyed Rummel)                                      | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 2.04E-03 | 1.88E-04   | --               | --               |
| T-05                                                 | Unleaded Gasoline (Rummel)                                    | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.33     | 0.01       | --               | --               |
| T-06                                                 | Diesel (Rummel)                                               | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 4.74E-04 | 4.36E-05   | --               | --               |
| T-07                                                 | Unleaded Gasoline                                             | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 1.92     | 0.04       | --               | --               |
| T-08                                                 | Unleaded Gasoline                                             | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 1.92     | 0.04       | --               | --               |
| T-09                                                 | Unleaded Gasoline                                             | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 1.92     | 0.04       | --               | --               |
| T-10                                                 | Diesel                                                        | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.04     | 3.60E-03   | --               | --               |
| T-11                                                 | Diesel                                                        | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.04     | 3.30E-03   | --               | --               |
| <b>Total - Non-Fugitive &amp; Fugitive Emissions</b> |                                                               |                 |                          |                          | 459.80                                | 176.02           | 78.64             | 1.59           | 154.74          | 170.56 | 7.92            | 99.23    | 53.77      | 10.12            | 833346.03        |
| <b>Total - Non-Fugitive Emissions</b>                |                                                               |                 |                          |                          | 228.47                                | 108.03           | 69.82             | 1.15           | 154.74          | 170.56 | 7.92            | 82.11    | 50.81      | 10.12            | 833346.03        |

1. Underground emissions conservatively taken as non-fugitive. South32 reserves the right to update this conservative assumption.

2. The concrete batch plant is conservatively assumed to be a non-fugitive source of emissions. South32 reserves the right to update this representation once we have more clarity on the concrete batch plant design per correspondence with ADEQ on Jan 13th 2023.

3. The surface refrigeration plant is considered a non-fugitive source of emissions based on correspondence with ADEQ on Jan 13th 2023.

**Table A-2a. Facility HAPs Summary**

| <b>Pollutant</b>               | <b>Emissions<br/>(tpy)</b> |
|--------------------------------|----------------------------|
| Benzene                        | 0.51                       |
| Toluene                        | 0.41                       |
| Xylene                         | 0.25                       |
| 1,3-Butadiene                  | 0.14                       |
| Formaldehyde                   | 6.78                       |
| Acetaldehyde                   | 27.48                      |
| Acrolein                       | 2.47                       |
| Naphthalene                    | 0.07                       |
| 1,1,2,2-Tetrachloroethane      | 0.19                       |
| 1,1,2-Trichloroethane          | 0.15                       |
| 1,3-Dichloropropene            | 0.01                       |
| 2-Methylnaphthalene            | 0.02                       |
| 2,2,4-Trimethylpentane         | 0.12                       |
| Biphenyl                       | 0.10                       |
| Carbon Tetrachloride           | 0.17                       |
| Chlorobenzene                  | 0.14                       |
| Chloroform                     | 0.13                       |
| Ethylbenzene                   | 0.04                       |
| Ethylene Dibromide             | 0.21                       |
| Methanol                       | 1.20                       |
| Methylene Chloride             | 0.09                       |
| Hexane                         | 0.55                       |
| PAH                            | 0.39                       |
| Phenol                         | 0.11                       |
| Tetrachloroethane              | 0.01                       |
| Vinyl Chloride                 | 0.07                       |
| Cresol                         | 9.52E-05                   |
| Ethylene Glycol Dimethyl Ether | 0.26                       |
| Urethane                       | 3.67E-05                   |
| Cumene                         | 4.46E-04                   |
| Isooctane                      | 0.04                       |
| PAC's                          | 5.84E-05                   |
| Hydrogen Cyanide               | 5.41E+00                   |
| Antimony Compounds             | 1.79E-02                   |
| Arsenic Compounds              | 2.37E-02                   |
| Beryllium Compounds            | 6.34E-04                   |
| Cadmium Compounds              | 9.07E-03                   |
| Chromium Compounds             | 1.24E-02                   |
| Cobalt Compounds               | 4.57E-03                   |
| Manganese Compounds            | 4.57                       |
| Nickel Compounds               | 7.77E-03                   |
| Selenium Compounds             | 2.08E-03                   |
| Lead Compounds                 | 1.59                       |

## Mine Development HAP Summary

Table A-2b. Metal HAP in PM - Constituents Summary

| Emission Point Number | Emissions Activity                                                                                                    | Include? Yes/No | PM       | Emissions <sup>1</sup> |                   |                     |                   |                    |                  |                     |                  |                    |                |                   | Total |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------|----------|------------------------|-------------------|---------------------|-------------------|--------------------|------------------|---------------------|------------------|--------------------|----------------|-------------------|-------|
|                       |                                                                                                                       |                 |          | Antimony Compounds     | Arsenic Compounds | Beryllium Compounds | Cadmium Compounds | Chromium Compounds | Cobalt Compounds | Manganese Compounds | Nickel Compounds | Selenium Compounds | Lead Compounds | Mercury Compounds |       |
| DRILL-1               | Drilling                                                                                                              | Yes             | 0.06     | 1.25E-05               | 9.44E-05          | 2.89E-08            | 1.18E-05          | 2.00E-06           | 1.42E-05         | 1.58E-06            | 2.71E-03         | 1.58E-06           | 3.01E-03       | 5.76E-03          |       |
| BLAST-1               | Blasting                                                                                                              | Yes             | 0.55     | 1.16E-04               | 8.48E-05          | 6.55E-07            | 1.06E-04          | 1.80E-05           | 2.44E-02         | 5.45E-06            | 1.42E-05         | 2.71E-02           | --             | 5.18E-02          |       |
| CRUSH-1               | Primary Crushing                                                                                                      | Yes             | 0.35     | 7.42E-05               | 5.44E-05          | 4.20E-07            | 6.79E-05          | 1.15E-05           | 9.10E-06         | 1.54E-02            | 3.50E-06         | 9.10E-06           | 1.74E-02       | 3.32E-02          |       |
| BREAK-1               | Clark Rock Breaker                                                                                                    | Yes             | 0.00     | 1.85E-06               | 2.16E-06          | 6.70E-09            | 4.88E-07          | 1.71E-07           | 2.39E-08         | 7.00E-04            | 3.11E-08         | 1.99E-08           | 7.01E-05       | 7.44E-04          |       |
| BREAK-2               | Underground Waste Rock Breaker                                                                                        | Yes             | 0.01     | 8.98E-08               | 2.61E-07          | 7.25E-09            | 1.85E-08          | 1.41E-07           | 1.96E-08         | 3.03E-05            | 4.05E-08         | 1.68E-08           | 1.83E-05       | 4.92E-05          |       |
| BREAK-3 / BREAK-7     | Various Underground Ore Rock Breakers                                                                                 | Yes             | 0.05     | 1.03E-05               | 7.78E-06          | 6.05E-08            | 9.29E-06          | 1.69E-06           | 1.27E-06         | 2.25E-03            | 5.07E-07         | 1.27E-06           | 2.40E-03       | 4.69E-03          |       |
| BREAK-8               | Underground Crusher Rock Breaker                                                                                      | Yes             | 0.14     | 2.79E-05               | 2.10E-05          | 1.64E-07            | 2.51E-05          | 4.57E-06           | 3.43E-06         | 6.10E-03            | 1.37E-06         | 3.43E-06           | 6.55E-03       | 1.27E-02          |       |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-0001 Main Shaft Ore Suroc Bin                                        | Yes             | 2.47     | 4.11E-04               | 3.29E-04          | 3.04E-06            | 3.65E-04          | 7.92E-05           | 9.29E-02         | 2.34E-05            | 5.11E-05         | 9.55E-02           | --             | 1.88E-01          |       |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                        | Yes             | 0.96     | 2.57E-05               | 5.36E-05          | 1.34E-06            | 1.21E-05          | 2.66E-05           | 4.87E-06         | 7.49E-03            | 7.64E-06         | 4.18E-06           | 5.53E-03       | 1.31E-02          |       |
| DP-21                 | Drop from Haul Truck to 17110-CV-0001 Primary Mill Feed Conveyor Hopper                                               | Yes             | 0.36     | 7.37E-05               | 5.57E-05          | 4.33E-07            | 6.60E-05          | 1.21E-05           | 9.80E-06         | 1.61E-02            | 3.62E-06         | 9.07E-06           | 1.72E-02       | 3.35E-02          |       |
| DP-22                 | Transfer from face to loader                                                                                          | Yes             | 0.02     | 3.04E-06               | 2.43E-06          | 2.25E-08            | 2.70E-06          | 5.86E-07           | 3.80E-07         | 6.73E-04            | 1.75E-07         | 3.79E-07           | 7.08E-04       | 1.39E-03          |       |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                         | Yes             | 0.02     | 3.04E-06               | 2.43E-06          | 2.25E-08            | 2.70E-06          | 5.86E-07           | 3.80E-07         | 6.73E-04            | 1.75E-07         | 3.79E-07           | 7.08E-04       | 1.39E-03          |       |
| DP-24                 | Drop from loader or haul truck through grizzly to ore bins                                                            | Yes             | 0.01     | 2.74E-06               | 2.07E-06          | 1.61E-08            | 2.47E-06          | 4.48E-07           | 3.36E-07         | 5.98E-04            | 1.35E-07         | 3.37E-07           | 6.69E-04       | 1.28E-03          |       |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                       | Yes             | 0.01     | 2.74E-06               | 2.07E-06          | 1.61E-08            | 2.47E-06          | 4.48E-07           | 3.36E-07         | 5.98E-04            | 1.35E-07         | 3.37E-07           | 6.69E-04       | 1.28E-03          |       |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-0005 Primary Crusher Bin                                      | Yes             | 0.01     | 2.98E-06               | 2.25E-06          | 1.75E-08            | 2.69E-06          | 4.88E-07           | 3.66E-07         | 6.52E-04            | 1.47E-07         | 3.67E-07           | 6.95E-04       | 1.36E-03          |       |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Drizzle Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor | Yes             | 0.01     | 2.98E-06               | 2.25E-06          | 1.75E-08            | 2.69E-06          | 4.88E-07           | 3.66E-07         | 6.52E-04            | 1.47E-07         | 3.67E-07           | 6.95E-04       | 1.36E-03          |       |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                      | Yes             | 0.01     | 2.98E-06               | 2.25E-06          | 1.75E-08            | 2.69E-06          | 4.88E-07           | 3.66E-07         | 6.52E-04            | 1.47E-07         | 3.67E-07           | 6.95E-04       | 1.36E-03          |       |
| DP-29                 | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin                    | Yes             | 0.10     | 2.09E-05               | 1.58E-05          | 1.23E-07            | 1.89E-05          | 3.43E-06           | 2.57E-06         | 4.57E-03            | 1.03E-06         | 2.57E-06           | 4.88E-03       | 9.51E-03          |       |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                     | Yes             | 0.03     | 4.35E-07               | 1.27E-06          | 3.51E-08            | 8.94E-08          | 6.85E-07           | 9.50E-08         | 1.47E-04            | 1.96E-07         | 8.14E-08           | 8.87E-05       | 2.38E-04          |       |
| DP-31                 | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor                           | Yes             | 0.02     | 4.52E-06               | 3.41E-06          | 2.65E-08            | 4.07E-06          | 7.40E-07           | 5.55E-07         | 9.88E-04            | 2.22E-07         | 5.56E-07           | 1.05E-03       | 2.06E-03          |       |
| DP-32                 | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                                 | Yes             | 0.01     | 9.40E-08               | 2.74E-07          | 7.59E-09            | 1.93E-08          | 1.48E-07           | 2.05E-08         | 3.17E-05            | 4.23E-08         | 1.76E-08           | 1.92E-05       | 5.14E-05          |       |
| DP-33                 | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flank Feed Chutes                           | Yes             | 0.03     | 4.61E-06               | 3.68E-06          | 3.41E-08            | 4.09E-06          | 8.88E-07           | 5.76E-07         | 1.02E-03            | 2.64E-07         | 5.74E-07           | 1.07E-03       | 2.11E-03          |       |
| DP-34                 | Drop from 12820-CH-0016/0017 Flank Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                                   | Yes             | 0.03     | 4.61E-06               | 3.68E-06          | 3.41E-08            | 4.09E-06          | 8.88E-07           | 5.76E-07         | 1.02E-03            | 2.64E-07         | 5.74E-07           | 1.07E-03       | 2.11E-03          |       |
| DP-82                 | Drop on West Rock Stockpile                                                                                           | Yes             | 0.67     | 1.19E-05               | 3.38E-05          | 9.37E-07            | 2.38E-06          | 1.83E-05           | 2.53E-06         | 3.91E-03            | 5.23E-06         | 2.17E-06           | 2.73E-03       | 6.35E-03          |       |
| DP-83                 | Drop on East Ore Stockpile                                                                                            | Yes             | 0.36     | 7.37E-05               | 5.57E-05          | 4.33E-07            | 6.60E-05          | 1.21E-05           | 9.80E-06         | 1.61E-02            | 3.62E-06         | 9.07E-06           | 1.72E-02       | 3.35E-02          |       |
| DP-84                 | Drop on TSF                                                                                                           | Yes             | 1.25     | 2.54E-04               | 1.92E-04          | 1.49E-06            | 2.29E-04          | 4.16E-05           | 3.12E-05         | 5.55E-02            | 1.25E-05         | 3.12E-05           | 5.33E-03       | 6.16E-02          |       |
| DP-94                 | Transfer from Aso Stockpile to Loader                                                                                 | Yes             | 0.08     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DP-95                 | Transfer of Agg Material from Loader to Haul Truck                                                                    | Yes             | 0.08     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DP-96                 | Transfer of Shotcrete Aggregate from Stockpile to Loader                                                              | Yes             | 0.08     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DP-97                 | Transfer from East Ore Stockpile to Loader                                                                            | Yes             | 0.36     | 7.37E-05               | 5.57E-05          | 4.33E-07            | 6.60E-05          | 1.21E-05           | 9.80E-06         | 1.61E-02            | 3.62E-06         | 9.07E-06           | 1.72E-02       | 3.35E-02          |       |
| DP-98                 | Transfer from Loader to Haul Truck                                                                                    | Yes             | 0.36     | 7.37E-05               | 5.57E-05          | 4.33E-07            | 6.60E-05          | 1.21E-05           | 9.80E-06         | 1.61E-02            | 3.62E-06         | 9.07E-06           | 1.72E-02       | 3.35E-02          |       |
| DP-99                 | Transfer from Waste Rock Stockpile to Loader                                                                          | Yes             | 0.67     | 1.19E-05               | 3.38E-05          | 9.37E-07            | 2.38E-06          | 1.83E-05           | 2.53E-06         | 3.91E-03            | 5.23E-06         | 2.17E-06           | 2.73E-03       | 6.35E-03          |       |
| DP-100                | Transfer from Loader to Haul Truck                                                                                    | Yes             | 3.21     | 8.55E-05               | 1.79E-04          | 4.47E-06            | 4.02E-05          | 8.88E-05           | 1.56E-05         | 2.50E-02            | 2.55E-05         | 1.39E-05           | 1.84E-02       | 4.38E-02          |       |
| DP-138                | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                                                | Yes             | 7.92E-05 | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DP-139                | Drop of Dry Cationic Flocculant via Manual Addition                                                                   | Yes             | 3.57E-08 | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DP-143                | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module                  | Yes             | 9.97E-04 | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DP-144                | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                                  | Yes             | 2.26E-03 | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DP-145                | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module                  | Yes             | 1.09E-03 | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DP-148                | Drop of Anionic Flocculant (Hydrex 6161)                                                                              | Yes             | 1.18E-05 | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DP-149                | Drop of Sodium Bicarbonate                                                                                            | Yes             | 1.18E-05 | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-1                  | 21210-CX-00002 Main Shaft Ore Discharge Dust Collector 7                                                              | Yes             | 0.24     | 4.07E-05               | 3.25E-05          | 3.01E-07            | 3.61E-05          | 7.83E-06           | 5.08E-06         | 8.99E-03            | 2.33E-06         | 5.06E-06           | 9.46E-03       | 1.86E-02          |       |
| DC-2                  | 21210-CX-00001 Coarse Ore Overland Conveyor Dust Collector 7                                                          | Yes             | 0.38     | 7.62E-05               | 5.75E-05          | 4.47E-07            | 6.87E-05          | 1.25E-05           | 9.36E-06         | 1.67E-02            | 3.74E-06         | 9.37E-06           | 1.78E-02       | 3.47E-02          |       |
| DC-3                  | 21210-CX-00003 Transfer Tower Silo Dust Collector 4                                                                   | Yes             | 2.25     | 3.75E-04               | 3.00E-04          | 2.78E-06            | 3.33E-04          | 7.23E-05           | 4.69E-05         | 8.30E-02            | 2.15E-05         | 4.67E-05           | 8.73E-02       | 1.71E-01          |       |
| DC-4                  | 21510-CX-00001 Coarse Ore Silo Dust Collector 4                                                                       | Yes             | 0.83     | 1.68E-04               | 1.27E-04          | 9.84E-07            | 1.51E-04          | 2.74E-05           | 2.06E-05         | 3.66E-02            | 8.24E-06         | 2.06E-05           | 3.91E-02       | 7.62E-02          |       |
| DC-5                  | 21710-CX-00002 Silo Discharge Dust Collector 5                                                                        | Yes             | 0.81     | 1.65E-04               | 1.25E-04          | 9.71E-07            | 1.49E-04          | 2.71E-05           | 2.03E-05         | 3.61E-02            | 8.13E-06         | 2.03E-05           | 3.85E-02       | 7.52E-02          |       |
| DC-12                 | 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector                                                                | Yes             | 0.30     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-13                 | 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector                                                              | Yes             | 0.30     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-14                 | 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector                                                              | Yes             | 0.30     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-15                 | 22620-CX-00004 Caustic Mix Tank Dust Collector                                                                        | Yes             | 0.30     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-16                 | 22210-CX-00001 Pebble Crusher Dust Collector 4                                                                        | Yes             | 0.93     | 1.88E-04               | 1.42E-04          | 1.10E-06            | 1.70E-04          | 3.08E-05           | 2.31E-05         | 4.11E-02            | 9.25E-06         | 2.32E-05           | 4.39E-02       | 8.56E-02          |       |
| DC-PBBS1              | 18610-SI-00001 Paste Plant Binder Storage Silo 1 6                                                                    | Yes             | 0.14     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-PBBS2              | 18610-SI-00002 Paste Plant Binder Storage Silo 2 6                                                                    | Yes             | 0.14     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-PBBS3              | 18610-SI-10003 Paste Plant Binder Storage Silo 3 6                                                                    | Yes             | 0.28     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-PBBS4              | 18610-SI-20004 Paste Plant Binder Storage Silo 4 6                                                                    | Yes             | 0.28     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-PPM1M              | 18610-DC-20002 Paste Plant Module 1 Mixer 6                                                                           | Yes             | 0.56     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-PPM2M              | 18610-DC-20002 Paste Plant Module 2 Mixer 6                                                                           | Yes             | 0.56     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-7                  | Coarse Ore Dust Collection System,23100-FAN-0001                                                                      | Yes             | 0.12     | 5.42E-05               | 6.52E-05          | 2.02E-07            | 1.47E-05          | 5.17E-06           | 7.21E-07         | 2.11E-02            | 9.37E-07         | 6.01E-07           | 2.11E-03       | 2.33E-02          |       |
| DC-8                  | Coarse Ore Dust Collection System,23100-FAN-0002                                                                      | Yes             | 0.12     | 5.42E-05               | 6.52E-05          | 2.02E-07            | 1.47E-05          | 5.17E-06           | 7.21E-07         | 2.11E-02            | 9.37E-07         | 6.01E-07           | 2.11E-03       | 2.33E-02          |       |
| DC-CPBS1              | Paste Plant Binder Silo 1 6                                                                                           | Yes             | 0.14     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-CPBS2              | Paste Plant Binder Silo 2 6                                                                                           | Yes             | 0.14     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-CPBS3              | Paste Plant Binder Silo 3 6                                                                                           | Yes             | 0.28     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-CPBS4              | Paste Plant Binder Silo 4 6                                                                                           | Yes             | 0.28     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-CPPM1M             | Paste Plant Module 1 Mixer 6                                                                                          | Yes             | 0.56     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-CPPM2M             | Paste Plant Module 2 Mixer 6                                                                                          | Yes             | 0.56     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| DC-10                 | Coarse Ore Dust Collection System,23100-DCC-0005                                                                      | Yes             | 0.12     | 5.42E-05               | 6.52E-05          | 2.02E-07            | 1.47E-05          | 5.17E-06           | 7.21E-07         | 2.11E-02            | 9.37E-07         | 6.01E-07           | 2.11E-03       | 2.33E-02          |       |
| WTP1L5                | Waste Water Treatment Plant #1 Lime Silo                                                                              | Yes             | 0.19     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| WTP2 DC               | Sodium Sulfate Indoor Dust Collector 5                                                                                | Yes             | 0.01     | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| TNK-040               | E59/MIBC                                                                                                              | Yes             | --       | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| TNK-041               | 3407/A                                                                                                                | Yes             | --       | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| TNK-044               | Solmax 5100                                                                                                           | Yes             | --       | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| TNK-045               | Copper Sulphate                                                                                                       | Yes             | --       | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| TNK-046               | Copper Sulphate                                                                                                       | Yes             | --       | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| TNK-047               | Zinc Sulphate                                                                                                         | Yes             | --       | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |
| TNK-048               | Zinc Sulphate                                                                                                         | Yes             | --       | --                     | --                | --                  | --                | --                 | --               | --                  | --               | --                 | --             | 0.00E+00          |       |

### Mine Development HAP Summary

|               |                                        |     |          |          |          |          |          |          |          |          |          |          |          |    |          |  |  |  |  |  |  |    |          |
|---------------|----------------------------------------|-----|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----|----------|--|--|--|--|--|--|----|----------|
| TNK-051       | Zinc Cyanide                           | Yes | --       |          |          |          |          |          |          |          |          |          |          |    |          |  |  |  |  |  |  | -- | 0.00E+00 |
| TNK-052       | Zinc Cyanide                           | Yes | --       |          |          |          |          |          |          |          |          |          |          |    |          |  |  |  |  |  |  | -- | 0.00E+00 |
| TNK-053       | SMBs                                   | Yes | --       |          |          |          |          |          |          |          |          |          |          |    |          |  |  |  |  |  |  | -- | 0.00E+00 |
| TNK-054       | SMBs                                   | Yes | --       |          |          |          |          |          |          |          |          |          |          |    |          |  |  |  |  |  |  | -- | 0.00E+00 |
| TNK-057       | Tailings Flocculant<br>(SNF AH910-VHM) | Yes | --       |          |          |          |          |          |          |          |          |          |          |    |          |  |  |  |  |  |  | -- | 0.00E+00 |
| TNK-058       | Tailings Flocculant<br>(SNF AH910-VHM) | Yes | --       |          |          |          |          |          |          |          |          |          |          |    |          |  |  |  |  |  |  | -- | 0.00E+00 |
| TNK-059       | Tailings Flocculant<br>(SNF AH910-VHM) | Yes | --       |          |          |          |          |          |          |          |          |          |          |    |          |  |  |  |  |  |  | -- | 0.00E+00 |
| TNK-660       | 3418-A                                 | Yes | --       |          |          |          |          |          |          |          |          |          |          |    |          |  |  |  |  |  |  | -- | 0.00E+00 |
|               | Shaft ANE                              | Yes | --       |          |          |          |          |          |          |          |          |          |          |    |          |  |  |  |  |  |  | -- | 0.00E+00 |
| TSF - 1       | Tailing Storage Facility               | Yes | 16.45    | 3.24E-03 | 2.52E-03 | 1.96E-05 | 3.01E-03 | 5.47E-04 | 4.10E-04 | 0.73     | 1.64E-04 | 4.11E-04 | 7.01E-02 | -- | 8.10E-01 |  |  |  |  |  |  | -- | 8.10E-01 |
|               | West Rock Stockpile                    | Yes | 1.16E-05 | 3.39E-05 | 9.46E-07 | 2.39E-06 | 1.83E-05 | 2.54E-06 | 3.92E-03 |          | 5.20E-06 | 1.18E-06 | 2.37E-03 | -- | 6.37E-03 |  |  |  |  |  |  | -- | 6.37E-03 |
| EOS           | East Ore Stockpile                     | Yes | 0.74     | 1.51E-04 | 1.14E-04 | 8.84E-07 | 1.36E-04 | 2.47E-05 | 1.85E-05 | 3.29E-02 | 7.40E-06 | 1.85E-05 | 3.51E-02 | -- | 6.85E-02 |  |  |  |  |  |  | -- | 6.85E-02 |
| TAGG          | Taylor Agg Stockpile                   | Yes | 4.53E-04 |          |          |          |          |          |          |          |          |          |          | -- | 0.00E+00 |  |  |  |  |  |  | -- | 0.00E+00 |
| SHOT          | Shotcrete Stockpile                    | Yes | 3.04E-04 |          |          |          |          |          |          |          |          |          |          | -- | 0.00E+00 |  |  |  |  |  |  | -- | 0.00E+00 |
| HRS           | Hardshell Rock Stockpile               | Yes | 3.95     | 6.86E-05 | 2.00E-04 | 5.54E-06 | 1.41E-05 | 1.08E-04 | 1.50E-05 | 2.31E-02 | 3.09E-05 | 1.28E-05 | 2.24E-02 | -- | 4.60E-02 |  |  |  |  |  |  | -- | 4.60E-02 |
| ORE           | Clark Ore Stockpile                    | Yes | 0.12     | 5.43E-05 | 6.54E-05 | 2.02E-07 | 1.48E-05 | 5.18E-06 | 7.23E-07 | 2.11E-02 | 9.39E-07 | 6.02E-07 | 2.12E-03 | -- | 2.34E-02 |  |  |  |  |  |  | -- | 2.34E-02 |
| ROM           | Clark ROM Stockpile                    | Yes | 0.04     | 1.61E-05 | 1.94E-05 | 6.01E-08 | 4.38E-06 | 1.54E-06 | 2.14E-07 | 6.27E-03 | 2.79E-07 | 1.79E-07 | 6.29E-04 | -- | 6.94E-03 |  |  |  |  |  |  | -- | 6.94E-03 |
| AGG           | Clark Agg Stockpile                    | Yes | 0.00     |          |          |          |          |          |          |          |          |          |          | -- | 0.00E+00 |  |  |  |  |  |  | -- | 0.00E+00 |
| SHOT          | Clark Shotcrete Stockpile              | Yes | 0.00     |          |          |          |          |          |          |          |          |          |          | -- | 0.00E+00 |  |  |  |  |  |  | -- | 0.00E+00 |
| CHUTE         | Waste Chute Stockpile                  | Yes | 0.00     |          |          |          |          |          |          |          |          |          |          | -- | 0.00E+00 |  |  |  |  |  |  | -- | 0.00E+00 |
| WTPACT        | Cooling Towers                         | Yes | 0.00     | 6.91E-08 | 1.44E-07 | 3.61E-09 | 3.25E-08 | 7.17E-08 | 1.26E-08 | 2.02E-05 | 2.06E-08 | 1.12E-08 | 1.49E-05 | -- | 3.54E-05 |  |  |  |  |  |  | -- | 3.54E-05 |
| PRODREF       | Refrigeration Plant#3                  | Yes | 0.05     |          |          |          |          |          |          |          |          |          |          | -- | 0.00E+00 |  |  |  |  |  |  | -- | 0.00E+00 |
| BRIREF        | Refrigeration Plant#3                  | Yes | 0.08     |          |          |          |          |          |          |          |          |          |          | -- | 0.00E+00 |  |  |  |  |  |  | -- | 0.00E+00 |
| MILLKEF       | Primary Mill Cooling Tower             | Yes | 0.00     |          |          |          |          |          |          |          |          |          |          | -- | 0.00E+00 |  |  |  |  |  |  | -- | 0.00E+00 |
| SCRUBBER-1    | Tank Exhaust HCN Scrubber              | Yes | --       |          |          |          |          |          |          |          |          |          |          | -- | 0.00E+00 |  |  |  |  |  |  | -- | 0.00E+00 |
| Tanks Exhaust | Process Tanks Exhaust                  | Yes | --       |          |          |          |          |          |          |          |          |          |          | -- | 0.00E+00 |  |  |  |  |  |  | -- | 0.00E+00 |



**Mine Development  
HAP Summary**

**Table A-2c. Constituent Mass Fraction in LOM**

| HAP                 | Taylor          |           |         |                         | Clark           |           |         | Taylor Weighted Average |                         |                      |
|---------------------|-----------------|-----------|---------|-------------------------|-----------------|-----------|---------|-------------------------|-------------------------|----------------------|
|                     | Development Ore | Stope Ore | Rock    | Tailings <sup>1,2</sup> | Development Ore | Stope Ore | Rock    | All Material            | Stope + Development Ore | Waste Chute Material |
| Antimony Compounds  | 0.01%           | 0.0212%   | 0.0017% | 0.0203%                 | 0.024%          | 0.045%    | 0.005%  | 0.017%                  | 0.020%                  | 0.003%               |
| Arsenic Compounds   | 0.0127%         | 0.0156%   | 0.0051% | 0.0153%                 | 0.033%          | 0.054%    | 0.008%  | 0.013%                  | 0.015%                  | 0.006%               |
| Beryllium Compounds | 0.0001%         | 0.0001%   | 0.0001% | 0.0001%                 | 0.0001%         | 0.0002%   | 0.0001% | 0.000%                  | 0.000%                  | 0.000%               |
| Cadmium Compounds   | 0.0060%         | 0.0194%   | 0.0004% | 0.0183%                 | 0.007%          | 0.012%    | 0.001%  | 0.015%                  | 0.018%                  | 0.001%               |
| Chromium Compounds  | 0.0036%         | 0.0033%   | 0.0027% | 0.0033%                 | 0.005%          | 0.004%    | 0.003%  | 0.003%                  | 0.003%                  | 0.003%               |
| Cobalt Compounds    | 0.0013%         | 0.0026%   | 0.0004% | 0.0025%                 | 0.0005%         | 0.001%    | 0.0002% | 0.002%                  | 0.002%                  | 0.000%               |
| Manganese Compounds | 4.0637%         | 4.4700%   | 0.5852% | 4.4366%                 | 9.497%          | 17.550%   | 1.726%  | 3.684%                  | 4.437%                  | 0.778%               |
| Mercury Compounds   | N/A             | N/A       | N/A     | N/A                     | N/A             | N/A       | N/A     | N/A                     | N/A                     | N/A                  |
| Nickel Compounds    | 0.0010%         | 0.0010%   | 0.0008% | 0.0010%                 | 0.001%          | 0.001%    | 0.001%  | 0.001%                  | 0.001%                  | 0.001%               |
| Radionuclides       | N/A             | N/A       | N/A     | N/A                     | N/A             | N/A       | N/A     | N/A                     | N/A                     | N/A                  |
| Selenium Compounds  | 0.0013%         | 0.0026%   | 0.0003% | 0.0025%                 | 0.000%          | 0.001%    | 0.000%  | 0.002%                  | 0.002%                  | 0.000%               |
| Lead Compounds      | 2.1756%         | 4.9606%   | 0.3541% | 0.4259%                 | 1.2896%         | 1.759%    | 0.5669% | 3.876%                  | 4.732%                  | 0.573%               |

1. For constituents other than lead, tailings based on the weighted average of the development and stope ore throughput and mass fraction.

2. Estimated 91% recovery for lead ore. Since the recovery fractions for other metals are not known yet, it is conservatively assumed that all of those metals pass through to the tailings.

Notes on Lead

| Material        | Notes                                          |
|-----------------|------------------------------------------------|
| Development Ore | Based on average inside domains                |
| Stope Ore       | Based on assays within stope design            |
| Rock            | Based on average lithology grades minus inside |

Stope numbers based on evaluation of drillhole data through stope designs

Rock is the evaluation of assays within lithological units.

**Table A-2d. Metal Content in Road Surface**

| Metal     | Content (kg/kg) |
|-----------|-----------------|
| Antimony  | 1.45E-05        |
| Arsenic   | 2.06E-05        |
| Beryllium | 2.00E-06        |
| Cadmium   | 4.64E-07        |
| Chromium  | 3.22E-05        |
| Cobalt    | 1.69E-05        |
| Nickel    | 3.38E-05        |
| Selenium  | 3.00E-06        |
| Mercury   | 0.00E+00        |

Mean of 61 rock samples collected on Trachyandesite of Meadow Valley geologic base (Ka) reported in "Geochemical and Mineralogical Study of the Red Mountain Porphyry Copper-Molybdenum Deposit and Vicinity, Santa Cruz County, Arizona" 2020 prepared by USGS.

Table A-2a. Generator HAPs Summary

| Emission ID        | Description | HAP Annual Emissions (t/yr) |          |          |                  |              |              |          |             |                           |                       |                     |                     |                        |          |                      |               |            |              |                     |          |                    |          |          |          | Total    |                   |                |
|--------------------|-------------|-----------------------------|----------|----------|------------------|--------------|--------------|----------|-------------|---------------------------|-----------------------|---------------------|---------------------|------------------------|----------|----------------------|---------------|------------|--------------|---------------------|----------|--------------------|----------|----------|----------|----------|-------------------|----------------|
|                    |             | Benzene                     | Toluene  | Xylene   | 1,3-Benzenediene | Formaldehyde | Acetaldehyde | Acrolein | Naphthalene | 1,1,2,2-Tetrachloroethane | 1,1,2-Trichloroethane | 1,2-Dichloropropane | 2-Methylnaphthalene | 2,2,4-Trimethylpentane | Biphenyl | Carbon Tetrachloride | Chlorobenzene | Chloroform | Ethylbenzene | Ethylene Dichloride | Methanol | Methylene Chloride | Hexane   | PAH      | Phenol   |          | Tetrachloroethane | Vinyl Chloride |
| ENGINE 0013 - 0056 | Trench      | 2.11E-01                    | 1.95E-01 | 8.81E-02 | 1.28E-01         | 6.75E+00     | 2.75E+01     | 2.46E+00 | 3.56E-02    | 1.88E-01                  | 1.49E-01              | 1.26E-02            | 1.59E-02            | 1.20E-01               | 1.02E-01 | 1.72E-01             | 1.43E-01      | 1.34E-01   | 1.90E-02     | 2.08E-01            | 1.20E+00 | 9.39E-02           | 5.30E-01 | 3.64E-01 | 1.13E-01 | 1.16E-02 | 7.00E-02          | 40.98          |
| ENGINE 0007 - 0012 | Heapstock   | 2.26E-01                    | 8.17E-02 | 5.61E-02 | 1.14E-02         | 2.29E-02     | 7.32E-02     | 2.29E-02 | 3.78E-02    |                           |                       |                     |                     |                        |          |                      |               |            |              |                     |          |                    |          |          |          |          | 0.47              |                |
| ENGINE 0002 - 0006 | Yard        | 6.01E-03                    | 2.18E-03 | 1.49E-03 | 3.03E-04         | 6.11E-04     | 1.92E-04     | 6.10E-05 | 1.01E-03    |                           |                       |                     |                     |                        |          |                      |               |            |              |                     |          |                    |          |          |          |          | 1.25E-02          |                |
| ENGINE 0001        | WW          | 8.17E-03                    | 3.58E-03 | 2.58E-03 | 1.42E-04         | 1.03E-02     | 6.72E-03     | 8.10E-04 |             |                           |                       |                     |                     |                        |          |                      |               |            |              |                     |          |                    |          |          |          |          | 3.32E-02          |                |
|                    | Total       | 4.59E-01                    | 2.83E-01 | 1.49E-01 | 1.46E-01         | 6.78E+00     | 2.75E+01     | 2.47E+00 | 7.44E-02    | 1.88E-01                  | 1.49E-01              | 1.26E-02            | 1.59E-02            | 1.20E-01               | 1.02E-01 | 1.72E-01             | 1.43E-01      | 1.34E-01   | 1.90E-02     | 2.08E-01            | 1.20E+00 | 9.39E-02           | 5.32E-01 | 7.25E-01 | 1.13E-01 | 1.16E-02 | 7.00E-02          | 41.49          |

Table A-2f. Emission Source - Other HAPs and Lead Compounds Summary

| Emission ID   |                                                   | Description | HAP Annual Emissions (t/yr) |          |                                |          |          |                     |          |              |          |           |             |          |          |          |         | Total |
|---------------|---------------------------------------------------|-------------|-----------------------------|----------|--------------------------------|----------|----------|---------------------|----------|--------------|----------|-----------|-------------|----------|----------|----------|---------|-------|
|               |                                                   |             | Hydrogen Cyanide            | Cresol   | Ethylene Glycol Dimethyl Ether | Urethane | Benzene  | Benz(a,h,i)perylene | Cumene   | Ethylbenzene | Hexane   | Isooctane | Naphthalene | PAH's    | Toluene  | Xylene   |         |       |
| T-01          | Unleaded Gasoline (S32)                           |             | --                          | --       | --                             | 2.02E-03 | 1.49E-13 | 2.59E-05            | 1.52E-04 | 1.52E-04     | 2.32E-03 | 1.18E-06  | 1.18E-06    | 2.32E-03 | 6.66E-04 |          | 7.7E-03 |       |
| T-02          | Diesel (Rat Diesel S32)                           |             |                             |          |                                | 3.20E-06 | 1.60E-18 | 0.00E+00            | 5.03E-06 | 5.03E-06     | 0.00E+00 | 7.69E-07  | 7.69E-07    | 3.77E-05 | 9.81E-05 |          | 1.9E-04 |       |
| T-03          | Diesel (Rat Diesel S32)                           |             |                             |          |                                | 3.20E-06 | 1.60E-18 | 0.00E+00            | 5.03E-06 | 5.03E-06     | 0.00E+00 | 7.69E-07  | 7.69E-07    | 3.77E-05 | 9.81E-05 |          | 1.9E-04 |       |
| T-04          | Diesel (Rat Diesel Burrell)                       |             |                             |          |                                | 3.98E-06 | 2.01E-18 | 0.00E+00            | 6.27E-06 | 6.27E-06     | 0.00E+00 | 9.61E-07  | 9.61E-07    | 4.70E-05 | 1.22E-04 |          | 1.9E-04 |       |
| T-05          | Unleaded Gasoline (Burrell)                       |             |                             |          |                                | 1.76E-03 | 1.29E-13 | 2.25E-05            | 1.52E-04 | 1.52E-04     | 2.01E-03 | 1.02E-06  | 1.02E-06    | 2.01E-03 | 5.79E-04 |          | 6.4E-03 |       |
| T-06          | Diesel (Burrell)                                  |             |                             |          |                                | 3.76E-07 | 4.61E-14 | 0.00E+00            | 1.46E-06 | 1.46E-06     | 0.00E+00 | 2.73E-07  | 2.73E-07    | 1.09E-05 | 2.84E-05 |          | 4.4E-05 |       |
| T-07          | Unleaded Gasoline                                 |             |                             |          |                                | 1.03E-02 | 7.62E-19 | 3.78E-04            | 7.78E-04 | 7.78E-04     | 1.19E-02 | 6.03E-06  | 6.03E-06    | 1.19E-02 | 3.40E-03 |          | 3.9E-02 |       |
| T-08          | Unleaded Gasoline                                 |             |                             |          |                                | 1.03E-02 | 7.62E-19 | 3.78E-04            | 7.78E-04 | 7.78E-04     | 1.19E-02 | 6.03E-06  | 6.03E-06    | 1.19E-02 | 3.40E-03 |          | 3.9E-02 |       |
| T-09          | Unleaded Gasoline                                 |             |                             |          |                                | 1.03E-02 | 7.62E-19 | 3.78E-04            | 7.78E-04 | 7.78E-04     | 1.19E-02 | 6.03E-06  | 6.03E-06    | 1.19E-02 | 3.40E-03 |          | 3.9E-02 |       |
| T-10          | Diesel                                            |             |                             |          |                                | 7.64E-05 | 3.86E-17 | 0.00E+00            | 1.20E-04 | 1.20E-04     | 0.00E+00 | 1.84E-05  | 1.84E-05    | 9.02E-04 | 2.35E-03 |          | 3.6E-03 |       |
| T-11          | Diesel                                            |             |                             |          |                                | 7.64E-05 | 3.86E-17 | 0.00E+00            | 1.20E-04 | 1.20E-04     | 0.00E+00 | 1.84E-05  | 1.84E-05    | 9.02E-04 | 2.35E-03 |          | 3.6E-03 |       |
| TNK-00        | PSPPHAC                                           |             |                             |          | 2.62E-01                       |          |          |                     |          |              |          |           |             |          |          |          | 2.6E-01 |       |
| TNK-01        | S407A                                             |             | 9.52E-05                    |          |                                |          |          |                     |          |              |          |           |             |          |          |          | 9.5E-05 |       |
| TNK-04        | Solway 2300                                       |             |                             |          | 3.67E-05                       |          |          |                     |          |              |          |           |             |          |          |          | 3.7E-05 |       |
| AGGP-T        | Aboveground Gasoline Dispensing Facility - Taylor |             |                             |          |                                |          | 1.52E-02 |                     |          | 1.18E-02     | 8.45E-03 |           |             |          | 5.92E-02 |          | 1.5E-01 |       |
| AGGP-C        | Aboveground Gasoline Dispensing Facility - Clark  |             |                             |          |                                |          | 2.60E-03 |                     |          | 2.80E-03     | 4.14E-03 |           |             |          | 2.30E-02 |          | 7.5E-02 |       |
| CR1100R-11    | Frank Johnson HRT Krumbein                        |             | 5.38E-02                    |          |                                |          |          |                     |          |              |          |           |             |          |          |          | 5.4E+00 |       |
| Tanks Exhaust | Process Tanks Exhaust                             |             |                             |          |                                |          |          |                     |          |              |          |           |             |          |          |          | 3.5E-03 |       |
| Total         |                                                   |             | 5.41E+00                    | 9.52E-05 | 2.62E-01                       | 3.67E-05 | 5.76E-02 | 8.22E-17            | 4.46E-04 | 2.05E-02     | 1.55E-02 | 3.99E-02  | 5.84E-05    | 5.84E-05 | 1.30E-01 | 1.04E-01 | 6.04    |       |

**Mine Development  
Pb Content**

**Table A-2c. Taylor Lead Content**

| <b>Material</b>                            | <b>Lead Content (%)</b> |
|--------------------------------------------|-------------------------|
| Stope Ore                                  | 4.96%                   |
| Waste Rock                                 | 0.35%                   |
| Developmental Ore                          | 2.18%                   |
| Tailings                                   | 0.43%                   |
| Stope Ore & Developmental Ore              | 4.73%                   |
| Stope Ore & Developmental Ore & Waste Rock | 3.88%                   |
| Waste Chute Material                       | 0.57%                   |

**Mine Development  
Drilling - Taylor**

**Table A-3a. Taylor Drilling - Parameters and Emission Factors**

| Emission Point Number | Activity | Throughput <sup>1</sup> |            | Controlled Emission Factor <sup>3</sup> |                                           |                               |                                         | Control <sup>4</sup>                                            |                                        |                                  |
|-----------------------|----------|-------------------------|------------|-----------------------------------------|-------------------------------------------|-------------------------------|-----------------------------------------|-----------------------------------------------------------------|----------------------------------------|----------------------------------|
|                       |          | (tons/hr)               | (ton/year) | PM<br>(lb/ton)                          | PM <sub>10</sub> <sup>2</sup><br>(lb/ton) | PM <sub>2.5</sub><br>(lb/ton) | Lead Compounds <sup>5</sup><br>(lb/ton) | Type                                                            | PM/PM <sub>10</sub> /Pb Efficiency (%) | PM <sub>2.5</sub> Efficiency (%) |
| DRILL-1               | Drilling | 657                     | 5,739,000  | 1.69E-04                                | 8.00E-05                                  | 1.21E-05                      | 8.39E-06                                | Gravity Settling due to underground drilling (underground only) | 87%                                    | 17%                              |

1. Per Total tonnes w/ backfill used from "Mined tonnes and Pb grade.xlsx" recd. on 7/12/2021

2. Per AP-42 Section 11.19.2, Table 11.19.2-2 (08/2004) for "Wet Drilling - Unfragmented Stone".

3. Per U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, the particle size multiplier used for calculating emission factors for PM10 and PM2.5 is as follows:

PM: 0.74

PM<sub>10</sub>: 0.35

PM<sub>2.5</sub>: 0.053

4. Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32. Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

5. Lead percentage in stope ore used conservatively for drilling

4.96 %

**Table A-3b. Taylor Drilling - Emissions**

| Emission Point Number | Activity | Controlled Emissions <sup>1</sup> |                  |                   |                |                          |                  |                   |                |                          |                  |                   |                |
|-----------------------|----------|-----------------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |          | Annual Emissions (tpy)            |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                | Hourly Emissions (lb/hr) |                  |                   |                |
|                       |          | PM                                | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DRILL-1               | Drilling | 0.06                              | 0.03             | 2.87E-02          | 3.01E-03       | 0.33                     | 0.16             | 0.16              | 0.02           | 1.39E-02                 | 6.57E-03         | 6.57E-03          | 6.89E-04       |

1. Controlled Emissions have been calculated for drilling since gravity settling is a part of an inherent process for underground mines.

Pursuant to 40 CFR §64.1, "control device" means "equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere." Furthermore, "inherent process equipment" means "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations." The gravity settling is an inherent part of the process.

**Mine Development  
Drilling - Clark**

**Table A-4a. Clark Drilling - Parameters and Emission Factors**

| Emission Point Number | Activity | Throughput <sup>1</sup> |            | Controlled Emission Factor <sup>3</sup> |                               |                   |                             | Control <sup>4</sup>                                            |                                        |                                  |
|-----------------------|----------|-------------------------|------------|-----------------------------------------|-------------------------------|-------------------|-----------------------------|-----------------------------------------------------------------|----------------------------------------|----------------------------------|
|                       |          |                         |            | PM                                      | PM <sub>10</sub> <sup>2</sup> | PM <sub>2.5</sub> | Lead Compounds <sup>5</sup> | Type                                                            | PM/PM <sub>10</sub> /Pb Efficiency (%) | PM <sub>2.5</sub> Efficiency (%) |
|                       |          | (tons/hr)               | (ton/year) | (lb/ton)                                | (lb/ton)                      | (lb/ton)          | (lb/ton)                    |                                                                 |                                        |                                  |
| DRILL-2               | Drilling | 128                     | 1,125,000  | 1.69E-04                                | 8.00E-05                      | 1.21E-05          | 2.98E-06                    | Gravity Settling due to underground drilling (underground only) | 80%                                    | 16%                              |

1. Per email "Clark Updated Inputs for Air Permit" from Cayley Hoffman received on 9/8/2022

2. Per AP-42 Section 11.19.2, Table 11.19.2-2 (08/2004) for "Wet Drilling - Unfragmented Stone".

3. Per U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, the particle size multiplier used for calculating emission factors for PM10 and PM2.5 is as follows:

PM: 0.74

PM<sub>10</sub>: 0.35

PM<sub>2.5</sub>: 0.053

4. Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32.

Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

5. Lead percentage in stope ore used conservatively for drilling 1.76 %

**Table A-4b. Clark Drilling - Emissions**

| Emission Point Number | Activity | Controlled Emissions <sup>1</sup> |                  |                   |                |                          |                  |                   |                |                          |                  |                   |                |
|-----------------------|----------|-----------------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |          | Annual Emissions (tpy)            |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                | Hourly Emissions (lb/hr) |                  |                   |                |
|                       |          | PM                                | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DRILL-2               | Drilling | 0.02                              | 0.009            | 0.0057            | 0.0003         | 0.11                     | 0.05             | 0.031             | 0.002          | 0.004                    | 0.002            | 1.30E-03          | 7.73E-05       |

1. Controlled Emissions have been calculated for drilling since gravity settling is a part of an inherent process for underground mines.

Pursuant to 40 CFR §64.1, "control device" means "equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere." Furthermore, "inherent process equipment" means "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations." The gravity settling is an inherent part of the process.

**Mine Development  
Blasting - Taylor**

**Table A-5a. Taylor Blasting - Parameters**

| Emission Point No. | Location | Blast Area<br>(ft <sup>2</sup> /blast) <sup>1</sup> | Throughput <sup>1</sup> |          | Blasting Rates <sup>1</sup> |
|--------------------|----------|-----------------------------------------------------|-------------------------|----------|-----------------------------|
|                    |          | Maximum                                             | (ton/hr)                | (ton/yr) | (blasts/yr)                 |
| BLAST-1            | Blasting | 9,000                                               | 17.42                   | 4,500    | 730                         |

1. Per meetings with Kevin McCoy on 9/9/2022, 10/14/2022, and 10/17/2022

Maximum Hourly emulsion usage = 17.42 ton/hr

**Table A-5b. Taylor Blasting Emissions**

| Emission Point No. | Location | Pollutant         | Emission Factor <sup>1,2,3,4,5</sup> | Unit              | Controlled Emissions <sup>6,7</sup> |          |          |
|--------------------|----------|-------------------|--------------------------------------|-------------------|-------------------------------------|----------|----------|
|                    |          |                   |                                      |                   | (tpy)                               | (lb/day) | (lb/hr)  |
| BLAST-1            | Blasting | NO <sub>x</sub>   | 0.50                                 | (lb/ton Emulsion) | 1.13                                | --       | 8.71     |
|                    |          | CO                | 27.00                                | (lb/ton Emulsion) | 60.75                               | --       | 470.25   |
|                    |          | H <sub>2</sub> S  | 4.00                                 | (lb/ton Emulsion) | 9.00                                | --       | 69.67    |
|                    |          | SO <sub>2</sub>   | 1.00                                 | (lb/ton Emulsion) | 2.25                                | --       | 17.42    |
|                    |          | PM                | 1.49                                 | (Max lb/Blast)    | 0.55                                | 2.99     | 1.49     |
|                    |          | PM <sub>10</sub>  | 0.78                                 | (Max lb/Blast)    | 0.28                                | 1.55     | 0.78     |
|                    |          | PM <sub>2.5</sub> | 0.30                                 | (Max lb/Blast)    | 0.11                                | 0.59     | 0.30     |
|                    |          | Lead (from ore)   | 0.07                                 | (Max lb/Blast)    | 0.03                                | 0.15     | 0.074    |
|                    |          | CO <sub>2</sub>   | 463.18                               | (lb/ton)          | 1,042.15                            | --       | 8,066.92 |

1. NO<sub>x</sub> and CO emission factors based on "Fume Memo WESCO Aug 2021" pdf dated 19 August 2021 provided by Seth Fredrick Dyno Nobel Inc.

2. H<sub>2</sub>S and SO<sub>2</sub> emission factors per AP-42 Section 13.3, Table 13.3-1 for dynamite, gelatin (January 1995).

This emission factor was used by FMI Climax Mine, Colorado (underground mine) per permit application in October 2013 for CDPHE Air Permit No. 95CC899.

3. PM emission factor calculated per AP-42 Section 11.9, Table 11.9-1 for blasting (July 1998)

$$0.000014(A)^{1.5} \quad \text{where, } A = \text{horizontal area (ft}^2\text{), with blasting depth } \leq 70 \text{ ft}$$

The following scaling factors are applied to PM emission factor to calculate PM<sub>10</sub> and PM<sub>2.5</sub> emission factors per AP-42 Table 11.9-1:

PM<sub>10</sub>: 0.52

PM<sub>2.5</sub>: 0.03

4. CO<sub>2</sub> emission factor is based on "Testing of mining explosives with regard to the content of carbon oxides and nitrogen oxides in their detonation products" - Iwona Zawadzka-Malota, January 7, 2016.

5. Lead content in ore 4.96 %

6. Hourly emissions are based on 1 1.00 blast/hr per meeting with Kevin McCoy on 9/9/2022

blast/hr (7 Developmental and 1 Stope 2.00 blasts/day per meeting with Kevin McCoy on 9/9/2022

sub-blasts per Blast).

**Mine Development  
Blasting - Clark**

**Table A-6a. Clark Blasting - Parameters**

| Emission Point No. | Location | Blast Area<br>(ft <sup>2</sup> /blast) <sup>1</sup> | Throughput <sup>1</sup> |          | Blasting Rates <sup>1</sup> |
|--------------------|----------|-----------------------------------------------------|-------------------------|----------|-----------------------------|
|                    |          | Maximum                                             | (ton/hr)                | (ton/yr) | (blasts/yr)                 |
| BLAST-2            | Blasting | 4,450                                               | 4.60                    | 562      | 730                         |

1. Per email "Clark Updated Inputs for Air Permit" from Cayley Hoffman received on 9/8/2022 and meetings on 10/2022  
Maximum total emulsion usage = 4.60 tonnes/hr

**Table A-6b. Clark Blasting Emissions**

| Emission Point No. | Location | Pollutant         | Emission Factor <sup>1,2,3,4,5</sup> | Unit              | Controlled Emissions <sup>6,7</sup> |          |          |
|--------------------|----------|-------------------|--------------------------------------|-------------------|-------------------------------------|----------|----------|
|                    |          |                   |                                      |                   | (tpy)                               | (lb/day) | (lb/hr)  |
| BLAST-2            | Blasting | NO <sub>x</sub>   | 0.50                                 | (lb/ton Emulsion) | 0.14                                | --       | 2.30     |
|                    |          | CO                | 27.00                                | (lb/ton Emulsion) | 7.59                                | --       | 124.11   |
|                    |          | H <sub>2</sub> S  | 4.00                                 | (lb/ton Emulsion) | 1.12                                | --       | 18.39    |
|                    |          | SO <sub>2</sub>   | 1.00                                 | (lb/ton Emulsion) | 0.28                                | --       | 4.60     |
|                    |          | PM                | 0.84                                 | (Max lb/Blast)    | 0.31                                | 1.68     | 0.84     |
|                    |          | PM <sub>10</sub>  | 0.44                                 | (Max lb/Blast)    | 0.16                                | 0.87     | 0.437    |
|                    |          | PM <sub>2.5</sub> | 0.10                                 | (Max lb/Blast)    | 0.038                               | 0.21     | 0.1045   |
|                    |          | Lead (from ore)   | 0.01                                 | (Max lb/Blast)    | 0.0054                              | 0.03     | 0.0148   |
|                    |          | CO <sub>2</sub>   | 463.18                               | (lb/ton)          | 130.15                              | --       | 2,129.05 |

1. NO<sub>x</sub> and CO emission factors based on "Fume Memo WESCO Aug 2021" pdf dated 19 August 2021 provided by Seth Fredrick Dyno Nobel Inc.

2. H<sub>2</sub>S and SO<sub>2</sub> emission factors per AP-42 Section 13.3, Table 13.3-1 for dynamite, gelatin (January 1995).

This emission factor was used by FMI Climax Mine, Colorado (underground mine) per permit application in October 2013 for CDPHE Air Permit No. 95CC899.

3. PM emission factor calculated per AP-42 Section 11.9, Table 11.9-1 for blasting (July 1998)

$$0.000014(A)^{1.5} \quad \text{where,} \quad A = \text{horizontal area (ft}^2\text{), with blasting depth} \leq 70 \text{ ft}$$

The following scaling factors are applied to PM emission factor to calculate PM<sub>10</sub> and PM<sub>2.5</sub> emission factors per AP-42 Table 11.9-1:

$$PM_{10}: \quad 0.52$$

$$PM_{2.5}: \quad 0.03$$

4. CO<sub>2</sub> emission factor is based on "Testing of mining explosives with regard to the content of carbon oxides and nitrogen oxides in their detonation products" - Iwona Zawadzka-Malota, January 7, 2016.

5. Lead content in ore

1.76 %

6. Hourly emissions are based on 1 blast/hr (4

1.00 blast/hr

per meeting with Cayley Hoffman on 9/9/2022

Developmental and 1 Stope sub-blasts per Blast).

2.00 blasts/day

per meeting with Cayley Hoffman on 9/9/2022

**Mine Development  
Crushing**

**Table A-7a. Crushing - Emission Factors**

| Emission Point Number | Description                           | Activity         | Throughput <sup>1,2</sup> |              | Material                      | Lead Grade | Controlled Emission Factor <sup>3,4,5</sup> |                                  |                                   |                                | Control <sup>6</sup>                                     |                                       |                                     |
|-----------------------|---------------------------------------|------------------|---------------------------|--------------|-------------------------------|------------|---------------------------------------------|----------------------------------|-----------------------------------|--------------------------------|----------------------------------------------------------|---------------------------------------|-------------------------------------|
|                       |                                       |                  | (ton ore/hr)              | (ton ore/yr) |                               |            | PM<br>(lb/ton ore)                          | PM <sub>10</sub><br>(lb/ton ore) | PM <sub>2.5</sub><br>(lb/ton ore) | Lead Compounds<br>(lb/ton ore) | Type                                                     | PM/PM <sub>10</sub><br>Efficiency (%) | PM <sub>2.5</sub><br>Efficiency (%) |
| CRUSH-1               | Underground Crushing                  | Primary Crushing | 1,543                     | 4,665,131    | Stope Ore                     | 4.96%      | 0.0012                                      | 0.00054                          | 0.0001                            | 5.95E-05                       | Gravity Settling                                         | 87%                                   | 17%                                 |
| BREAK-1               | Clark Rock Breaker                    | Rock Breaker     | 12                        | 47,131       | Clark Ore                     | 1.76%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 2.98E-06                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |
| BREAK-2               | Underground Waste Rock Breaker        | Rock Breaker     | 29                        | 61,138       | Waste Rock                    | 0.35%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 5.99E-07                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |
| BREAK-3 - BREAK-7     | Various Underground Ore Rock Breakers | Rock Breaker     | 69                        | 600,453      | Stope Ore & Developmental Ore | 4.73%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 8.00E-06                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |
| BREAK-8               | Underground Crusher Rock Breaker      | Rock Breaker     | 538                       | 1,624,871    | Stope Ore & Developmental Ore | 4.73%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 8.00E-06                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |

1. Annual Taylor rock breaker throughputs per meeting with Kevin McCoy on 5/3/2024

Hourly taylor rock breakers throughputs based on hourly drop throughput

Hourly crusher throughputs based on "thyssenkrupp ERC Product Range Sizes.pdf" recd. on 7/12/2021.

2. Rock breakers are hydraulic-type hammers that break down rock pieces that are too large for the Clark Grizzly Screen. As such, the throughput will correspond to a percent (%) of the total grizzly screen throughput. Emission factor is similar to drilling.

3. Crushing emission factors obtained from AP-42 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing for tertiary crushing

4. For rock breakers, per U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, the particle size multiplier used for calculating emission factors for PM<sub>10</sub> and PM<sub>2.5</sub> is as follows:

PM: 0.74

PM<sub>10</sub>: 0.35

PM<sub>2.5</sub>: 0.053

5. Emission factors per AP-42 Section 11.19.2, Table 11.19.2-2 (08/2004) for "Wet Drilling - Unfragmented Stone".

6. Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32.

For Watering

70%

Gravity Settling (underground only) (PM/PM<sub>10</sub>/Pb)

87%

Gravity Settling (underground only) (PM<sub>2.5</sub>)

17%

**Table A-7b. Crushing - Emissions**

| Emission Point Number | Activity                              | Controlled Emissions   |                  |                   |                |                          |                  |                   |                |                          |                  |                   |                |
|-----------------------|---------------------------------------|------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |                                       | Annual Emissions (tpy) |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                | Hourly Emissions (lb/hr) |                  |                   |                |
|                       |                                       | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| CRUSH-1               | Underground Crushing <sup>1</sup>     | 0.349936               | 0.16             | 0.19              | 0.02           | 5.56                     | 2.50             | 3.06              | 0.28           | 0.23                     | 0.10             | 0.13              | 0.01           |
| BREAK-1               | Clark Rock Breaker                    | 3.99E-03               | 1.89E-03         | 2.85E-04          | 7.01E-05       | 0.05                     | 0.02             | 3.52E-03          | 8.64E-04       | 2.05E-03                 | 9.68E-04         | 1.47E-04          | 3.60E-05       |
| BREAK-2               | Underground Waste Rock Breaker        | 5.17E-03               | 2.45E-03         | 3.70E-04          | 1.83E-05       | 0.12                     | 0.06             | 0.01              | 4.13E-04       | 4.86E-03                 | 2.30E-03         | 3.48E-04          | 1.72E-05       |
| BREAK-3 - BREAK-7     | Various Underground Ore Rock Breakers | 5.08E-02               | 2.40E-02         | 3.64E-03          | 2.40E-03       | 0.28                     | 0.13             | 0.02              | 0.01           | 0.01                     | 0.01             | 8.30E-04          | 5.49E-04       |
| BREAK-8               | Underground Crusher Rock Breaker      | 1.37E-01               | 6.50E-02         | 9.84E-03          | 6.50E-03       | 2.18                     | 1.03             | 0.16              | 0.10           | 0.09                     | 0.04             | 0.01              | 4.30E-03       |
| Total                 |                                       | 0.55                   | 0.25             | 0.21              | 0.03           | 8.18                     | 3.74             | 3.25              | 0.39           | 0.34                     | 0.16             | 0.14              | 0.02           |

1. Controlled Emissions have been calculated for underground crushing since gravity settling is a part of an inherent process for underground mines.

Pursuant to 40 CFR §64.1, "control device" means "equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere." Furthermore, "inherent process equipment" means "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations." The gravity settling is an inherent part of the process.



**Mine Development  
Crushing Monthly**

**Table A-8a. Crushing Monthly - Emission Factors**

| Emission Point Number | Description                           | Activity         | Throughput <sup>1,2</sup><br>(ton ore/month) | Material                         | Lead Grade | Controlled Emission Factor <sup>3,4,5</sup> |                                  |                                   |                                | Control <sup>6</sup>                                     |                                       |                                     |
|-----------------------|---------------------------------------|------------------|----------------------------------------------|----------------------------------|------------|---------------------------------------------|----------------------------------|-----------------------------------|--------------------------------|----------------------------------------------------------|---------------------------------------|-------------------------------------|
|                       |                                       |                  |                                              |                                  |            | PM<br>(lb/ton ore)                          | PM <sub>10</sub><br>(lb/ton ore) | PM <sub>2.5</sub><br>(lb/ton ore) | Lead Compounds<br>(lb/ton ore) | Type                                                     | PM/PM <sub>10</sub><br>Efficiency (%) | PM <sub>2.5</sub><br>Efficiency (%) |
| CRUSH-1               | Underground Crushing                  | Primary Crushing | 388,761                                      | Stope Ore                        | 4.96%      | 0.0012                                      | 0.00054                          | 0.0001                            | 5.95E-05                       | Gravity Settling                                         | 87%                                   | 70%                                 |
| BREAK-1               | Clark Rock Breaker                    | Rock Breaker     | 3,927.6                                      | Clark Ore                        | 1.76%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 2.98E-06                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |
| BREAK-2               | Underground Waste Rock Breaker        | Rock Breaker     | 5,095                                        | Waste Rock                       | 0.35%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 5.99E-07                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |
| BREAK-3 -<br>BREAK-7  | Various Underground Ore Rock Breakers | Rock Breaker     | 50,038                                       | Stope Ore &<br>Developmental Ore | 4.73%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 8.00E-06                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |
| BREAK-8               | Underground Crusher Rock Breaker      | Rock Breaker     | 135,406                                      | Stope Ore &<br>Developmental Ore | 4.73%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 8.00E-06                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |

1. Annual Taylor rock breaker throughputs per meeting with Kevin McCoy on 5/3/2024

Hourly taylor rock breakers throughputs based on hourly drop throughput

Hourly crusher throughputs based on "thyssenkrupp ERC Product Range Sizes.pdf" recd. on 7/12/2021.

2. Rock breakers are hydraulic-type hammers that break down rock pieces that are too large for the Clark Grizzly Screen. As such, the throughput will correspond to a percent (%) of the total grizzly screen throughput. Emission factor is similar to drilling.

3. Crushing emission factors obtained from AP-42 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing for tertiary crushing

4. For rock breakers, per U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, the particle size multiplier used for calculating emission factors for PM<sub>10</sub> and PM<sub>2.5</sub> is as follows:

PM: 0.74

PM<sub>10</sub>: 0.35

PM<sub>2.5</sub>: 0.053

5. Emission factors per AP-42 Section 11.19.2, Table 11.19.2-2 (08/2004) for "Wet Drilling - Unfragmented Stone".

6. Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs

For Watering

70%

Gravity Settling (underground only) (PM/PM<sub>10</sub>/Pb)

87%

Gravity Settling (underground only) (PM<sub>2.5</sub>)

17%

**Table A-8b. Crushing Monthly - Emissions**

| Emission Point Number | Activity                              | Controlled Emissions            |                  |                   |                |
|-----------------------|---------------------------------------|---------------------------------|------------------|-------------------|----------------|
|                       |                                       | Monthly Emissions<br>(lb/month) |                  |                   |                |
|                       |                                       | PM                              | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| CRUSH-1               | Underground Crushing <sup>1</sup>     | 58.32                           | 26.25            | 11.66             | 2.89E+00       |
| BREAK-1               | Clark Rock Breaker                    | 6.64E-01                        | 3.14E-01         | 4.76E-02          | 1.17E-02       |
| BREAK-2               | Underground Waste Rock Breaker        | 8.62E-01                        | 4.08E-01         | 6.17E-02          | 3.05E-03       |
| BREAK-3 -<br>BREAK-7  | Various Underground Ore Rock Breakers | 8.46E+00                        | 4.00E+00         | 6.06E-01          | 4.00E-01       |
| BREAK-8               | Underground Crusher Rock Breaker      | 2.29E+01                        | 1.08E+01         | 1.64E+00          | 1.08E+00       |
| <b>Total</b>          |                                       | <b>91.22</b>                    | <b>41.80</b>     | <b>14.02</b>      | <b>4.39</b>    |

1. Controlled Emissions have been calculated for underground crushing since gravity settling is a part of an inherent process for underground mines.

Pursuant to 40 CFR §64.1, "control device" means "equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere." Furthermore, "inherent process equipment" means "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations." The gravity settling is an inherent part of the process.

**Mine Development  
Drops (Hourly) - Taylor**

**Table A-9a. Taylor Drops - Emissions - Inputs - Hourly/Daily**

| Emission Point Number | Description                                                                                                                                                | Throughput <sup>1</sup><br>(tph) | Material                                   | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                                                                  | Control Factor <sup>2</sup>        |                                  | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                           |                            |                         |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------|-------------------------|--------------------------------|---------------------------------------------------------------------------------|------------------------------------|----------------------------------|---------------------------------|-------------------------------------------|---------------------------|----------------------------|-------------------------|
|                       |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 | PM/PM <sub>10</sub> Efficiency (%) | PM <sub>2.5</sub> Efficiency (%) |                                 | PM (lb/ton)                               | PM <sub>10</sub> (lb/ton) | PM <sub>2.5</sub> (lb/ton) | Lead Compounds (lb/ton) |
|                       |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 | Coarse Ore Delivery and Storage    |                                  |                                 |                                           |                           |                            |                         |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                                                            | 714.04                           | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Full Enclosure, Watering                                                        | 85%                                | 85%                              | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.04E-04                |
| DP-2                  | Drop from 21210-FE-00001 Main Shaft Ore Discharge Feeder to 21210-CV-00003 Main Shaft Outfeed Conveyor                                                     | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00002 Main Shaft Ore Discharge Dust Collector (DC-1)     |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-3                  | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-CV-00001 Coarse Ore Overland Conveyor                                                        | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21210-CX-00001 Coarse Ore Overland Conveyor Dust Collector (DC-2) |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                                                             | 126.67                           | Waste Chute Material                       | 0.57%                   | 4.00                           | Watering                                                                        | 70%                                | 70%                              | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 3.01E-05                |
| DP-5                  | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-BN-00002 Transfer Tower Storage Bin                                                          | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00003 Transfer Tower Dust Collector (DC-3)               |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-6                  | Drop from 21210-BN-00002 Transfer Tower Storage Bin to Haul Truck                                                                                          | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00003 Transfer Tower Dust Collector                      |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-7                  | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00001 Coarse Ore Silo No. 1                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-8                  | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00002 Coarse Ore Silo No. 2                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-9                  | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00003 Coarse Ore Silo No. 3                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-10                 | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00004 Coarse Ore Silo No. 4                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-11                 | Drop from 21710-FE-00001/00002 Coarse Ore Silo No.1 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-12                 | Drop from 21710-FE-00003/00005 Coarse Ore Silo No.2 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-13                 | Drop from 21710-FE-00006/00007 Coarse Ore Silo No. 3 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                  | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-14                 | Drop from 21710-FE-00008/00009 Coarse Ore Silo No.4 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-15                 | Drop from 21710-CV-00001 Primary Mill Feed Conveyor to 22110-CH-00001 Primary Mill Feed Chute                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                          | Wet Stream, no emissions expected                                               |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-16                 | Drop from 22110-ML-00001 Primary Mill to 22110-SN-00002 Primary Mill Discharge Screen                                                                      | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                          | Wet Stream, no emissions expected                                               |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-17                 | Drop from 22110-SN-00002 Primary Mill Discharge Screen to 22210-CV-00002 Primary Screen Discharge Conveyor                                                 | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-18                 | Drop from 22210-CV-00002 Primary Screen Discharge Conveyor to 22210-CV-00001 Pebble Crusher Feed Conveyor                                                  | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-19                 | Drop from 22210-CV-00001 Pebble Crusher Feed Conveyor to 22210-BN-00001 Pebble Crusher Feed Bin/Bunker/22210-FE-00002 Pebble Crusher Product Return Feeder | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-20                 | Drop from 22210-FE-00002 Pebble Crusher Product Return Feeder to 21710-CV-00001 Primary Mill Feed Conveyor                                                 | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-21                 | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                                                                   | 459.12                           | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | No Control                                                                      | 0%                                 | 0%                               | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.49E-04                |
| Underground Drops     |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 |                                    |                                  |                                 |                                           |                           |                            |                         |
| DP-22                 | Transfer from face to loader                                                                                                                               | 714.04                           | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 6.04E-06                |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                                                              | 714.04                           | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 6.04E-06                |
| DP-24                 | Drop from loader or haul truck through grizzly to ore pass                                                                                                 | 527.27                           | Stope Ore                                  | 4.96%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.73E-06                |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                                                            | 527.27                           | Stope Ore                                  | 4.96%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.73E-06                |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                                                        | 574.46                           | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor                                      | 574.46                           | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                                                           | 574.46                           | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-29                 | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3                                                   | 574.46                           | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 5.82                            | 1.09E-03                                  | 5.17E-04                  | 7.82E-05                   | 5.17E-05                |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                                                          | 139.58                           | Waste Rock                                 | 0.35%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 5.82                            | 1.09E-03                                  | 5.17E-04                  | 7.82E-05                   | 3.87E-06                |

**Mine Development  
Drops (Hourly) - Taylor**

|                 |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
|-----------------|------------------------------------------------------------------------------------------------------|----------|--------------------------------------------|-------|-------|------------------------------------------------------------------------------|-----|-----|-------|----------|----------|----------|----------|
| DP-31           | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor          | 574.46   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 1.12E-05 |
| DP-32           | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                | 139.58   | Waste Rock                                 | 0.35% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 8.36E-07 |
| DP-33           | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes          | 714.04   | Slope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| DP-34           | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                  | 714.04   | Slope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| WTP2            |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-138          | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                               | 1.19E-02 | Dry Anionic Flocculant                     | 0.00% | 0.25  | Enclosure by building                                                        | 80% | 80% | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-139          | Drop of Dry Cationic Flocculant via Manual Addition                                                  | 5.39E-06 | Dry Cationic Flocculant                    | 0.00% | 0.25  | Enclosure by building                                                        | 80% | 80% | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-140          | Drop of Sodium Sulfate to Bulk Handling System                                                       | 3.72E-02 | Sodium Sulfate                             | 0.00% | 0.25  | Controlled by WTP2 DC                                                        |     |     | 19.49 | --       | --       | --       | --       |
| Reagents        |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-141          | Drop of Copper Sulphate into 22620-TN-00005 Copper Sulphate Mix Tank                                 | --       | Copper Sulphate                            | 0%    | 0.25  | Controlled by DC-12 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector   |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-142          | Drop of 50% Zinc Sulphate into 22620-TN-00025 50% Zinc Sulphate Mix/Holding Tank                     | --       | 50% Zinc Sulphate                          | 0%    | 0.25  | Controlled by DC-14 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-143          | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module | 0.08     | Lead Concentrate Flocculant                | 0%    | 0.25  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-144          | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                 | 3.31     | Tailings Flocculant                        | 0%    | 0.25  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-145          | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module | 0.05     | Zinc Concentrate Flocculant                | 0%    | 0.25  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-146          | Drop of 10% Zinc Sulphate to 22620-TN-00007 10% Zinc Sulphate Mix Tank                               | --       | 10% Zinc Sulphate                          | 0%    | 0.25  | Controlled by DC-13 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-147          | Drop of Caustic to 22620-TN-00023 Caustic Mix/Holding Tank                                           | --       | Caustic                                    | 0%    | 0.25  | Controlled by DC-15 22620-CX-00004 Caustic Mix Tank                          |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| Stockpile Drops |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-82           | Drop on West Rock Stockpile                                                                          | 29.00    | Waste Rock                                 | 0.35% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 1.86E-05 |
| DP-83           | Drop on East Ore Stockpile                                                                           | 643.01   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-84           | TSF                                                                                                  | 247.02   | Tailings                                   | 0.43% | 11.80 | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0012   | 0.0005   | 0.0001   | 4.93E-06 |
| From Stockpiles |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-94           | Transfer from Agg Stockpile to Loader                                                                | 9.19     | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-95           | Transfer of Agg Material from Loader to Haul Truck                                                   | 9.19     | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-96           | Transfer of Shotcrete Aggregate from Stockpile to Loader                                             | 6.43     | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-97           | Transfer from East Ore Stockpile to Loader                                                           | 643.01   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-98           | Transfer from Loader to Haul Truck                                                                   | 643.01   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-99           | Transfer from Waste Chute Stockpile to Loader                                                        | 126.67   | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| DP-100          | Transfer from Loader to Haul Truck                                                                   | 126.67   | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| WTP1            |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-148          | Drop of Anionic Flocculant (Hydrex 6161)                                                             | 8.92E-04 | Anionic Flocculant                         | 0.00% | 0.25  | No Control                                                                   | 0%  | 0%  | 1.3   | 7.55E-03 | 3.57E-03 | 5.41E-04 | --       |
| DP-149          | Drop of Sodium Bicarbonate                                                                           | 8.92E-04 | Sodium Bicarbonate                         | 0.00% | 0.25  | No Control                                                                   | 0%  | 0%  | 1.3   | 7.55E-03 | 3.57E-03 | 5.41E-04 | --       |

1. Per February 2021 dated Process Flow Diagram, provided by South32 in May 2021.

Confirmed by RFI provided by South32, Sarah Richman, on 7/12/2021.

Per August 2023 date Process Flow Diagrams, provided by South32 in April 2024.

Reagent throughputs per RFI responses from Matt Novak on 4/26/2024 and 6/19/2024

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

For Watering:

Moisture Content (Moisture Content taken into account in AP-42 Drop Equation)

70%

0%

Gravity Settling (underground only) (PM<sub>10</sub>/Pb)

87%

Gravity Settling (underground only) (PM<sub>2.5</sub>)

17%

For Full Enclosure/Enclosure by building

80%

For Partial Enclosure

50%

No control

0%

Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023.

Horizontal settling is based on Stoke's Equation and inputs from South32.

Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCoy (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \left( \frac{U}{S} \right)^{1.3} \left( \frac{M}{2} \right)^{1.4}$$

Where: E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)

U = Mean wind speed (miles per hour [mph]), which is equal to:

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1  
0.25 %

PM

0.74

19.49

1.3

PM<sub>10</sub>

0.35

Based on 2019-2021 On-Site Met Data

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

PM<sub>2.5</sub>

0.053

Mine Development  
Drops (Hourly) - Taylor

Table A-9b. Taylor Drops - Hourly/Daily Emissions - Controlled

| Emission Point Number | Description                                                                                                           | Controlled Emissions     |                  |                   |                |                          |                  |                   |                |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |                                                                                                                       | Hourly Emissions (lb/hr) |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                |
|                       |                                                                                                                       | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                       | 0.56                     | 0.27             | 0.04              | 2.18E-02       | 13.52                    | 6.39             | 0.97              | 5.24E-01       |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                        | 0.20                     | 0.09             | 0.01              | 1.15E-03       | 4.80                     | 2.27             | 0.34              | 2.75E-02       |
| DP-21                 | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                              | 2.41                     | 1.14             | 0.173             | 1.14E-01       | 57.95                    | 27.41            | 4.15              | 2.74E+00       |
| DP-22                 | Transfer from face to loader                                                                                          | 0.004                    | 0.002            | 0.002             | 1.62E-04       | 0.10                     | 0.05             | 0.05              | 3.88E-03       |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                         | 0.004                    | 0.002            | 0.002             | 1.62E-04       | 0.10                     | 0.05             | 0.05              | 3.88E-03       |
| DP-24                 | Drop from loader or haul truck through grizzly to ore pass                                                            | 0.003                    | 0.001            | 0.001             | 1.53E-04       | 0.07                     | 0.03             | 0.03              | 3.67E-03       |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                       | 0.003                    | 0.001            | 0.001             | 1.53E-04       | 0.07                     | 0.03             | 0.03              | 3.67E-03       |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                   | 0.003                    | 0.002            | 0.002             | 1.59E-04       | 0.08                     | 0.04             | 0.04              | 3.81E-03       |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor | 0.003                    | 0.002            | 0.002             | 1.59E-04       | 0.08                     | 0.04             | 0.04              | 3.81E-03       |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                      | 0.003                    | 0.002            | 0.002             | 1.59E-04       | 0.08                     | 0.04             | 0.04              | 3.81E-03       |
| DP-29                 | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3              | 0.024                    | 0.011            | 0.011             | 1.11E-03       | 0.56                     | 0.27             | 0.27              | 2.67E-02       |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                     | 0.006                    | 0.003            | 0.003             | 2.02E-05       | 0.14                     | 0.06             | 0.06              | 4.86E-04       |
| DP-31                 | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor                           | 0.005                    | 0.002            | 0.002             | 2.41E-04       | 0.12                     | 0.06             | 0.06              | 5.77E-03       |
| DP-32                 | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                                 | 0.001                    | 0.001            | 0.001             | 4.37E-06       | 0.03                     | 0.01             | 0.01              | 1.05E-04       |
| DP-33                 | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes                           | 0.006                    | 0.003            | 0.003             | 2.45E-04       | 0.15                     | 0.07             | 0.07              | 5.88E-03       |
| DP-34                 | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                                   | 0.006                    | 0.003            | 0.003             | 2.45E-04       | 0.15                     | 0.07             | 0.07              | 5.88E-03       |
| DP-82                 | Drop on West Rock Stockpile                                                                                           | 0.15                     | 0.07             | 0.01              | 5.40E-04       | 3.66                     | 1.73             | 0.26              | 1.30E-02       |
| DP-83                 | Drop on East Ore Stockpile                                                                                            | 3.38                     | 1.60             | 0.24              | 1.60E-01       | 81.16                    | 38.39            | 5.81              | 3.84E+00       |
| DP-84                 | TSF                                                                                                                   | 0.29                     | 0.14             | 0.02              | 1.22E-03       | 6.86                     | 3.24             | 0.49              | 2.92E-02       |
| DP-94                 | Transfer from Agg Stockpile to Loader                                                                                 | 0.15                     | 0.07             | 0.01              | --             | 3.63                     | 1.72             | 0.26              | --             |
| DP-95                 | Transfer of Agg Material from Loader to Haul Truck                                                                    | 0.15                     | 0.07             | 0.01              | --             | 3.63                     | 1.72             | 0.26              | --             |
| DP-96                 | Transfer of Shotcrete Aggregate from Stockpile to Loader                                                              | 0.11                     | 0.05             | 0.01              | --             | 2.54                     | 1.20             | 0.18              | --             |
| DP-97                 | Transfer from East Ore Stockpile to Loader                                                                            | 3.38                     | 1.60             | 0.24              | 0.16           | 81.16                    | 38.39            | 5.81              | 3.84E+00       |
| DP-98                 | Transfer from Loader to Haul Truck                                                                                    | 3.38                     | 1.60             | 0.24              | 0.16           | 81.16                    | 38.39            | 5.81              | 3.84E+00       |
| DP-99                 | Transfer from Waste Chute Stockpile to Loader                                                                         | 0.67                     | 0.32             | 0.05              | 0.00           | 15.99                    | 7.56             | 1.15              | 9.16E-02       |
| DP-100                | Transfer from Loader to Haul Truck                                                                                    | 0.67                     | 0.32             | 0.05              | 0.00           | 15.99                    | 7.56             | 1.15              | 9.16E-02       |
| DP-138                | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                                                | 1.80E-05                 | 8.50E-06         | 1.29E-06          | --             | 4.31E-04                 | 2.04E-04         | 3.09E-05          | --             |
| DP-139                | Drop of Dry Cationic Flocculant via Manual Addition                                                                   | 8.14E-09                 | 3.85E-09         | 5.84E-10          | --             | 1.95E-07                 | 9.24E-08         | 1.40E-08          | --             |
| DP-143                | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module                  | 0.02                     | 0.01             | 0.00              | --             | 0.46                     | 0.22             | 0.03              | --             |
| DP-144                | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                                  | 0.84                     | 0.40             | 0.06              | --             | 20.25                    | 9.58             | 1.45              | --             |
| DP-145                | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module                  | 0.01                     | 0.01             | 0.00              | --             | 0.31                     | 0.14             | 0.02              | --             |
| DP-148                | Drop of Anionic Flocculant (Hydrex 6161)                                                                              | 6.74E-06                 | 3.19E-06         | 4.83E-07          | --             | 1.62E-04                 | 7.65E-05         | 1.16E-05          | --             |
| DP-149                | Drop of Sodium Bicarbonate                                                                                            | 6.74E-06                 | 3.19E-06         | 4.83E-07          | --             | 1.62E-04                 | 7.65E-05         | 1.16E-05          | --             |
| <b>Total</b>          |                                                                                                                       | <b>16.45</b>             | <b>7.78</b>      | <b>1.21</b>       | <b>0.63</b>    | <b>394.82</b>            | <b>186.74</b>    | <b>28.98</b>      | <b>15.11</b>   |

**Mine Development  
Drops (Monthly) - Taylor**

**Table A-10a. Taylor Drops - Emissions - Inputs - Hourly/Daily**

| Emission Point Number           | Description                                                                                                                                                | Throughput <sup>1</sup><br>(tons/month) | Material                                   | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                                                           | Control Factor <sup>2</sup>        |                                  | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                           |                            |                         |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------|-------------------------|--------------------------------|--------------------------------------------------------------------------|------------------------------------|----------------------------------|---------------------------------|-------------------------------------------|---------------------------|----------------------------|-------------------------|
|                                 |                                                                                                                                                            |                                         |                                            |                         |                                |                                                                          | PM/PM <sub>10</sub> Efficiency (%) | PM <sub>2.5</sub> Efficiency (%) |                                 | PM (lb/ton)                               | PM <sub>10</sub> (lb/ton) | PM <sub>2.5</sub> (lb/ton) | Lead Compounds (lb/ton) |
| Coarse Ore Delivery and Storage |                                                                                                                                                            |                                         |                                            |                         |                                |                                                                          |                                    |                                  |                                 |                                           |                           |                            |                         |
| DP-1                            | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                                                            | 521,251                                 | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Full Enclosure, Watering                                                 | 85%                                | 85%                              | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.04E-04                |
| DP-2                            | Drop from 21210-FE-00001 Main Shaft Ore Discharge Feeder to 21210-CV-00003 Main Shaft Outfeed Conveyor                                                     | --                                      | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00002 Main Shaft Ore Discharge Dust Collector     |                                    |                                  | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.04E-04                |
| DP-3                            | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-CV-00001 Coarse Ore Overland Conveyor                                                        | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21210-CX-00001 Coarse Ore Overland Conveyor Dust Collector |                                    |                                  | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.49E-04                |
| DP-4                            | Drop from Shaft to Waste Chute                                                                                                                             | 101,710                                 | Waste Chute Material                       | 0.57%                   | 4.00                           | Watering                                                                 | 70%                                | 70%                              | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 3.01E-05                |
| DP-5                            | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-BN-00002 Transfer Tower Storage Bin                                                          | --                                      | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00003 Transfer Tower Dust Collector (DC-3)        |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-6                            | Drop from 21210-BN-00002 Transfer Tower Storage Bin to Haul Truck                                                                                          | --                                      | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00003 Transfer Tower Dust Collector (DC-3)        |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-7                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00001 Coarse Ore Silo No. 1                                                              | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-8                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00002 Coarse Ore Silo No. 2                                                              | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-9                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00003 Coarse Ore Silo No. 3                                                              | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-10                           | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00004 Coarse Ore Silo No. 4                                                              | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-11                           | Drop from 21710-FE-00001/00002 Coarse Ore Silo No.1 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)              |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-12                           | Drop from 21710-FE-00003/00005 Coarse Ore Silo No.2 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)              |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-13                           | Drop from 21710-FE-00006/00007 Coarse Ore Silo No. 3 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                  | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)              |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-14                           | Drop from 21710-FE-00008/00009 Coarse Ore Silo No.4 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)              |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-15                           | Drop from 21710-CV-00001 Primary Mill Feed Conveyor to 22110-CH-00001 Primary Mill Feed Chute                                                              | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                          | Wet Stream, no emissions expected                                        |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-16                           | Drop from 22110-ML-00001 Primary Mill to 22110-SN-00002 Primary Mill Discharge Screen                                                                      | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                          | Wet Stream, no emissions expected                                        |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-17                           | Drop from 22110-SN-00002 Primary Mill Discharge Screen to 22210-CV-00002 Primary Screen Discharge Conveyor                                                 | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-18                           | Drop from 22210-CV-00002 Primary Screen Discharge Conveyor to 22210-CV-00001 Pebble Crusher Feed Conveyor                                                  | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-19                           | Drop from 22210-CV-00001 Pebble Crusher Feed Conveyor to 22210-BN-00001 Pebble Crusher Feed Bin/Bunker/22210-FE-00002 Pebble Crusher Product Return Feeder | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-20                           | Drop from 22210-FE-00002 Pebble Crusher Product Return Feeder to 21710-CV-00001 Primary Mill Feed Conveyor                                                 | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-21                           | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                                                                   | 11,516                                  | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | No Control                                                               | 0%                                 | 0%                               | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.49E-04                |
| Underground Drops               |                                                                                                                                                            |                                         |                                            |                         |                                |                                                                          |                                    |                                  |                                 |                                           |                           |                            |                         |
| DP-22                           | Transfer from face to loader                                                                                                                               | 521,251                                 | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 6.04E-06                |
| DP-23                           | Transfer from loader to haul truck, as needed                                                                                                              | 521,251                                 | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 6.04E-06                |
| DP-24                           | Drop from loader or haul truck through grizzly to ore pass                                                                                                 | 384,906                                 | Stope Ore                                  | 4.96%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.73E-06                |
| DP-25                           | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                                                            | 384,906                                 | Stope Ore                                  | 4.96%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.73E-06                |
| DP-26                           | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                                                        | 419,355                                 | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-27                           | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor                                      | 419,355                                 | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-28                           | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                                                           | 419,355                                 | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-29                           | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3                                                   | 419,355                                 | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 5.82                            | 1.09E-03                                  | 5.17E-04                  | 7.82E-05                   | 5.17E-05                |
| DP-30                           | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                                                          | 101,897                                 | Waste Rock                                 | 0.35%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 5.82                            | 1.09E-03                                  | 5.17E-04                  | 7.82E-05                   | 3.87E-06                |

**Mine Development  
Drops (Monthly) - Taylor**

|                 |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
|-----------------|------------------------------------------------------------------------------------------------------|----------|--------------------------------------------|-------|-------|------------------------------------------------------------------------------|--------|--------|-------|----------|----------|----------|----------|
| DP-31           | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor          | 419,355  | Slope Ore & Developmental Ore              | 4.73% | 4.00  | Gravity Settling, Watering                                                   | 96.25% | 75.22% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 1.12E-05 |
| DP-32           | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                | 101,897  | Waste Rock                                 | 0.35% | 4.00  | Gravity Settling, Watering                                                   | 96.25% | 75.22% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 8.36E-07 |
| DP-33           | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes          | 521,251  | Slope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96.25% | 75.22% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| DP-34           | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                  | 521,251  | Slope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96%    | 75%    | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| Stockpile Drops |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
| DP-82           | Drop on West Rock Stockpile                                                                          | 21,167   | Waste Rock                                 | 0.35% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 1.86E-05 |
| DP-83           | Drop on East Ore Stockpile                                                                           | 11,516   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-84           | TSF                                                                                                  | 180,323  | Tailings                                   | 0.43% | 11.80 | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0012   | 0.0005   | 0.0001   | 4.93E-06 |
| From Stockpiles |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
| DP-94           | Transfer from Agg Stockpile to Loader                                                                | 6,834    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-95           | Transfer of Agg Material from Loader to Haul Truck                                                   | 6,834    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-96           | Transfer of Shotcrete Aggregate from Stockpile to Loader                                             | 4,784    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-97           | Transfer of Ore from East Ore Stockpile to Loader                                                    | 11,516   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-98           | Transfer of Ore from Loader to Haul Truck                                                            | 11,516   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-99           | Transfer from Waste Chute to Loader                                                                  | 101,710  | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| DP-100          | Transfer from Loader to Haul Truck                                                                   | 101,710  | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| WTP2            |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
| DP-138          | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                               | 1.08E-03 | Dry Anionic Flocculant                     | 0.00% | 0.25  | Enclosure by building                                                        | 80%    | 80%    | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-139          | Drop of Dry Cationic Flocculant via Manual Addition                                                  | 5.39E-06 | Dry Cationic Flocculant                    | 0.00% | 0.25  | Enclosure by building                                                        | 80%    | 80%    | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-140          | Drop of Sodium Sulfate to Bulk Handling System                                                       | 3.72E-02 | Sodium Sulfate                             | 0.00% | 0.25  | Controlled by WTP2 DC                                                        |        |        | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| Reagents        |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
| DP-141          | Drop of Copper Sulphate into 22620-TN-00005 Copper Sulphate Mix Tank                                 | --       | Copper Sulphate                            | 0%    | 0.25  | Controlled by DC-12 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector   |        |        | 19.49 | 0.26     | 0.12     | 0.02     | 0        |
| DP-142          | Drop of 50% Zinc Sulphate into 22620-TN-00025 50% Zinc Sulphate Mix/Holding Tank                     | --       | 50% Zinc Sulphate                          | 0%    | 0.25  | Controlled by DC-14 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector |        |        | 19.49 | 0.26     | 0.12     | 0.02     | 0        |
| DP-143          | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module | 0.72     | Lead Concentrate Flocculant                | 0%    | 25%   | No Control                                                                   | 0%     | 0%     | 19.49 | 0.26     | 0.12     | 0.02     | 0        |
| DP-144          | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                 | 0.72     | Tailings Flocculant                        | 0%    | 0.25  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.26     | 0.12     | 0.02     | 0        |
| DP-145          | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module | 1.51     | Zinc Concentrate Flocculant                | 0%    | 0.25  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.26     | 0.12     | 0.02     | 0        |
| DP-146          | Drop of 10% Zinc Sulphate to 22620-TN-00007 10% Zinc Sulphate Mix Tank                               | --       | 10% Zinc Sulphate                          | 0%    | 0.25  | Controlled by DC-13 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector |        |        | 19.49 | 0.26     | 0.12     | 0.02     | 0.00E+00 |
| DP-147          | Drop of Caustic to 22620-TN-00023 Caustic Mix/Holding Tank                                           | --       | Caustic                                    | 0%    | 0.25  | Controlled by DC-15 22620-CX-00004 Caustic Mix Tank                          |        |        | 19.49 | 0.26     | 0.12     | 0.02     | 0.00E+00 |
| WTP1            |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
| DP-148          | Drop of Anionic Flocculant (Hydrex 6161)                                                             | 0.65     | Anionic Flocculant                         | 0%    | 0.25  | No Control                                                                   | 0%     | 0%     | 1.30  | 7.55E-03 | 3.57E-03 | 5.41E-04 | 0        |
| DP-149          | Drop of Sodium Bicarbonate                                                                           | 0.65     | Sodium Bicarbonate                         | 0%    | 0.25  | No Control                                                                   | 0%     | 0%     | 1.30  | 7.55E-03 | 3.57E-03 | 5.41E-04 | 0        |

1. Per February 2021 dated Process Flow Diagram, provided by South32 in May 2021.

Confirmed by RFI provided by South32, Sarah Richman, on 7/12/2021.

Per August 2023 date Process Flow Diagrams, provided by South32 in April 2024.

Reassent throughout per RFI responses from Matt Novak on 4/26/2024 and 6/19/2024

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

|                                                                               |     |
|-------------------------------------------------------------------------------|-----|
| For Watering                                                                  | 70% |
| Moisture Content (Moisture Content taken into account in AP-42 Drop Equation) | 0%  |
| Gravity Settling (underground only) (PM <sub>10</sub> /Pb)                    | 87% |
| Gravity Settling (underground only) (PM <sub>2.5</sub> )                      | 17% |
| For Full Enclosure/Enclosure by building                                      | 80% |
| For Partial Enclosure                                                         | 50% |
| No control                                                                    | 0%  |

Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023.

Horizontal settling is based on Stoke's Equation and inputs from South32.

Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCov (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \left( \frac{U}{5} \right)^{1.3} \left( \frac{M}{2} \right)^{1.4}$$

Where: E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)

U = Mean wind speed (miles per hour [mph]), which is equal to:

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1  
0.25 %

PM  
0.74  
19.49  
1.3

PM<sub>10</sub>  
0.35

PM<sub>2.5</sub>  
0.053

Based on 2019-2021 On-Site Met Data

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

Mine Development  
Drops (Monthly) - Taylor

Table A-10b. Taylor Drops - Monthly Emissions - Controlled

| Emission Point Number | Description                                                                                                           | Controlled Emissions         |                  |                   |                |                          |                  |                   |                |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |                                                                                                                       | Monthly Emissions (lb/month) |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                |
|                       |                                                                                                                       | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                       | 411.22                       | 194.50           | 29.45             | 1.59E+01       | 13.48                    | 6.38             | 0.97              | 5.23E-01       |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                        | 160.48                       | 75.90            | 11.49             | 9.20E-01       | 5.26                     | 2.49             | 0.38              | 3.01E-02       |
| DP-21                 | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                              | 60.57                        | 28.65            | 4.34              | 2.87E+00       | 1.99                     | 0.94             | 0.14              | 9.40E-02       |
| DP-22                 | Transfer from face to loader                                                                                          | 3.04                         | 1.44             | 1.44              | 1.18E-01       | 0.10                     | 0.05             | 0.05              | 3.87E-03       |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                         | 3.04                         | 1.44             | 1.44              | 1.18E-01       | 0.10                     | 0.05             | 0.05              | 3.87E-03       |
| DP-24                 | Drop from loader or haul truck through grizzly to ore pass                                                            | 2.25                         | 1.06             | 1.06              | 1.12E-01       | 0.07                     | 0.03             | 0.03              | 3.66E-03       |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                       | 2.25                         | 1.06             | 1.06              | 1.12E-01       | 0.07                     | 0.03             | 0.03              | 3.66E-03       |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                   | 2.45                         | 1.16             | 1.16              | 1.16E-01       | 0.08                     | 0.04             | 0.04              | 3.80E-03       |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor | 2.45                         | 1.16             | 1.16              | 1.16E-01       | 0.08                     | 0.04             | 0.04              | 3.80E-03       |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                      | 2.45                         | 1.16             | 1.16              | 1.16E-01       | 0.08                     | 0.04             | 0.04              | 3.80E-03       |
| DP-29                 | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3              | 17.18                        | 8.12             | 8.13              | 8.13E-01       | 0.56                     | 0.27             | 0.27              | 2.66E-02       |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                     | 4.17                         | 1.97             | 1.98              | 1.48E-02       | 0.14                     | 0.06             | 0.06              | 4.85E-04       |
| DP-31                 | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor                           | 3.71                         | 1.76             | 1.76              | 1.76E-01       | 0.12                     | 0.06             | 0.06              | 5.76E-03       |
| DP-32                 | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                                 | 0.90                         | 0.43             | 0.43              | 3.19E-03       | 0.03                     | 0.01             | 0.01              | 1.05E-04       |
| DP-33                 | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes                           | 4.61                         | 2.18             | 2.18              | 1.79E-01       | 0.15                     | 0.07             | 0.07              | 5.86E-03       |
| DP-34                 | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                                   | 4.61                         | 2.18             | 2.18              | 1.79E-01       | 0.15                     | 0.07             | 0.07              | 5.86E-03       |
| DP-82                 | Drop on West Rock Stockpile                                                                                           | 111.33                       | 52.65            | 7.97              | 3.94E-01       | 3.65                     | 1.73             | 0.26              | 1.29E-02       |
| DP-83                 | Drop on East Ore Stockpile                                                                                            | 60.57                        | 28.65            | 4.34              | 2.87E+00       | 1.99                     | 0.94             | 0.14              | 9.40E-02       |
| DP-94                 | TSF                                                                                                                   | 208.56                       | 98.64            | 14.94             | 8.88E-01       | 6.84                     | 3.23             | 0.49              | 2.91E-02       |
| DP-94                 | Transfer from Agg Stockpile to Loader                                                                                 | 112.55                       | 53.23            | 8.06              | --             | 3.690                    | 1.745            | 0.2643            | --             |
| DP-95                 | Transfer of Agg Material from Loader to Haul Truck                                                                    | 112.55                       | 53.23            | 8.06              | --             | 3.690                    | 1.745            | 0.2643            | --             |
| DP-96                 | Transfer of Shotcrete Aggregate from Stockpile to Loader                                                              | 78.79                        | 37.26            | 5.64              | --             | 2.583                    | 1.222            | 0.1850            | --             |
| DP-97                 | Transfer of Ore from East Ore Stockpile to Loader                                                                     | 60.57                        | 28.65            | 4.34              | 2.87           | 1.99                     | 0.94             | 0.14              | 9.40E-02       |
| DP-98                 | Transfer of Ore from Loader to Haul Truck                                                                             | 60.57                        | 28.65            | 4.34              | 2.87           | 1.99                     | 0.94             | 0.14              | 9.40E-02       |
| DP-99                 | Transfer from Waste Chute to Loader                                                                                   | 534.93                       | 253.01           | 38.31             | 3.07           | 17.54                    | 8.30             | 1.26              | 1.00E-01       |
| DP-100                | Transfer from Loader to Haul Truck                                                                                    | 534.93                       | 253.01           | 38.31             | 3.07           | 17.54                    | 8.30             | 1.26              | 1.00E-01       |
| DP-138                | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                                                | 1.63E-06                     | 7.72E-07         | 1.17E-07          | --             | 5.35E-08                 | 2.53E-08         | 3.83E-09          | --             |
| DP-139                | Drop of Dry Cationic Flocculant via Manual Addition                                                                   | 8.15E-09                     | 3.85E-09         | 5.84E-10          | --             | 2.67E-10                 | 1.26E-10         | 1.91E-11          | --             |
| DP-143                | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module                  | 1.84E-01                     | 8.72E-02         | 1.32E-02          | --             | 0.01                     | 0.00             | 0.00              | --             |
| DP-144                | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                                  | 1.84E-01                     | 8.72E-02         | 1.32E-02          | --             | 0.01                     | 0.00             | 0.00              | --             |
| DP-145                | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module                  | 3.84E-01                     | 1.82E-01         | 2.75E-02          | --             | 0.01                     | 0.01             | 0.00              | --             |
| DP-148                | Drop of Anionic Flocculant (Hydrex 6161)                                                                              | 4.92E-03                     | 2.33E-03         | 3.52E-04          | --             | 1.61E-04                 | 7.63E-05         | 1.15E-05          | --             |
| DP-149                | Drop of Sodium Bicarbonate                                                                                            | 4.92E-03                     | 2.33E-03         | 3.52E-04          | --             | 1.61E-04                 | 7.63E-05         | 1.15E-05          | --             |
|                       | <b>Total</b>                                                                                                          | <b>2,561</b>                 | <b>1,212</b>     | <b>205</b>        | <b>38</b>      | <b>84</b>                | <b>40</b>        | <b>7</b>          | <b>1</b>       |

**Mine Development  
Drops (Annual) - Taylor**

**Table A-11a. Taylor Drops - Emissions - Inputs - Annual**

| Emission Point Number           | Description                                                                                                                                                | Throughput <sup>1</sup><br>(tpy) | Material                                   | Lead Grade <sup>1</sup> | Water Content<br>(%) <sup>1</sup> | Control Method                                                                  | Control Factor <sup>2</sup>    |                              | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                              |                               |                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------|-------------------------|-----------------------------------|---------------------------------------------------------------------------------|--------------------------------|------------------------------|---------------------------------|-------------------------------------------|------------------------------|-------------------------------|----------------------------|
|                                 |                                                                                                                                                            |                                  |                                            |                         |                                   |                                                                                 | PM/PM <sub>10</sub> Efficiency | PM <sub>2.5</sub> Efficiency |                                 | PM<br>(lb/ton)                            | PM <sub>10</sub><br>(lb/ton) | PM <sub>2.5</sub><br>(lb/ton) | Lead Compounds<br>(lb/ton) |
|                                 |                                                                                                                                                            |                                  |                                            |                         |                                   |                                                                                 | (%)                            | (%)                          |                                 |                                           |                              |                               |                            |
| Coarse Ore Delivery and Storage |                                                                                                                                                            |                                  |                                            |                         |                                   |                                                                                 |                                |                              |                                 |                                           |                              |                               |                            |
| DP-1                            | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                                                            | 6,255,015                        | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                              | Full Enclosure, Watering                                                        | 85%                            | 85%                          | 19.49                           | 0.0053                                    | 0.0025                       | 0.0004                        | 0.0002                     |
| DP-2                            | Drop from 21210-FE-00001 Main Shaft Ore Discharge Feeder to 21210-CV-00003 Main Shaft Outfeed Conveyor                                                     | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                              | Controlled by 21210-CX-00002 Main Shaft Ore Discharge Dust Collector (DC-1)     |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-3                            | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-CV-00001 Coarse Ore Overland Conveyor                                                        | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Controlled by 21210-CX-00001 Coarse Ore Overland Conveyor Dust Collector (DC-2) |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-4                            | Drop from Shaft to Waste Chute                                                                                                                             | 1,220,522                        | Waste Chute Material                       | 0.57%                   | 4.00                              | Watering                                                                        | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025                       | 0.0004                        | 0.00003                    |
| DP-5                            | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-BN-00002 Transfer Tower Storage Bin                                                          | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                              | Controlled by 21210-CX-00003 Transfer Tower Dust Collector (DC-3)               |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-6                            | Drop from 21210-BN-00002 Transfer Tower Storage Bin to Haul Truck                                                                                          | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                              | Controlled by 21210-CX-00003 Transfer Tower Dust Collector (DC-3)               |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-7                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00001 Coarse Ore Silo No. 1                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-8                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00002 Coarse Ore Silo No. 2                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-9                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00003 Coarse Ore Silo No. 3                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-10                           | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00004 Coarse Ore Silo No. 4                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-11                           | Drop from 21710-FE-00001/00002 Coarse Ore Silo No.1 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-12                           | Drop from 21710-FE-00003/00005 Coarse Ore Silo No.2 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-13                           | Drop from 21710-FE-00006/00007 Coarse Ore Silo No. 3 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                  | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-14                           | Drop from 21710-FE-00008/00009 Coarse Ore Silo No.4 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-15                           | Drop from 21710-CV-00001 Primary Mill Feed Conveyor to 22110-CH-00001 Primary Mill Feed Chute                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                             | Wet Stream, no emissions expected                                               |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-16                           | Drop from 22110-ML-00001 Primary Mill to 22110-SN-00002 Primary Mill Discharge Screen                                                                      | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                             | Wet Stream, no emissions expected                                               |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-17                           | Drop from 22110-SN-00002 Primary Mill Discharge Screen to 22210-CV-00002 Primary Screen Discharge Conveyor                                                 | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                              | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-18                           | Drop from 22210-CV-00002 Primary Screen Discharge Conveyor to 22210-CV-00001 Pebble Crusher Feed Conveyor                                                  | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                              | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-19                           | Drop from 22210-CV-00001 Pebble Crusher Feed Conveyor to 22210-BN-00001 Pebble Crusher Feed Bin/Bunker/22210-FE-00002 Pebble Crusher Product Return Feeder | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                              | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-20                           | Drop from 22210-FE-00002 Pebble Crusher Product Return Feeder to 21710-CV-00001 Primary Mill Feed Conveyor                                                 | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                              | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-21                           | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                                                                   | 138,188                          | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | No Control                                                                      | 0%                             | 0%                           | 19.49                           | 0.0053                                    | 0.0025                       | 0.0004                        | 0.00025                    |
| Underground Drops               |                                                                                                                                                            |                                  |                                            |                         |                                   |                                                                                 |                                |                              |                                 |                                           |                              |                               |                            |
| DP-22                           | Transfer from face to loader                                                                                                                               | 6,255,015                        | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                              | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 6.04E-06                   |
| DP-23                           | Transfer from loader to haul truck, as needed                                                                                                              | 6,255,015                        | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                              | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 6.04E-06                   |
| DP-24                           | Drop from loader or haul truck through grizzly to ore pass                                                                                                 | 4,618,867                        | Stope Ore                                  | 4.96%                   | 4.00                              | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 7.73E-06                   |
| DP-25                           | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                                                            | 4,618,867                        | Stope Ore                                  | 4.96%                   | 4.00                              | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 7.73E-06                   |
| DP-26                           | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                                                        | 5,032,256                        | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 7.37E-06                   |
| DP-27                           | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor                                      | 5,032,256                        | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 7.37E-06                   |
| DP-28                           | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                                                           | 5,032,256                        | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 7.37E-06                   |
| DP-29                           | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3                                                   | 5,032,256                        | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                              | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 5.82                            | 1.09E-03                                  | 5.17E-04                     | 7.82E-05                      | 5.17E-05                   |



**Mine Development  
Drops (Annual) - Taylor**

|                        |                                                                                                      |           |                                            |       |       |                                                                              |       |        |        |          |          |          |          |
|------------------------|------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------|-------|-------|------------------------------------------------------------------------------|-------|--------|--------|----------|----------|----------|----------|
| DP-30                  | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill    | 1,222,759 | Waste Rock                                 | 0.35% | 4.00  | Gravity Settling, Watering                                                   | 96%   | 75%    | 5.82   | 1.09E-03 | 5.17E-04 | 7.82E-05 | 3.87E-06 |
| DP-31                  | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor          | 5,032,256 | Stope Ore & Developmental Ore              | 4.73% | 4.00  | Gravity Settling, Watering                                                   | 96%   | 75%    | 1.79   | 2.36E-04 | 1.12E-04 | 1.69E-05 | 1.12E-05 |
| DP-32                  | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                | 1,222,759 | Waste Rock                                 | 0.35% | 4.00  | Gravity Settling, Watering                                                   | 96%   | 75%    | 1.79   | 2.36E-04 | 1.12E-04 | 1.69E-05 | 8.36E-07 |
| DP-33                  | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes          | 6,255,015 | Stope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96%   | 75%    | 1.79   | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| DP-34                  | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                  | 6,255,015 | Stope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96%   | 75%    | 1.79   | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| <b>From Stockpiles</b> |                                                                                                      |           |                                            |       |       |                                                                              |       |        |        |          |          |          |          |
| DP-82                  | Drop on West Rock Stockpile                                                                          | 254,005   | Waste Rock                                 | 0.35% | 4.00  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.0053   | 0.0025   | 0.0004   | 1.86E-05 |
| DP-83                  | Drop on East Ore Stockpile                                                                           | 138,188   | Stope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-84                  | Drop on TSF                                                                                          | 2,163,873 | Tailings                                   | 0.43% | 11.80 | No Control                                                                   | 0%    | 0%     | 19.49  | 0.0012   | 0.0005   | 0.0001   | 4.93E-06 |
| DP-94                  | Transfer from Agg Stockpile to Loader                                                                | 10,000    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-95                  | Transfer of Agg Material from Loader to Haul Truck                                                   | 10,000    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-96                  | Transfer of Shotcrete Aggregate from Stockpile to Loader                                             | 10,000    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-97                  | Transfer from East Ore Stockpile to Loader                                                           | 138,188   | Stope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-98                  | Transfer from Loader to Haul Truck                                                                   | 138,188   | Stope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-99                  | Transfer from Waste Chute Stockpile to Loader                                                        | 1,220,522 | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| DP-100                 | Transfer from Loader to Haul Truck                                                                   | 1,220,522 | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| <b>Reagents</b>        |                                                                                                      |           |                                            |       |       |                                                                              |       |        |        |          |          |          |          |
| DP-141                 | Drop of Copper Sulphate into 22620-TN-00005 Copper Sulphate Mix Tank                                 | --        | Copper Sulphate                            | 0.00% | 0.25  | Controlled by DC-12 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector   | 19.49 | 0.2551 | 0.1207 | 0.0183   | --       | --       | --       |
| DP-142                 | Drop of 50% Zinc Sulphate into 22620-TN-00025 50% Zinc Sulphate Mix/Holding Tank                     | --        | 50% Zinc Sulphate                          | 0.00% | 0.25  | Controlled by DC-14 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector | 19.49 | 0.2551 | 0.1207 | 0.0183   | --       | --       | --       |
| DP-143                 | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module | 7.81      | Lead Concentrate Flocculant                | 0.00% | 0.25  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-144                 | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                 | 17.73     | Tailings Flocculant                        | 0.00% | 0.25  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-145                 | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module | 8.51      | Zinc Concentrate Flocculant                | 0.00% | 0.25  | No Control                                                                   | 0%    | 0%     | 19.49  | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-146                 | Drop of 10% Zinc Sulphate to 22620-TN-00007 10% Zinc Sulphate Mix Tank                               | --        | 10% Zinc Sulphate                          | 0.00% | 0.25  | Controlled by DC-13 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector | 19.49 | 0.2551 | 0.1207 | 0.0183   | --       | --       | --       |
| DP-147                 | Drop of Caustic to 22620-TN-00023 Caustic Mix/Holding Tank                                           | --        | Caustic                                    | 0.00% | 0.25  | Controlled by DC-15 22620-CX-00004 Caustic Mix Tank                          | 19.49 | 0.2551 | 0.1207 | 0.0183   | --       | --       | --       |
| <b>WTP2</b>            |                                                                                                      |           |                                            |       |       |                                                                              |       |        |        |          |          |          |          |
| DP-138                 | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                               | 104.90    | Dry Anionic Flocculant                     | 0.00% | 0.25  | Enclosure by building                                                        | 80%   | 80%    | 1.30   | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-139                 | Drop of Dry Cationic Flocculant via Manual Addition                                                  | 0.05      | Dry Cationic Flocculant                    | 0.00% | 0.25  | Enclosure by building                                                        | 80%   | 80%    | 1.30   | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-140                 | Drop of Sodium Sulfate to Bulk Handling System                                                       | 325.50    | Sodium Sulfate                             | 0.00% | 0.25  | Controlled by WTP2 DC                                                        | 1.30  | 0.0076 | 0.0036 | 0.0005   | --       | --       | --       |
| <b>WTP1</b>            |                                                                                                      |           |                                            |       |       |                                                                              |       |        |        |          |          |          |          |
| DP-148                 | Drop of Anionic Flocculant (Hydrex 6161)                                                             | 3.13      | Anionic Flocculant                         | 0.00% | 0.25  | No Control                                                                   | 0%    | 0%     | 1.3    | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-149                 | Drop of Sodium Bicarbonate                                                                           | 3.13      | Sodium Bicarbonate                         | 0.00% | 0.25  | No Control                                                                   | 0%    | 0%     | 1.3    | 0.0076   | 0.0036   | 0.0005   | --       |

1. Per February 2021 dated Process Flow Diagram, provided by South32 in May 2021.

Confirmed by RFI provided by South32, Sarah Richman, on 7/12/2021.

Per August 2023 date Process Flow Diagrams, provided by South32 in April 2024.

Reagent throughputs per RFI responses from Matt Novak on 4/26/2024 and 6/19/2024

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

For Watering 70%  
Moisture Content (Moisture Content taken into account in AP-42 Drop Equation) 0%

Gravity Settling (underground only) (PM<sub>10</sub>/PM<sub>2.5</sub>/Pb) 87%

Gravity Settling (underground only) (PM<sub>2.5</sub>) 17%

For Full Enclosure/Enclosure by building 80%

For Partial Enclosure 50%

No control 0%

Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32.

Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCoy (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)

U = Mean wind speed (miles per hour [mph]), which is equal to:

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1  
0.25 %

PM

0.74

19.49

1.3

PM<sub>10</sub>

0.35

PM<sub>2.5</sub>

0.053

Based on 2019-2021 On-Site Met Data

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

Mine Development  
Drops (Annual) - Taylor

Table A-11b. Taylor Drops - Annual Emissions - Controlled

| Emission Point Number | Description                                                                                                           | Fugitive (Y/N) | Controlled Emissions   |                  |                   |                | Uncontrolled Emissions |                  |                   |                |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|----------------|------------------------|------------------|-------------------|----------------|------------------------|------------------|-------------------|----------------|
|                       |                                                                                                                       |                | Annual Emissions (tpy) |                  |                   |                | Annual Emissions (tpy) |                  |                   |                |
|                       |                                                                                                                       |                | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                       | Y              | 2.47                   | 1.166971         | 0.176713          | 9.56E-02       | 16.45                  | 7.78             | 1.18              | 0.638          |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                        | N              | 0.96                   | 0.455415         | 0.068963          | 5.52E-03       | 3.21                   | 1.52             | 0.23              | 0.018          |
| DP-21                 | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                              | Y              | 0.36                   | 0.171874         | 0.026027          | 1.72E-02       | 0.36                   | 0.17             | 0.03              | 0.017          |
| DP-22                 | Transfer from face to loader                                                                                          | N              | 0.02                   | 0.008640         | 0.008645          | 7.08E-04       | 0.49                   | 0.23             | 0.03              | 0.019          |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                         | N              | 0.02                   | 0.008640         | 0.008645          | 7.08E-04       | 0.49                   | 0.23             | 0.03              | 0.019          |
| DP-24                 | Drop from loader or haul truck through grizzly to ore pass                                                            | N              | 0.01                   | 0.006380         | 0.006384          | 6.69E-04       | 0.36                   | 0.17             | 0.03              | 0.018          |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                       | N              | 0.01                   | 0.006380         | 0.006384          | 6.69E-04       | 0.36                   | 0.17             | 0.03              | 0.018          |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                   | N              | 0.01                   | 0.006951         | 0.006955          | 6.95E-04       | 0.39                   | 0.19             | 0.03              | 0.019          |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor | N              | 0.01                   | 0.006951         | 0.006955          | 6.95E-04       | 0.39                   | 0.19             | 0.03              | 0.019          |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                      | N              | 0.01                   | 0.006951         | 0.006955          | 6.95E-04       | 0.39                   | 0.19             | 0.03              | 0.019          |
| DP-29                 | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3              | N              | 0.10                   | 0.048748         | 0.048773          | 4.88E-03       | 2.75                   | 1.30             | 0.20              | 0.130          |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                     | N              | 0.03                   | 0.011845         | 0.011851          | 8.87E-05       | 0.67                   | 0.32             | 0.05              | 0.002          |
| DP-31                 | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor                           | N              | 0.02                   | 0.010532         | 0.010537          | 1.05E-03       | 0.59                   | 0.28             | 0.04              | 0.028          |
| DP-32                 | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                                 | N              | 0.01                   | 0.002559         | 0.002560          | 1.92E-05       | 0.14                   | 0.07             | 0.01              | 0.001          |
| DP-33                 | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes                           | N              | 0.03                   | 0.013091         | 0.013098          | 1.07E-03       | 0.74                   | 0.35             | 0.05              | 0.029          |
| DP-34                 | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                                   | N              | 0.03                   | 0.013091         | 0.013098          | 1.07E-03       | 0.74                   | 0.35             | 0.05              | 0.029          |
| DP-82                 | Drop on West Rock Stockpile                                                                                           | Y              | 0.67                   | 0.32             | 0.05              | 2.37E-03       | 0.67                   | 0.32             | 0.05              | 0.00           |
| DP-83                 | Drop on East Ore Stockpile                                                                                            | Y              | 0.36                   | 0.17             | 0.03              | 1.72E-02       | 0.36                   | 0.17             | 0.03              | 0.02           |
| DP-84                 | Drop on TSF                                                                                                           | Y              | 1.25                   | 0.59             | 0.09              | 5.33E-03       | 1.25                   | 0.59             | 0.09              | 0.01           |
| DP-94                 | Transfer from Agg Stockpile to Loader                                                                                 | Y              | 0.08                   | 0.04             | 0.01              | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-95                 | Transfer of Agg Material from Loader to Haul Truck                                                                    | Y              | 0.08                   | 0.04             | 0.01              | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-96                 | Transfer of Shotcrete Aggregate from Stockpile to Loader                                                              | Y              | 0.08                   | 0.04             | 0.01              | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-97                 | Transfer from East Ore Stockpile to Loader                                                                            | Y              | 0.36                   | 0.17             | 0.03              | 1.72E-02       | 0.36                   | 0.17             | 0.03              | 0.02           |
| DP-98                 | Transfer from Loader to Haul Truck                                                                                    | Y              | 0.36                   | 0.17             | 0.03              | 1.72E-02       | 0.36                   | 0.17             | 0.03              | 0.02           |
| DP-99                 | Transfer from Waste Chute Stockpile to Loader                                                                         | Y              | 3.21                   | 1.52             | 0.23              | 1.84E-02       | 3.21                   | 1.52             | 0.23              | 0.02           |
| DP-100                | Transfer from Loader to Haul Truck                                                                                    | Y              | 3.21                   | 1.52             | 0.23              | 1.84E-02       | 3.21                   | 1.52             | 0.23              | 0.02           |
| DP-138                | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                                                | Y              | 7.92E-05               | 3.75E-05         | 5.68E-06          | --             | 0.00                   | 0.00             | 0.00              | --             |
| DP-139                | Drop of Dry Cationic Flocculant via Manual Addition                                                                   | Y              | 3.57E-08               | 1.69E-08         | 2.56E-09          | --             | 0.00                   | 0.00             | 0.00              | --             |
| DP-143                | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module                  | Y              | 9.97E-04               | 4.71E-04         | 7.14E-05          | --             | 9.97E-04               | 4.71E-04         | 7.14E-05          | --             |
| DP-144                | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                                  | Y              | 2.26E-03               | 1.07E-03         | 1.62E-04          | --             | 2.26E-03               | 1.07E-03         | 1.62E-04          | --             |
| DP-145                | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module                  | Y              | 1.09E-03               | 5.13E-04         | 7.77E-05          | --             | 1.09E-03               | 5.13E-04         | 7.77E-05          | --             |
| DP-148                | Drop of Anionic Flocculant (Hydrex 6161)                                                                              | Y              | 1.18E-05               | 5.58E-06         | 8.45E-07          | --             | 1.18E-05               | 5.58E-06         | 8.45E-07          | --             |
| DP-149                | Drop of Sodium Bicarbonate                                                                                            | Y              | 1.18E-05               | 5.58E-06         | 8.45E-07          | --             | 1.18E-05               | 5.58E-06         | 8.45E-07          | --             |
| <b>Total</b>          |                                                                                                                       |                | <b>13.79</b>           | <b>6.52</b>      | <b>1.12</b>       | <b>0.23</b>    | <b>38.20</b>           | <b>18.07</b>     | <b>2.74</b>       | <b>1.12</b>    |

**Mine Development  
Drops (Hourly) - Clark**

**Table A-12a. Clark Drops - Emissions - Inputs**

| Emission Point Number           | Description                                                   | Throughput <sup>1</sup><br>(tph) | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                    | Control Factor <sup>2</sup>    |                              | Windspeed <sup>4</sup><br>(mph) | Uncontrolled Emission Factor <sup>3</sup> |                  |                   |                |  |
|---------------------------------|---------------------------------------------------------------|----------------------------------|-------------------------|--------------------------------|-----------------------------------|--------------------------------|------------------------------|---------------------------------|-------------------------------------------|------------------|-------------------|----------------|--|
|                                 |                                                               |                                  |                         |                                |                                   | PM/PM <sub>10</sub> Efficiency | PM <sub>2.5</sub> Efficiency |                                 | PM                                        | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |  |
|                                 |                                                               |                                  |                         |                                |                                   | %                              | %                            |                                 | (lb/ton)                                  | (lb/ton)         | (lb/ton)          | (lb/ton)       |  |
| Surface Activities              |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |  |
| Coarse Ore Delivery and Storage |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |  |
| DP-103                          | Dump into Primary Crusher Feed Hopper                         | 129                              | 1.76%                   | 4.00                           | Spray Bar, Partial Enclosure      | 85%                            | 85%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |  |
| DP-104                          | Drop from silo to trucks                                      | 90                               | 1.76%                   | 4.00                           | Partial Enclosure, Dust Extractor | 50%                            | 50%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |  |
| From Stockpiles                 |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |  |
| DP-105                          | Transfer of Ore from Ore Stockpile to Loader                  | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25274E-05    |  |
| DP-106                          | Transfer of Ore Mined from Loader to Haul Truck               | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 0.0001         |  |
| DP-107                          | Transfer from ROM Stockpile to Loader                         | 22.96                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 0.0001         |  |
| DP-109                          | Transfer from Agg Stockpile to Loader                         | 9.19                             | 0.00%                   | 1.77                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |  |
| DP-110                          | Transfer of Agg Material from Loader to Haul Truck            | 9.19                             | 0.00%                   | 1.77                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |  |
| DP-111                          | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 6.43                             | 0.00%                   | 1.77                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |  |
| Stockpile Drops                 |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |  |
| DP-113                          | Hardshell Rock Storage Drop                                   | 112.71                           | 0.57%                   | 4.00                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 2.98E-05       |  |
| DP-114                          | Ore Stockpile Drop                                            | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |  |
| DP-115                          | ROM Stockpile Drop                                            | 22.96                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |  |
| Underground                     |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |  |
| DP-124                          | Transfer of Development Ore from Face to Loader               | 22                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.01E-06       |  |
| DP-125                          | Transfer of Development Ore from Loader to Stockpile          | 22                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.01E-06       |  |
| DP-126                          | Transfer of Development Ore from Stockpile to Loader          | 22                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.01E-06       |  |
| DP-127                          | Transfer of Development Ore Mined from Loader to Haul Truck   | 22                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.01E-06       |  |
| DP-129                          | Transfer of Development Waste Mined from Face to Loader       | 113                              | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 8.83E-07       |  |
| DP-130                          | Transfer of Development Waste Mined from Loader to Stockpile  | 113                              | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 8.83E-07       |  |
| DP-131                          | Transfer of Development Waste Mined from Stockpile to Loader  | 113                              | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 8.83E-07       |  |
| DP-132                          | Transfer of Development Waste Mined from Loader to Haul Truck | 113                              | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 8.83E-07       |  |
| DP-134                          | Transfer of Stope Ore from Stope to Loader                    | 62                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.74E-06       |  |
| DP-135                          | Transfer of Stope Ore from Loader to Stockpile                | 62                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.74E-06       |  |
| DP-136                          | Transfer of Stope Ore from Stockpile to Loader                | 62                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.74E-06       |  |
| DP-137                          | Transfer of Stope Ore from Loader to Haul Truck               | 62                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.74E-06       |  |

1. Per March 2022 dated Process Flow Diagram, provided by South32 in March 2022.

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

|                                                                     |     |                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| For Watering                                                        | 70% |                                                                                                                                                                                                                                                                                                                                          |
| Moisture Content (Moisture taken into account within drop equation) | 0%  |                                                                                                                                                                                                                                                                                                                                          |
| Gravity Settling (underground only) (PM/PM <sub>10</sub> /Pb)       | 80% | Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32. |
| Gravity Settling (underground only) (PM <sub>2.5</sub> )            | 16% | Detailed calculations are included in the Gravity Settling Tab of this spreadsheet                                                                                                                                                                                                                                                       |
| For Full Enclosure/Enclosure by building                            | 80% |                                                                                                                                                                                                                                                                                                                                          |
| For Partial Enclosure                                               | 50% |                                                                                                                                                                                                                                                                                                                                          |
| No control                                                          | 0%  |                                                                                                                                                                                                                                                                                                                                          |

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCoy (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)

|       |                  |                   |
|-------|------------------|-------------------|
| PM    | PM <sub>10</sub> | PM <sub>2.5</sub> |
| 0.74  | 0.35             | 0.053             |
| 19.49 |                  |                   |
| 1.3   |                  |                   |

Based on 2019-2021 On-Site Met Data

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1  
0.25 %

Moisture Content of Aggregate taken to be 1.7 per AP-42 Section 11.12 Table 11.12-1 Footnote b

Mine Development  
Drops (Hourly) - Clark

Table A-12b. Clark Drops - Emissions - Controlled

| Emission Point Number | Description                                                   | Controlled Emissions     |                  |                   |                |                          |                  |                   |                |
|-----------------------|---------------------------------------------------------------|--------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |                                                               | Hourly Emissions (lb/hr) |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                |
|                       |                                                               | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-103                | Dump into Primary Crusher Feed Hopper                         | 0.10                     | 0.05             | 0.007             | 0.002          | 2.44                     | 1.15             | 0.17              | 0.04           |
| DP-104                | Drop from silo to trucks                                      | 0.24                     | 0.11             | 0.02              | 0.004          | 5.69                     | 2.69             | 0.41              | 0.10           |
| DP-105                | Transfer of Ore from Ore Stockpile to Loader                  | 0.13                     | 0.06             | 0.01              | 0.00           | 3.17                     | 1.50             | 0.23              | 0.06           |
| DP-106                | Transfer of Ore Mined from Loader to Haul Truck               | 0.13                     | 0.06             | 0.01              | 0.00           | 3.17                     | 1.50             | 0.23              | 0.06           |
| DP-107                | Transfer from ROM Stockpile to Loader                         | 0.04                     | 0.02             | 0.00              | 0.00           | 0.87                     | 0.41             | 0.06              | 0.02           |
| DP-109                | Transfer from Agg Stockpile to Loader                         | 0.15                     | 0.07             | 0.01              | --             | 3.63                     | 1.72             | 0.26              | --             |
| DP-110                | Transfer of Agg Material from Loader to Haul Truck            | 0.15                     | 0.07             | 0.01              | --             | 3.63                     | 1.72             | 0.26              | --             |
| DP-111                | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 0.11                     | 0.05             | 0.01              | --             | 2.54                     | 1.20             | 0.18              | --             |
| DP-113                | Hardshell Rock Storage Drop                                   | 0.59                     | 0.28             | 0.04              | 0.003          | 14.23                    | 6.73             | 1.02              | 0.08           |
| DP-114                | Ore Stockpile Drop                                            | 0.13                     | 0.06             | 0.01              | 0.00           | 3.17                     | 1.50             | 0.23              | 0.06           |
| DP-115                | ROM Stockpile Drop                                            | 0.04                     | 0.02             | 0.00              | 0.001          | 0.87                     | 0.41             | 0.06              | 0.02           |
| DP-124                | Transfer of Development Ore from Face to Loader               | 2.06E-04                 | 9.73E-05         | 6.11E-05          | 2.65E-06       | 0.00                     | 0.00             | 0.001             | 0.000          |
| DP-125                | Transfer of Development Ore from Loader to Stockpile          | 2.06E-04                 | 9.73E-05         | 6.11E-05          | 2.65E-06       | 0.00                     | 0.00             | 0.001             | 0.000          |
| DP-126                | Transfer of Development Ore from Stockpile to Loader          | 2.06E-04                 | 9.73E-05         | 6.11E-05          | 2.65E-06       | 0.00                     | 0.00             | 0.001             | 0.000          |
| DP-127                | Transfer of Development Ore Mined from Loader to Haul Truck   | 2.06E-04                 | 9.73E-05         | 6.11E-05          | 2.65E-06       | 0.00                     | 0.00             | 0.001             | 0.000          |
| DP-129                | Transfer of Development Waste Mined from Face to Loader       | 1.07E-03                 | 5.04E-04         | 3.16E-04          | 6.04E-06       | 0.03                     | 0.01             | 0.008             | 0.000          |
| DP-130                | Transfer of Development Waste Mined from Loader to Stockpile  | 1.07E-03                 | 5.04E-04         | 3.16E-04          | 6.04E-06       | 0.03                     | 0.01             | 0.008             | 0.000          |
| DP-131                | Transfer of Development Waste Mined from Stockpile to Loader  | 1.07E-03                 | 5.04E-04         | 3.16E-04          | 6.04E-06       | 0.03                     | 0.01             | 0.008             | 0.000          |
| DP-132                | Transfer of Development Waste Mined from Loader to Haul Truck | 1.07E-03                 | 5.04E-04         | 3.16E-04          | 6.04E-06       | 0.03                     | 0.01             | 0.008             | 0.000          |
| DP-134                | Transfer of Slope Ore from Slope to Loader                    | 5.86E-04                 | 2.77E-04         | 1.74E-04          | 1.03E-05       | 0.01                     | 0.01             | 0.004             | 0.000          |
| DP-135                | Transfer of Slope Ore from Loader to Stockpile                | 5.86E-04                 | 2.77E-04         | 1.74E-04          | 1.03E-05       | 0.01                     | 0.01             | 0.004             | 0.000          |
| DP-136                | Transfer of Slope Ore from Stockpile to Loader                | 5.86E-04                 | 2.77E-04         | 1.74E-04          | 1.03E-05       | 0.01                     | 0.01             | 0.004             | 0.000          |
| DP-137                | Transfer of Slope Ore from Loader to Haul Truck               | 5.86E-04                 | 2.77E-04         | 1.74E-04          | 1.03E-05       | 0.01                     | 0.01             | 0.004             | 0.000          |
|                       | <b>Total</b>                                                  | <b>1.82</b>              | <b>0.86</b>      | <b>0.13</b>       | <b>0.02</b>    | <b>43.60</b>             | <b>20.62</b>     | <b>3.16</b>       | <b>0.42</b>    |

**Mine Development  
Drops (Monthly) - Clark**

**Table A-13a. Clark Drops - Emissions - Inputs**

| Emission Point Number           | Description                                                   | Throughput <sup>1</sup><br>(tph) | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                    | Control Factor <sup>2</sup>        |                                  | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                           |                            |                         |  |
|---------------------------------|---------------------------------------------------------------|----------------------------------|-------------------------|--------------------------------|-----------------------------------|------------------------------------|----------------------------------|---------------------------------|-------------------------------------------|---------------------------|----------------------------|-------------------------|--|
|                                 |                                                               |                                  |                         |                                |                                   | PM/PM <sub>10</sub> Efficiency (%) | PM <sub>2.5</sub> Efficiency (%) |                                 | PM (lb/ton)                               | PM <sub>10</sub> (lb/ton) | PM <sub>2.5</sub> (lb/ton) | Lead Compounds (lb/ton) |  |
|                                 |                                                               |                                  |                         |                                |                                   |                                    |                                  |                                 |                                           |                           |                            |                         |  |
| Surface Activities              |                                                               |                                  |                         |                                |                                   |                                    |                                  |                                 |                                           |                           |                            |                         |  |
| Coarse Ore Delivery and Storage |                                                               |                                  |                         |                                |                                   |                                    |                                  |                                 |                                           |                           |                            |                         |  |
| DP-103                          | Dump into Primary Crusher Feed Hopper                         | 86                               | 1.76%                   | 4.00                           | Spray Bar, Partial Enclosure      | 85%                                | 85%                              | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 9.25E-05                |  |
| DP-104                          | Drop from silo to trucks                                      | 86                               | 1.76%                   | 4.00                           | Partial Enclosure, Dust Extractor | 50%                                | 50%                              | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 9.25E-05                |  |
| From Stockpiles                 |                                                               |                                  |                         |                                |                                   |                                    |                                  |                                 |                                           |                           |                            |                         |  |
| DP-105                          | Transfer of Ore from Ore Stockpile to Loader                  | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                                | 70%                              | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 9.25274E-05             |  |
| DP-106                          | Transfer of Ore Mined from Loader to Haul Truck               | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                                | 70%                              | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 0.0001                  |  |
| DP-107                          | Transfer from ROM Stockpile to Loader                         | 22.96                            | 1.76%                   | 4.00                           | Watering                          | 70%                                | 70%                              | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 0.0001                  |  |
| DP-109                          | Transfer from Agg Stockpile to Loader                         | 9.19                             | 0.00%                   | 1.77                           | No control                        | 0%                                 | 0%                               | 19.49                           | 0.0165                                    | 0.0078                    | 0.0012                     | --                      |  |
| DP-110                          | Transfer of Agg Material from Loader to Haul Truck            | 9.19                             | 0.00%                   | 1.77                           | No control                        | 0%                                 | 0%                               | 19.49                           | 0.0165                                    | 0.0078                    | 0.0012                     | --                      |  |
| DP-111                          | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 6.43                             | 0.00%                   | 1.77                           | No control                        | 0%                                 | 0%                               | 19.49                           | 0.0165                                    | 0.0078                    | 0.0012                     | --                      |  |
| Stockpile Drops                 |                                                               |                                  |                         |                                |                                   |                                    |                                  |                                 |                                           |                           |                            |                         |  |
| DP-113                          | Hardshell Rock Storage Drop                                   | 112.71                           | 0.57%                   | 4.00                           | No control                        | 0%                                 | 0%                               | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 2.98E-05                |  |
| DP-114                          | Ore Stockpile Drop                                            | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                                | 70%                              | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 9.25E-05                |  |
| DP-115                          | ROM Stockpile Drop                                            | 22.96                            | 1.76%                   | 4.00                           | Watering                          | 70%                                | 70%                              | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 9.25E-05                |  |
| Underground                     |                                                               |                                  |                         |                                |                                   |                                    |                                  |                                 |                                           |                           |                            |                         |  |
| DP-124                          | Transfer of Development Ore from Face to Loader               | 53                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.01E-06                |  |
| DP-125                          | Transfer of Development Ore from Loader to Stockpile          | 53                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.01E-06                |  |
| DP-126                          | Transfer of Development Ore from Stockpile to Loader          | 53                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.01E-06                |  |
| DP-127                          | Transfer of Development Ore Mined from Loader to Haul Truck   | 53                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.01E-06                |  |
| DP-129                          | Transfer of Development Waste Mined from Face to Loader       | 74                               | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 8.83E-07                |  |
| DP-130                          | Transfer of Development Waste Mined from Loader to Stockpile  | 74                               | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 8.83E-07                |  |
| DP-131                          | Transfer of Development Waste Mined from Stockpile to Loader  | 74                               | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 8.83E-07                |  |
| DP-132                          | Transfer of Development Waste Mined from Loader to Haul Truck | 74                               | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 8.83E-07                |  |
| DP-134                          | Transfer of Stope Ore from Stope to Loader                    | 81                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.74E-06                |  |
| DP-135                          | Transfer of Stope Ore from Loader to Stockpile                | 81                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.74E-06                |  |
| DP-136                          | Transfer of Stope Ore from Stockpile to Loader                | 81                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.74E-06                |  |
| DP-137                          | Transfer of Stope Ore from Loader to Haul Truck               | 81                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                                | 75%                              | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.74E-06                |  |

1. Per March 2022 dated Process Flow Diagram, provided by South32 in March 2022.

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

|                                                                     |     |
|---------------------------------------------------------------------|-----|
| For Watering                                                        | 70% |
| Moisture Content (Moisture taken into account within drop equation) | 0%  |
| Gravity Settling (underground only) (PM/PM <sub>10</sub> /Pb)       | 80% |
| Gravity Settling (underground only) (PM <sub>2.5</sub> )            | 16% |
| For Full Enclosure/Enclosure by building                            | 80% |
| For Partial Enclosure                                               | 50% |
| No control                                                          | 0%  |

Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32. Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCoy (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)

U = Mean wind speed (miles per hour [mph]), which is equal to:

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1  
0.25 %

Moisture Content of Aggregate taken to be 1.7 per AP-42 Section 11.12 Table 11.12-1 Footnote b

PM

0.74

19.49

1.3

PM<sub>10</sub>

0.35

Based on 2019-2021 On-Site Met Data

1.3

PM<sub>2.5</sub>

0.053

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

**Mine Development  
Drops (Monthly) - Clark**

**Table A-13b. Clark Drops - Emissions - Controlled**

| Emission Point Number | Description                                                   | Controlled Emissions        |                  |                   |                |                             |                  |                   |                |
|-----------------------|---------------------------------------------------------------|-----------------------------|------------------|-------------------|----------------|-----------------------------|------------------|-------------------|----------------|
|                       |                                                               | Hourly Emissions<br>(lb/hr) |                  |                   |                | Daily Emissions<br>(lb/day) |                  |                   |                |
|                       |                                                               | PM                          | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                          | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-103                | Dump into Primary Crusher Feed Hopper                         | 0.07                        | 0.03             | 0.005             | 0.001          | 1.63                        | 0.77             | 0.12              | 0.03           |
| DP-104                | Drop from silo to trucks                                      | 0.23                        | 0.11             | 0.02              | 0.004          | 5.43                        | 2.57             | 0.39              | 0.10           |
| DP-105                | Transfer of Ore from Ore Stockpile to Loader                  | 0.13                        | 0.06             | 0.01              | 0.00           | 3.17                        | 1.50             | 0.23              | 0.06           |
| DP-106                | Transfer of Ore Mined from Loader to Haul Truck               | 0.13                        | 0.06             | 0.01              | 0.00           | 3.17                        | 1.50             | 0.23              | 0.06           |
| DP-107                | Transfer from ROM Stockpile to Loader                         | 0.04                        | 0.02             | 0.00              | 0.00           | 0.87                        | 0.41             | 0.06              | 0.02           |
| DP-109                | Transfer from Agg Stockpile to Loader                         | 0.15                        | 0.07             | 0.01              | --             | 3.63                        | 1.72             | 0.26              | --             |
| DP-110                | Transfer of Agg Material from Loader to Haul Truck            | 0.15                        | 0.07             | 0.01              | --             | 3.63                        | 1.72             | 0.26              | --             |
| DP-111                | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 0.11                        | 0.05             | 0.01              | --             | 2.54                        | 1.20             | 0.18              | --             |
| DP-113                | Hardshell Rock Storage Drop                                   | 0.59                        | 0.28             | 0.04              | 0.003          | 14.23                       | 6.73             | 1.02              | 0.08           |
| DP-114                | Ore Stockpile Drop                                            | 0.13                        | 0.06             | 0.01              | 0.00           | 3.17                        | 1.50             | 0.23              | 0.06           |
| DP-115                | ROM Stockpile Drop                                            | 0.04                        | 0.02             | 0.00              | 0.001          | 0.87                        | 0.41             | 0.06              | 0.02           |
| DP-124                | Transfer of Development Ore from Face to Loader               | 5.00E-04                    | 2.36E-04         | 1.48E-04          | 6.45E-06       | 0.01                        | 0.01             | 0.004             | 0.000          |
| DP-125                | Transfer of Development Ore from Loader to Stockpile          | 5.00E-04                    | 2.36E-04         | 1.48E-04          | 6.45E-06       | 0.01                        | 0.01             | 0.004             | 0.000          |
| DP-126                | Transfer of Development Ore from Stockpile to Loader          | 5.00E-04                    | 2.36E-04         | 1.48E-04          | 6.45E-06       | 0.01                        | 0.01             | 0.004             | 0.000          |
| DP-127                | Transfer of Development Ore Mined from Loader to Haul Truck   | 5.00E-04                    | 2.36E-04         | 1.48E-04          | 6.45E-06       | 0.01                        | 0.01             | 0.004             | 0.000          |
| DP-129                | Transfer of Development Waste Mined from Face to Loader       | 6.99E-04                    | 3.31E-04         | 2.07E-04          | 3.96E-06       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-130                | Transfer of Development Waste Mined from Loader to Stockpile  | 6.99E-04                    | 3.31E-04         | 2.07E-04          | 3.96E-06       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-131                | Transfer of Development Waste Mined from Stockpile to Loader  | 6.99E-04                    | 3.31E-04         | 2.07E-04          | 3.96E-06       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-132                | Transfer of Development Waste Mined from Loader to Haul Truck | 6.99E-04                    | 3.31E-04         | 2.07E-04          | 3.96E-06       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-134                | Transfer of Stope Ore from Stope to Loader                    | 7.63E-04                    | 3.61E-04         | 2.26E-04          | 1.34E-05       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-135                | Transfer of Stope Ore from Loader to Stockpile                | 7.63E-04                    | 3.61E-04         | 2.26E-04          | 1.34E-05       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-136                | Transfer of Stope Ore from Stockpile to Loader                | 7.63E-04                    | 3.61E-04         | 2.26E-04          | 1.34E-05       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-137                | Transfer of Stope Ore from Loader to Haul Truck               | 7.63E-04                    | 3.61E-04         | 2.26E-04          | 1.34E-05       | 0.02                        | 0.01             | 0.005             | 0.000          |
| <b>Total</b>          |                                                               | <b>1.77</b>                 | <b>0.84</b>      | <b>0.13</b>       | <b>0.02</b>    | <b>42.54</b>                | <b>20.12</b>     | <b>3.09</b>       | <b>0.41</b>    |

**Mine Development  
Drops (Annual) - Clark**

**Table A-14a. Clark Drops - Emissions - Inputs**

| Emission Point Number           | Description                                                   | Throughput <sup>1</sup><br>(tpy) | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                    | Control Factor <sup>2</sup>    |                              | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                  |                   |                |
|---------------------------------|---------------------------------------------------------------|----------------------------------|-------------------------|--------------------------------|-----------------------------------|--------------------------------|------------------------------|---------------------------------|-------------------------------------------|------------------|-------------------|----------------|
|                                 |                                                               |                                  |                         |                                |                                   | PM/PM <sub>10</sub> Efficiency | PM <sub>2.5</sub> Efficiency |                                 | PM                                        | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
|                                 |                                                               |                                  |                         |                                |                                   | %                              | %                            |                                 | (lb/ton)                                  | (lb/ton)         | (lb/ton)          | (lb/ton)       |
| Surface Activities              |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |
| Coarse Ore Delivery and Storage |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |
| DP-103                          | Dump into Primary Crusher Feed Hopper                         | 733,798                          | 1.76%                   | 4.00                           | Spray Bar, Partial Enclosure      | 85%                            | 85%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| DP-104                          | Drop from silo to trucks                                      | 733,798                          | 1.76%                   | 4.00                           | Partial Enclosure, Dust Extractor | 50%                            | 50%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| From Stockpiles                 |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |
| DP-105                          | Transfer of Ore from Ore Stockpile to Loader                  | 733794                           | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| DP-106                          | Transfer of Ore Mined from Loader to Haul Truck               | 733794                           | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| DP-107                          | Transfer from ROM Stockpile to Loader                         | 201172                           | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| DP-109                          | Transfer from Agg Stockpile to Loader                         | 10,000                           | 0.00%                   | 1.77                           | No Control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |
| DP-110                          | Transfer of Agg Material from Loader to Haul Truck            | 10,000                           | 0.00%                   | 1.77                           | No Control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |
| DP-111                          | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 10,000                           | 0.00%                   | 1.77                           | No Control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |
| Stockpile Drops                 |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |
| DP-113                          | Hardshell Rock Storage                                        | 987,351                          | 0.57%                   | 4.00                           | No Control                        | 0%                             | 0%                           | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 2.98E-05       |
| DP-114                          | Ore Stockpile                                                 | 733,794                          | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| DP-115                          | ROM Stockpile                                                 | 201,172                          | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| Underground                     |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |
| DP-124                          | Transfer of Development Ore from Face to Loader               | 190,691                          | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000002       |
| DP-125                          | Transfer of Development Ore from Loader to Stockpile          | 190,691                          | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000002       |
| DP-126                          | Transfer of Development Ore from Stockpile to Loader          | 190,691                          | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000002       |
| DP-127                          | Transfer of Development Ore Mined from Loader to Haul Truck   | 190,691                          | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000002       |
| DP-129                          | Transfer of Development Waste Mined from Face to Loader       | 987,351                          | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000001       |
| DP-130                          | Transfer of Development Waste Mined from Loader to Stockpile  | 987,351                          | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000001       |
| DP-131                          | Transfer of Development Waste Mined from Stockpile to Loader  | 987,351                          | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000001       |
| DP-132                          | Transfer of Development Waste Mined from Loader to Haul Truck | 987,351                          | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000001       |
| DP-134                          | Transfer of Stope Ore from Stope to Loader                    | 543,107                          | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000003       |
| DP-135                          | Transfer of Stope Ore from Loader to Stockpile                | 543,107                          | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000003       |
| DP-136                          | Transfer of Stope Ore from Stockpile to Loader                | 543,107                          | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000003       |
| DP-137                          | Transfer of Stope Ore from Loader to Haul Truck               | 543,107                          | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000003       |

1. Per March 2022 dated Process Flow Diagram, provided by South32 in March 2022.

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

For Watering  
For Moisture Content

70%  
0%

Gravity Settling (underground only) (PM/PM<sub>10</sub>/Pb)  
Gravity Settling (underground only) (PM<sub>2.5</sub>)  
For Full Enclosure/Enclosure by building  
For Partial Enclosure  
No control

80%  
16%  
80%  
50%  
0%

Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32.  
Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCoy (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)  
U = Mean wind speed (miles per hour [mph]), which is equal to:

PM  
0.74  
19.49

PM<sub>10</sub>  
0.35

PM<sub>2.5</sub>  
0.053

Based on 2019-2021 On-Site Met Data

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1  
0.25 %

Moisture Content of Aggregate taken to be 1.7 per AP-42 Section 11.12 Table 11.12-1 Footnote b

Mine Development  
Drops (Annual) - Clark

Table A-14b. Clark Drops - Emissions - Controlled

| Emission Point Number | Description                                                   | Controlled Emissions   |                  |                   |                | Uncontrolled Emissions |                  |                   |                |
|-----------------------|---------------------------------------------------------------|------------------------|------------------|-------------------|----------------|------------------------|------------------|-------------------|----------------|
|                       |                                                               | Annual Emissions (tpy) |                  |                   |                | Annual Emissions (tpy) |                  |                   |                |
|                       |                                                               | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-103                | Dump into Primary Crusher Feed Hopper                         | 0.29                   | 0.14             | 0.02              | 0.01           | 1.93                   | 0.91             | 0.14              | 0.03           |
| DP-104                | Drop from silo to trucks                                      | 0.96                   | 0.46             | 0.07              | 0.02           | 1.93                   | 0.91             | 0.14              | 0.03           |
| DP-105                | Transfer of Ore from Ore Stockpile to Loader                  | 0.58                   | 0.27             | 0.04              | 0.01           | 1.93                   | 0.91             | 0.14              | 0.03           |
| DP-106                | Transfer of Ore Mined from Loader to Haul Truck               | 0.58                   | 0.27             | 0.04              | 0.01           | 1.93                   | 0.91             | 0.14              | 0.03           |
| DP-107                | Transfer from ROM Stockpile to Loader                         | 0.16                   | 0.08             | 0.011             | 0.003          | 0.53                   | 0.25             | 0.04              | 0.01           |
| DP-109                | Transfer from Aqg Stockpile to Loader                         | 0.08                   | 0.04             | 0.006             | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-110                | Transfer of Aqg Material from Loader to Haul Truck            | 0.08                   | 0.04             | 0.006             | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-111                | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 0.08                   | 0.04             | 0.006             | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-113                | Hardshell Rock Storage                                        | 2.60                   | 1.23             | 0.186             | 0.015          | 2.60                   | 1.23             | 0.19              | 0.01           |
| DP-114                | Ore Stockpile                                                 | 0.58                   | 0.27             | 0.041             | 0.010          | 1.93                   | 0.91             | 0.14              | 0.03           |
| DP-115                | ROM Stockpile                                                 | 0.16                   | 0.08             | 0.011             | 0.003          | 0.53                   | 0.25             | 0.04              | 0.01           |
| DP-124                | Transfer of Development Ore from Face to Loader               | 9.01E-04               | 4.26E-04         | 2.67E-04          | 1.16E-05       | 0.01                   | 0.01             | 0.00              | 0.00           |
| DP-125                | Transfer of Development Ore from Loader to Stockpile          | 9.01E-04               | 4.26E-04         | 2.67E-04          | 1.16E-05       | 0.01                   | 0.01             | 0.00              | 0.00           |
| DP-126                | Transfer of Development Ore from Stockpile to Loader          | 9.01E-04               | 4.26E-04         | 2.67E-04          | 1.16E-05       | 0.01                   | 0.01             | 0.00              | 0.00           |
| DP-127                | Transfer of Development Ore Mined from Loader to Haul Truck   | 9.01E-04               | 4.26E-04         | 2.67E-04          | 1.16E-05       | 0.01                   | 0.01             | 0.00              | 0.00           |
| DP-129                | Transfer of Development Waste Mined from Face to Loader       | 4.67E-03               | 2.21E-03         | 1.38E-03          | 2.65E-05       | 0.08                   | 0.04             | 0.01              | 0.00           |
| DP-130                | Transfer of Development Waste Mined from Loader to Stockpile  | 4.67E-03               | 2.21E-03         | 1.38E-03          | 2.65E-05       | 0.08                   | 0.04             | 0.01              | 0.00           |
| DP-131                | Transfer of Development Waste Mined from Stockpile to Loader  | 4.67E-03               | 2.21E-03         | 1.38E-03          | 2.65E-05       | 0.08                   | 0.04             | 0.01              | 0.00           |
| DP-132                | Transfer of Development Waste Mined from Loader to Haul Truck | 4.67E-03               | 2.21E-03         | 1.38E-03          | 2.65E-05       | 0.08                   | 0.04             | 0.01              | 0.00           |
| DP-134                | Transfer of Stope Ore from Stope to Loader                    | 2.57E-03               | 1.21E-03         | 7.62E-04          | 4.52E-05       | 0.04                   | 0.02             | 0.00              | 0.00           |
| DP-135                | Transfer of Stope Ore from Loader to Stockpile                | 2.57E-03               | 1.21E-03         | 7.62E-04          | 4.52E-05       | 0.04                   | 0.02             | 0.00              | 0.00           |
| DP-136                | Transfer of Stope Ore from Stockpile to Loader                | 2.57E-03               | 1.21E-03         | 7.62E-04          | 4.52E-05       | 0.04                   | 0.02             | 0.00              | 0.00           |
| DP-137                | Transfer of Stope Ore from Loader to Haul Truck               | 2.57E-03               | 1.21E-03         | 7.62E-04          | 4.52E-05       | 0.04                   | 0.02             | 0.00              | 0.00           |
|                       | <b>Total</b>                                                  | <b>6.18</b>            | <b>2.93</b>      | <b>0.45</b>       | <b>0.07</b>    | <b>14.09</b>           | <b>6.66</b>      | <b>1.01</b>       | <b>0.21</b>    |



Mine Development  
Dust Collectors

Table A-15. Dust Collectors - Emissions

| Emission Point Number | Description                                                             | Max Outlet Grain Loading <sup>1</sup><br>(gr/dscf) | Stack Flow Rate <sup>2</sup><br>(cfm) | Hours of Operation<br>(hr/yr) | Material                                   | Lead Content in Material<br>(%) | Annual Emissions <sup>3</sup> |                           |                            |                                      | Hourly Emissions <sup>3</sup> |                             |                              |                                        | Daily Emissions <sup>3</sup> |                              |                               |                                         |
|-----------------------|-------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------|-------------------------------|--------------------------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------------------|-------------------------------|-----------------------------|------------------------------|----------------------------------------|------------------------------|------------------------------|-------------------------------|-----------------------------------------|
|                       |                                                                         |                                                    |                                       |                               |                                            |                                 | PM<br>(tpy)                   | PM <sub>10</sub><br>(tpy) | PM <sub>2.5</sub><br>(tpy) | Lead Compounds <sup>4</sup><br>(tpy) | PM<br>(lb/hr)                 | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) | Lead Compounds <sup>4</sup><br>(lb/hr) | PM<br>(lb/day)               | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | Lead Compounds <sup>4</sup><br>(lb/day) |
| Taylor                |                                                                         |                                                    |                                       |                               |                                            |                                 |                               |                           |                            |                                      |                               |                             |                              |                                        |                              |                              |                               |                                         |
| DC-1                  | 21210-CX-00002 Main Shaft Ore Discharge Dust Collector <sup>7</sup>     | 0.002                                              | 3,250                                 | 8,760                         | Stope Ore & Developmental Ore & Waste Rock | 3.88%                           | 0.24                          | 0.24                      | 0.24                       | 9.46E-03                             | 0.06                          | 0.06                        | 0.06                         | 0.00                                   | 1.34                         | 1.34                         | 1.34                          | 0.05                                    |
| DC-2                  | 21210-CX-00001 Coarse Ore Overland Conveyor Dust Collector <sup>7</sup> | 0.002                                              | 5,000                                 | 8,760                         | Stope Ore & Developmental Ore              | 4.73%                           | 0.38                          | 0.38                      | 0.38                       | 1.78E-02                             | 0.09                          | 0.09                        | 0.09                         | 0.00                                   | 2.06                         | 2.06                         | 2.06                          | 0.10                                    |
| DC-3                  | 21210-CX-00003 Transfer Tower Silo Dust Collector <sup>4</sup>          | 0.002                                              | 30,000                                | 8,760                         | Stope Ore & Developmental Ore & Waste Rock | 3.88%                           | 2.25                          | 2.25                      | 2.25                       | 8.73E-02                             | 0.51                          | 0.51                        | 0.51                         | 0.02                                   | 12.34                        | 12.34                        | 12.34                         | 0.48                                    |
| DC-4                  | 21510-CX-00001 Coarse Ore Silo Dust Collector <sup>4</sup>              | 0.002                                              | 11,000                                | 8,760                         | Stope Ore & Developmental Ore              | 4.73%                           | 0.83                          | 0.83                      | 0.83                       | 3.91E-02                             | 0.19                          | 0.19                        | 0.19                         | 0.01                                   | 4.53                         | 4.53                         | 4.53                          | 0.21                                    |
| DC-5                  | 21710-CX-00002 Silo Discharge Dust Collector <sup>5</sup>               | 0.002                                              | 10,850                                | 8,760                         | Stope Ore & Developmental Ore              | 4.73%                           | 0.81                          | 0.81                      | 0.81                       | 3.85E-02                             | 0.19                          | 0.19                        | 0.19                         | 8.80E-03                               | 4.46                         | 4.46                         | 4.46                          | 2.11E-01                                |
| DC-12                 | 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector                  | 0.008                                              | 1,000                                 | 8,760                         | Copper Sulphate                            | 0.00%                           | 0.30                          | 0.30                      | 0.30                       | 0.00E+00                             | 0.07                          | 0.07                        | 0.07                         | 0.00                                   | 1.65                         | 1.65                         | 1.65                          | 0.00                                    |
| DC-13                 | 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector                | 0.008                                              | 1,000                                 | 8,760                         | 10% Zinc Sulphate                          | 0.00%                           | 0.30                          | 0.30                      | 0.30                       | 0.00E+00                             | 0.07                          | 0.07                        | 0.07                         | 0.00                                   | 1.65                         | 1.65                         | 1.65                          | 0.00                                    |
| DC-14                 | 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector                | 0.008                                              | 1,000                                 | 8,760                         | 50% Zinc Sulphate                          | 0.00%                           | 0.30                          | 0.30                      | 0.30                       | 0.00E+00                             | 0.07                          | 0.07                        | 0.07                         | 0.00                                   | 1.65                         | 1.65                         | 1.65                          | 0.00                                    |
| DC-15                 | 22620-CX-00004 Caustic Mix Tank Dust Collector                          | 0.008                                              | 1,000                                 | 8,760                         | Caustic Mix                                | 0.00%                           | 0.30                          | 0.30                      | 0.30                       | 0.00E+00                             | 0.07                          | 0.07                        | 0.07                         | 0.00                                   | 1.65                         | 1.65                         | 1.65                          | 0.00                                    |
| DC-16                 | 22210-CX-00001 Pebble Crusher Dust Collector <sup>4</sup>               | 0.002                                              | 12,350                                | 8,760                         | Stope Ore & Developmental Ore              | 4.73%                           | 0.93                          | 0.93                      | 0.93                       | 4.39E-02                             | 0.21                          | 0.21                        | 0.21                         | 0.01                                   | 5.08                         | 5.08                         | 5.08                          | 0.24                                    |
| DC-PPBS1              | 18610-SI-00001 Paste Plant Binder Storage Silo 1 <sup>4</sup>           | 0.005                                              | 750                                   | 8,760                         | Binder                                     | 0%                              | 0.14                          | 0.14                      | 0.14                       | 0.00E+00                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.77                         | 0.77                         | 0.77                          | 0.00                                    |
| DC-PPBS2              | 18610-SI-00002 Paste Plant Binder Storage Silo 2 <sup>4</sup>           | 0.005                                              | 750                                   | 8,760                         | Binder                                     | 0%                              | 0.14                          | 0.14                      | 0.14                       | 0.00E+00                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.77                         | 0.77                         | 0.77                          | 0.00                                    |
| DC-PPBS3              | 18610-SI-10003 Paste Plant Binder Storage Silo 3 <sup>4</sup>           | 0.005                                              | 1,500                                 | 8,760                         | Binder                                     | 0%                              | 0.28                          | 0.28                      | 0.28                       | 0.00E+00                             | 0.06                          | 0.06                        | 0.06                         | 0.00                                   | 1.54                         | 1.54                         | 1.54                          | 0.00                                    |
| DC-PPBS4              | 18610-SI-20004 Paste Plant Binder Storage Silo 4 <sup>4</sup>           | 0.005                                              | 1,500                                 | 8,760                         | Binder                                     | 0%                              | 0.28                          | 0.28                      | 0.28                       | 0.00E+00                             | 0.06                          | 0.06                        | 0.06                         | 0.00                                   | 1.54                         | 1.54                         | 1.54                          | 0.00                                    |
| DC-PPM1M              | 18610-DC-20002 Paste Plant Module 1 Mixer <sup>4</sup>                  | 0.005                                              | 3,000                                 | 8,760                         | Paste                                      | 0%                              | 0.56                          | 0.56                      | 0.56                       | 0.00E+00                             | 0.13                          | 0.13                        | 0.13                         | 0.00                                   | 3.09                         | 3.09                         | 3.09                          | 0.00                                    |
| DC-PPM2M              | 18610-DC-20002 Paste Plant Module 2 Mixer <sup>4</sup>                  | 0.005                                              | 3,000                                 | 8,760                         | Paste                                      | 0%                              | 0.56                          | 0.56                      | 0.56                       | 0.00E+00                             | 0.13                          | 0.13                        | 0.13                         | 0.00                                   | 3.09                         | 3.09                         | 3.09                          | 0.00                                    |
| Clark                 |                                                                         |                                                    |                                       |                               |                                            |                                 |                               |                           |                            |                                      |                               |                             |                              |                                        |                              |                              |                               |                                         |
| DC-7                  | Coarse Ore Dust Collection System 23100-FAN-0001                        | 0.001                                              | 3,200                                 | 8,760                         | Clark Stope Ore                            | 1.76%                           | 0.12                          | 0.12                      | 0.12                       | 2.11E-03                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.66                         | 0.66                         | 0.66                          | 0.01                                    |
| DC-8                  | Coarse Ore Dust Collection System 23100-FAN-0002                        | 0.001                                              | 3,200                                 | 8,760                         | Clark Stope Ore                            | 1.76%                           | 0.12                          | 0.12                      | 0.12                       | 2.11E-03                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.66                         | 0.66                         | 0.66                          | 0.01                                    |
| DC-CPPBS1             | Paste Plant Binder Silo 1 <sup>6</sup>                                  | 0.005                                              | 750                                   | 8,760                         | Binder                                     | 0.00%                           | 0.14                          | 0.14                      | 0.14                       | 0.00E+00                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.77                         | 0.77                         | 0.77                          | 0.00                                    |
| DC-CPPBS2             | Paste Plant Binder Silo 2 <sup>6</sup>                                  | 0.005                                              | 750                                   | 8,760                         | Binder                                     | 0.00%                           | 0.14                          | 0.14                      | 0.14                       | 0.00E+00                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.77                         | 0.77                         | 0.77                          | 0.00                                    |
| DC-CPPBS3             | Paste Plant Binder Silo 3 <sup>6</sup>                                  | 0.005                                              | 1,500                                 | 8,760                         | Binder                                     | 0.00%                           | 0.28                          | 0.28                      | 0.28                       | 0.00E+00                             | 0.06                          | 0.06                        | 0.06                         | 0.00                                   | 1.54                         | 1.54                         | 1.54                          | 0.00                                    |
| DC-CPPBS4             | Paste Plant Binder Silo 4 <sup>6</sup>                                  | 0.005                                              | 1,500                                 | 8,760                         | Binder                                     | 0.00%                           | 0.28                          | 0.28                      | 0.28                       | 0.00E+00                             | 0.06                          | 0.06                        | 0.06                         | 0.00                                   | 1.54                         | 1.54                         | 1.54                          | 0.00                                    |
| DC-CPM1M              | Paste Plant Module 1 Mixer <sup>4</sup>                                 | 0.005                                              | 3,000                                 | 8,760                         | Paste                                      | 0.00%                           | 0.56                          | 0.56                      | 0.56                       | 0.00E+00                             | 0.13                          | 0.13                        | 0.13                         | 0.00                                   | 3.09                         | 3.09                         | 3.09                          | 0.00                                    |
| DC-CPM2M              | Paste Plant Module 2 Mixer <sup>4</sup>                                 | 0.005                                              | 3,000                                 | 8,760                         | Paste                                      | 0.00%                           | 0.56                          | 0.56                      | 0.56                       | 0.00E+00                             | 0.13                          | 0.13                        | 0.13                         | 0.00                                   | 3.09                         | 3.09                         | 3.09                          | 0.00                                    |
| DC-10                 | Coarse Ore Dust Collection System 23100-DCD-0005                        | 0.001                                              | 3,200                                 | 8,760                         | Clark Stope Ore                            | 1.76%                           | 0.12                          | 0.12                      | 0.12                       | 2.11E-03                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.66                         | 0.66                         | 0.66                          | 0.01                                    |
| General               |                                                                         |                                                    |                                       |                               |                                            |                                 |                               |                           |                            |                                      |                               |                             |                              |                                        |                              |                              |                               |                                         |
| WTP1L5                | Waste Water Treatment Plant #1 Lime Silo                                | 0.005                                              | 1,001                                 | 8,760                         | Lime                                       | 0%                              | 0.19                          | 0.19                      | 0.19                       | 0.00E+00                             | 0.04                          | 0.04                        | 0.04                         | 0.00                                   | 1.03                         | 1.03                         | 1.03                          | 0.00                                    |
| WTP2 DC               | Sodium Sulfate Indoor Dust Collector <sup>5</sup>                       | 0.010                                              | 77                                    | 8,760                         | Sodium Sulfate                             | 0%                              | 5.78E-03                      | 5.78E-03                  | 5.78E-03                   | 0.00E+00                             | 1.32E-03                      | 1.32E-03                    | 1.32E-03                     | 0.00E+00                               | 3.17E-02                     | 3.17E-02                     | 3.17E-02                      | 0.00                                    |
| Total                 |                                                                         |                                                    |                                       |                               |                                            |                                 | 11.14                         | 11.14                     | 11.14                      | 0.24                                 | 2.54                          | 2.54                        | 2.54                         | 0.06                                   | 61.03                        | 61.03                        | 61.03                         | 1.33                                    |

1. Per email from Sarah Richman, South32, on 07/06/2021 (Per Fluor Canada Ltd. Engineering)

Per RFI responses from Rodolfo Moctezuma on 4/29/2024

Per "Clark Deposit General RFI for Air Permit 030922" RFI received on 3/3/2022

2. Per RFI responses from Rodolfo Moctezuma on 4/29/2024

3. Using the conversion factors given below:

7000 grains/lb  
2000 lb/ton  
60 min/hr  
4.96 %  
1.76 %  
0.00 %

4. Lead Conc.

For Taylor deposit  
For Clark deposit  
Lead at paste plant assumed to be negligible

5. Per email from Sarah Richman, South32, on 08/24/2022 (Per Fluor Canada Ltd. Engineering)

6. Per email from Sarah Richman, South32, on 08/31/2022 (Per Fluor Canada Ltd. Engineering and Paterson Cooke)

7. Per PFD's received on 5/29/2024 from Sarah Richman, South32.

Table A-16a. Engines - Emission Factors

| Pollutant                           | Value    | Unit     | Source                                                                                                                                                                                                                                                                                                |
|-------------------------------------|----------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NO <sub>x</sub>                     | 7.87E-02 | g/KW-hr  | Per Natural Gas Generator 100% load Emissions Performance on G3520 Caterpillar engine provided by Brad Kaufman, VoltaGrid, on 9/22/2021                                                                                                                                                               |
| NO <sub>2</sub>                     | 7.50E-03 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO                                  | 1.31E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| PM <sub>10</sub> /PM <sub>2.5</sub> | 2.08E-03 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| VOC                                 | 1.18E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO <sub>2</sub>                     | 5.05E+02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| CH <sub>4</sub>                     | 1.29E+00 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| N <sub>2</sub> O                    | 1.10E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| Acetaldehyde                        | 7.10E-03 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| Formaldehyde                        | 4.70E-03 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| NO <sub>x</sub>                     | 5.26E-02 | g/KW-hr  | Per Natural Gas Generator 75% load Emissions Performance on G3520 Caterpillar engine provided by Brad Kaufman, VoltaGrid, on 9/22/2021                                                                                                                                                                |
| NO <sub>2</sub>                     | 3.00E-04 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO                                  | 1.88E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| PM <sub>10</sub> /PM <sub>2.5</sub> | 2.21E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| VOC                                 | 5.40E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO <sub>2</sub>                     | 5.30E+02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| CH <sub>4</sub>                     | 1.48E+00 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| N <sub>2</sub> O                    | 1.40E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| Acetaldehyde                        | 2.55E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| Formaldehyde                        | 0.00E+00 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| NO <sub>x</sub>                     | 6.27E-02 | g/KW-hr  | Per Natural Gas Generator 50% load Emissions Performance on G3520 Caterpillar engine provided by Brad Kaufman, VoltaGrid, on 9/22/2021                                                                                                                                                                |
| NO <sub>2</sub>                     | 0.00E+00 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO                                  | 3.23E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| PM <sub>10</sub> /PM <sub>2.5</sub> | 7.30E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| VOC                                 | 5.30E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO <sub>2</sub>                     | 5.56E+02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| CH <sub>4</sub>                     | 1.53E+00 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| N <sub>2</sub> O                    | 1.55E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| Acetaldehyde                        | 1.45E-02 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| Formaldehyde                        | 4.00E-04 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| NO <sub>x</sub>                     | 7.80     | tpy      | Per voluntary limit accepted by South32, as referenced in South32 Response to Public Comments, Supplement #1, on May 17, 2024                                                                                                                                                                         |
| CO                                  | 40.00    | tpy      |                                                                                                                                                                                                                                                                                                       |
| VOC                                 | 15.00    | tpy      |                                                                                                                                                                                                                                                                                                       |
| PM <sub>10</sub> /PM <sub>2.5</sub> | 1.00E-02 | g/KW-hr  | Per Caterpillar engine emissions certification, provided by Kara Haas, South32, on 7/18/2022                                                                                                                                                                                                          |
| SO <sub>2</sub>                     | 5.88E-04 | lb/MMBtu | AP-42 Section 3.2, Natural Gas Engines (Maximum Emission Factor Available), dated October 2024                                                                                                                                                                                                        |
| VOC                                 | 1.20E-01 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzene                             | 4.40E-04 | lb/MMBtu | AP-42 Section 3.2, Natural Gas Engines (4 Stroke Lean Burn) dated October 2024. The emission factor for PAH (which are HAPs because they are POMs) is the sum of the value listed for "PAH" in AP-42 and all other PAHs listed in the AP-42 that are not specifically listed HAPs.                    |
| Toluene                             | 4.08E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Xylene                              | 1.94E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 1,3-Butadiene                       | 2.67E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acrolein                            | 5.14E-03 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Naphthalene                         | 7.44E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 1,1,2,2-Tetrachloroethane           | 4.00E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 1,1,2-Trichloroethane               | 3.18E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 1,3-Dichloropropene                 | 2.64E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 2-Methylnaphthalene                 | 1.32E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 2,2,4-Trimethylpentane              | 2.50E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acenaphthene                        | 1.25E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acenaphthylene                      | 5.53E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(b)fluoranthene                | 1.66E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(e)pyrene                      | 4.15E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(g,h,i)perylene                | 4.14E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Biphenyl                            | 2.12E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Carbon Tetrachloride                | 3.67E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Chlorobenzene                       | 3.04E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Chloroform                          | 2.85E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Chrysene                            | 6.53E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Ethylbenzene                        | 3.97E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Ethylene Dibromide                  | 4.43E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Formaldehyde                        | 5.28E-02 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Fluoranthene                        | 1.11E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Fluorene                            | 5.67E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Methanol                            | 2.50E-03 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Methylene Chloride                  | 2.00E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Hexane                              | 1.11E-03 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| PAH                                 | 7.75E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Phenanthrene                        | 1.04E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Phenol                              | 2.40E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Pyrene                              | 1.36E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Styrene                             | 2.36E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Tetrachloroethane                   | 2.48E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Vinyl Chloride                      | 1.49E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| PM <sub>10</sub> /PM <sub>2.5</sub> | 4.00E-02 | g/KW-hr  | Tier 4 emission factors for diesel engines from Table 1 of §1039.101                                                                                                                                                                                                                                  |
| NO <sub>x</sub>                     | 3.50E+00 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO                                  | 3.50E+00 | g/KW-hr  |                                                                                                                                                                                                                                                                                                       |
| VOC                                 | 1.90E-01 | g/KW-hr  | Tier 4 NMHC emission factors for diesel engines from Table 1 of §1039.101                                                                                                                                                                                                                             |
| SO <sub>x</sub>                     | 1.21E-05 | lb/Hp-hr | AP-42, Table 3.4-1 (April 2025) based on Ultra Low Sulfur Diesel (15 ppm sulfur or 0.0015%) for Large Uncontrolled Stationary Diesel Engines (>600 HP).                                                                                                                                               |
| CO <sub>2</sub>                     | 7.40E+01 | kg/MMBtu |                                                                                                                                                                                                                                                                                                       |
| CH <sub>4</sub>                     | 3.00E-03 | kg/MMBtu |                                                                                                                                                                                                                                                                                                       |
| N <sub>2</sub> O                    | 6.00E-04 | kg/MMBtu | 40 CFR Part 98, Subpart C, Table C-1 for Distillate Fuel Oil No. 2 (diesel)                                                                                                                                                                                                                           |
| PM (condensable)                    | 9.91E-03 | lb/MMBtu | AP-42 Section 3.2, Natural Gas Engines (4 stroke lean burn) dated October 2024                                                                                                                                                                                                                        |
| CO <sub>2</sub>                     | 5.31E+01 | kg/MMBtu |                                                                                                                                                                                                                                                                                                       |
| CH <sub>4</sub>                     | 1.00E-03 | kg/MMBtu |                                                                                                                                                                                                                                                                                                       |
| N <sub>2</sub> O                    | 1.00E-04 | kg/MMBtu | 40 CFR Part 98, Subpart C, Table C-1 and C-2 for Natural Gas (Weighted U.S Average)                                                                                                                                                                                                                   |
| Benzene                             | 7.76E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Toluene                             | 2.81E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Xylene                              | 1.93E-04 | lb/MMBtu | AP-42 Section 3.4, HAP Emission Factors For Large Uncontrolled Stationary Diesel Engines (>600 HP) dated April 2025. The emission factor for PAH (which are HAPs because they are POMs) is the value for "Total PAH" listed in AP-42 minus the value listed for naphthalene, as it is specified here. |
| 1,3-Butadiene                       | 3.91E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Formaldehyde                        | 2.88E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acetaldehyde                        | 2.52E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acrolein                            | 2.88E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Naphthalene                         | 1.30E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Propylene                           | 2.79E-03 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acenaphthylene                      | 5.23E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acenaphthene                        | 4.68E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Fluorene                            | 1.28E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Phenanthrene                        | 4.68E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Anthracene                          | 1.23E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Fluoranthene                        | 4.03E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Pyrene                              | 3.71E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(a)anthracene                  | 6.22E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Chrysene                            | 1.53E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(k)fluoranthene                | 1.11E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(k)fluoranthene                | 2.18E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(a)pyrene                      | 5.57E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Indeno(1,2,3-cd)pyrene              | 4.14E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Dibenz(a,h)anthracene               | 3.46E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(g,h,i)perylene                | 5.56E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| PAH                                 | 8.20E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| SO <sub>2</sub>                     | 2.05E-03 | lb/Hp-hr | AP-42 Section 3.3 for Diesel Engines (<600 HP) dated April 2025                                                                                                                                                                                                                                       |

|                   |          |          |
|-------------------|----------|----------|
| NOx               | 4.00E-01 | g/kW-hr  |
| CO                | 3.50E+00 | g/kW-hr  |
| PM                | 2.00E-02 | g/kW-hr  |
| PM <sub>10</sub>  | 2.00E-02 | g/kW-hr  |
| PM <sub>2.5</sub> | 2.00E-02 | g/kW-hr  |
| VOC               | 1.90E-01 | g/kW-hr  |
| Benzene           | 9.33E-04 | lb/MMBtu |
| Toluene           | 4.09E-04 | lb/MMBtu |
| Xylene            | 2.85E-04 | lb/MMBtu |
| 1,3-Butadiene     | 3.91E-05 | lb/MMBtu |
| Formaldehyde      | 1.18E-03 | lb/MMBtu |
| Acetaldehyde      | 7.67E-04 | lb/MMBtu |
| Acrolein          | 9.25E-05 | lb/MMBtu |
| Napthalene        | 8.48E-05 | lb/MMBtu |
| PAH               | 8.32E-05 | lb/MMBtu |

Tier 4 emission factors for diesel engines of rated capacity 130 ≤ kW < 560 from Table 1 of §1039.101

AP-42 Section 3.3 Table 3.3-2 Speciated Organic Compound Emission Factors For Uncontrolled Diesel Engines (< 600 HP) dated April 2025. The emission factor for PAH (which are HAPs because they are POPs) is the value for 'Total PAH' listed in AP-42 minus the value listed for naphthalene, as it is speciated here.

Table A-16b. Generator - Criteria Pollutant Emissions (Annual)

| Emission Point Number           | Location  | Equipment Name       | Number of Engines | Engine Rating (kW) |              | Fuel Type | Operation Hours<br>(hrs/yr) | Criteria Pollutants Annual Emissions (tpy) |                 |               |              |                  |                   |                  |                 | GHG Annual Emissions (tpy) |                 |                  |                   |
|---------------------------------|-----------|----------------------|-------------------|--------------------|--------------|-----------|-----------------------------|--------------------------------------------|-----------------|---------------|--------------|------------------|-------------------|------------------|-----------------|----------------------------|-----------------|------------------|-------------------|
|                                 |           |                      |                   | (Electrical)       | (Mechanical) |           |                             | NO <sub>x</sub>                            | NO <sub>x</sub> | CO            | PM           | PM <sub>10</sub> | PM <sub>2.5</sub> | VOC <sup>1</sup> | SO <sub>x</sub> | CO <sub>2</sub>            | CH <sub>4</sub> | N <sub>2</sub> O | CO <sub>2</sub> e |
|                                 |           |                      |                   | 53000              | 57,200       |           |                             | 45.02                                      | 0.00            | 23.19         | 52.42        | 52.42            | 52.42             | 38.06            | 1.53            | 399,229.42                 | 1,100.04        | 11.13            | 430,046.92        |
| ENGINE 0013 - 0056 (50% Load)   | Trench    | CAT 3520 DSL 2600 kW | 40                | 76,000             | 85,800       | NG        | 8,760                       | 56.65                                      | 0.32            | 20.25         | 23.80        | 23.80            | 23.80             | 58.16            | 2.15            | 570,840.63                 | 1,591.78        | 15.08            | 615,128.71        |
| ENGINE 0013 - 0056 (75% Load)   | Trench    |                      |                   | 104,000            | 114,400      | NG        | 8,760                       | 113.02                                     | 10.77           | 18.81         | 2.87         | 2.87             | 2.87              | 16.95            | 2.76            | 730,963.23                 | 1,850.24        | 15.80            | 781,926.73        |
| ENGINE 0007 - 0012 <sup>2</sup> | Hardshell | CAT C18, 589 kW      | 6                 | 2,730              | 3,534        | Diesel    | 8,760                       | 3.9                                        | 1.95            | 20            | 0.34         | 0.34             | 0.34              | 7.5              | 4.14E-04        | 23,692.22                  | 9.61E-01        | 1.92E-01         | 23,773.52         |
|                                 |           | CAT C18, 589 kW      | 6                 | 2,730              | 3,534        | Diesel    | 8,760                       | 3.9                                        | 1.95            | 20            | 0.34         | 0.34             | 0.34              | 7.5              | 4.14E-04        | 23,692.22                  | 9.61E-01        | 1.92E-01         | 23,773.52         |
| ENGINE 0002 - 0006              | Taylor    | CAT C175 3000 kW     | 5                 | 3,000              | 3,300        | Diesel    | 500                         | 31.83                                      | 31.83           | 31.83         | 3.64E-01     | 3.64E-01         | 3.64E-01          | 1.73E+00         | 6.71E-02        | 1,262.75                   | 0.05            | 0.01             | 1,267.09          |
| ENGINE 0001                     | WW1       | C2000ZRE             | 1                 | 198                | 213          | Diesel    | 8,760                       | 0.82                                       | 0.82            | 7.20          | 0.04         | 0.04             | 0.04              | 0.39             | 2.56            | 1,427.97                   | 0.06            | 0.01             | 1,432.87          |
| <b>Total Annual Emissions</b>   |           |                      |                   |                    |              |           |                             | <b>153.47</b>                              | <b>47.32</b>    | <b>102.22</b> | <b>53.50</b> | <b>53.50</b>     | <b>53.50</b>      | <b>75.28</b>     | <b>5.39</b>     | <b>781038.39</b>           | <b>1852.27</b>  | <b>16.20</b>     | <b>832173.73</b>  |

1. VOC emission factors for NG engines assumed to be total of VOC, Acetaldehyde, and Formaldehyde emission factors from performance test.

2. ENGINE 0007 - 0012 generators will be CAT XQ1140 make/model. Each XQ1140 generator set will consist of two CAT C18 engines exhausting to a shared stack

Table A-16c. Generator - HAP Emissions (Annual)<sup>1</sup>

| Emission Point Number            | ENGINE 0013 - 0056<br>(50%) | ENGINE 0056<br>(75%) | ENGINE 0013 - 0056<br>(100%) | ENGINE 0007 - 0012 | ENGINE 0002 - 0006 | ENGINE 0001 | Total Annual<br>Emissions<br>(tpy) |
|----------------------------------|-----------------------------|----------------------|------------------------------|--------------------|--------------------|-------------|------------------------------------|
| Engine Rating (kW)               | 57,200                      | 85,800               | 114,400                      | 3,534              | 3,534              | 3,300       | 213                                |
| Fuel Consumption Rate (SCFH)     | 582,360                     | 818,200              | 1,051,120                    | -                  | -                  | -           | -                                  |
| Fuel Input (MMBtu/hr)            | 594.01                      | 834.56               | 1,072.14                     | 33.17              | 33.17              | 30.98       | 2.00                               |
| Benzene                          | 1.17E-01                    | 1.64E-01             | 2.11E-01                     | 1.13E-01           | 1.13E-01           | 6.17E-01    | 0.450                              |
| Toluene                          | 1.08E-01                    | 1.52E-01             | 1.95E-01                     | 4.08E-02           | 4.08E-02           | 2.18E-03    | 0.283                              |
| Xylene                           | 4.88E-02                    | 6.88E-02             | 8.81E-02                     | 2.80E-02           | 2.80E-02           | 1.49E-03    | 0.148                              |
| 1,3-Butadiene                    | 7.09E-02                    | 9.99E-02             | 1.28E-01                     | 5.68E-03           | 5.68E-03           | 3.45E-04    | 0.140                              |
| Formaldehyde                     | 2.87E-01                    | 0.00E+00             | 6.75E+00                     | 1.15E-02           | 1.15E-02           | 6.11E-04    | 6.783                              |
| Acetaldehyde                     | 1.04E+01                    | 2.75E+01             | 1.02E+01                     | 3.66E-03           | 3.66E-03           | 1.95E-04    | 27.479                             |
| Acetone                          | 1.36E+00                    | 1.96E+00             | 2.46E+00                     | 1.14E-01           | 1.14E-01           | 6.10E-05    | 2.465                              |
| Naphthalene                      | 1.97E-02                    | 2.77E-02             | 3.56E-02                     | 1.89E-02           | 1.89E-02           | 1.01E-03    | 0.074                              |
| 1,1,2,2-Tetrachloroethane        | 1.04E-01                    | 1.46E-01             | 1.88E-01                     | -                  | -                  | -           | 0.188                              |
| 1,1,2-Trichloroethane            | 8.27E-02                    | 1.16E-01             | 1.49E-01                     | -                  | -                  | -           | 0.149                              |
| 1,3-Dichlorobenzene              | 7.01E-03                    | 9.84E-03             | 1.26E-02                     | -                  | -                  | -           | 0.013                              |
| 2-Methylnaphthalene              | 8.81E-03                    | 1.24E-02             | 1.59E-02                     | -                  | -                  | -           | 0.016                              |
| 2,2,4-Trimethylpentane           | 6.63E-02                    | 9.32E-02             | 1.20E-01                     | -                  | -                  | -           | 0.120                              |
| Biphenyl                         | 5.63E-02                    | 7.90E-02             | 1.02E-01                     | -                  | -                  | -           | 0.102                              |
| Carbon Tetrachloride             | 9.55E-02                    | 1.34E-01             | 1.72E-01                     | -                  | -                  | -           | 0.172                              |
| Chlorobenzene                    | 7.91E-02                    | 1.11E-01             | 1.43E-01                     | -                  | -                  | -           | 0.143                              |
| Chloroform                       | 7.51E-02                    | 1.06E-01             | 1.34E-01                     | -                  | -                  | -           | 0.134                              |
| Ethylbenzene                     | 1.05E-02                    | 1.48E-02             | 1.90E-02                     | -                  | -                  | -           | 0.019                              |
| Ethylene Dibromide               | 1.15E-01                    | 1.62E-01             | 2.08E-01                     | -                  | -                  | -           | 0.208                              |
| Methanol                         | 6.63E-01                    | 9.32E-01             | 1.20E+00                     | -                  | -                  | -           | 1.197                              |
| Methylene Chloride               | 9.20E-02                    | 7.31E-02             | 9.39E-02                     | -                  | -                  | -           | 0.094                              |
| Hexane                           | 2.95E-01                    | 4.14E-01             | 5.32E-01                     | -                  | -                  | -           | 0.532                              |
| PM <sub>10</sub>                 | 2.03E-01                    | 2.82E-01             | 3.64E-01                     | 1.19E-02           | 1.19E-02           | 6.33E-04    | 0.389                              |
| Phenol                           | 6.24E-02                    | 8.77E-02             | 1.13E-01                     | -                  | -                  | -           | 0.113                              |
| Tetrachloroethane                | 6.45E-03                    | 9.07E-03             | 1.16E-02                     | -                  | -                  | -           | 0.012                              |
| Vinyl Chloride                   | 3.88E-02                    | 5.45E-02             | 7.03E-02                     | -                  | -                  | -           | 0.070                              |
| Total Annual HAP emissions (tpy) |                             |                      |                              |                    |                    |             | 41.49                              |

1. The CAT N6 engines (EU, T, ENG) are Tier 4 emissions certified and equipped with oxidation catalysts. Oxidation catalysts reduce emissions of organic HAPs. To develop an appropriate control efficiency (CE) for the HAP emissions from these engines that could be applied to the AP-42 Ch. 3.2 HAP Emission factors, Formaldehyde and VOC emission factors determined through stack testing were compared with Formaldehyde and VOC emission factors from AP-42 for natural gas engines, and the resulting ratio was applied to all organic HAPs.

100% Load CAT 3520 engines CE based on formaldehyde or VOC emission factors: CE % = (1 - (Stack Testing Emission Factor) / (AP-42 Ch. 3.2 Emission Factor)) x 100

Formaldehyde CE =

VOC CE =

75% Load CAT 3520 engines

CE based on formaldehyde emission factors: CE % = (Stack Testing Emission Factor) / (AP-42 Ch. 3.2 Emission Factor) x 100

Formaldehyde CE =

VOC CE =

50% Load CAT 3520 engines

CE based on formaldehyde emission factors: CE % = (Stack Testing Emission Factor) / (AP-42 Ch. 3.2 Emission Factor) x 100

Formaldehyde CE =

VOC CE =

Based on the calculations above, a conservative CE of

89.8% was applied to all AP-42 organic HAP emission factors for these engines.

Table A-16d. Generator - Criteria Pollutant Emissions (Daily)

| Emission Point Number     | Location  | Equipment Name       | Number of Engines | Engine Rating (kW) <sup>1,2</sup> |              | Fuel Type | Operation Hours | Criteria Pollutants Daily Emissions (lb/day) <sup>3,4,5</sup> |                 |          |                  |                  |                   |        |                 |
|---------------------------|-----------|----------------------|-------------------|-----------------------------------|--------------|-----------|-----------------|---------------------------------------------------------------|-----------------|----------|------------------|------------------|-------------------|--------|-----------------|
|                           |           |                      |                   | (Electrical)                      | (Mechanical) |           | (hrs/yr)        | NO <sub>x</sub>                                               | NO <sub>x</sub> | CO       | PM <sub>10</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | VOC    | SO <sub>x</sub> |
| ENGINE 0013 - 0056 (50%)  | Trench    | CAT 3520 DSL 2600 kW | 40                | 78,000                            | 85,800       | NG        | 8,760           | 310.43                                                        | 1.77            | 110.95   | 130.43           | 130.43           | 130.43            | 318.69 | 11.78           |
| ENGINE 0013 - 0056 (75%)  | Trench    | CAT 3520 DSL 2600 kW |                   | 104,000                           | 114,400      | NG        | 8,760           | 103.08                                                        | 59.02           | 103.08   | 15.74            | 15.74            | 15.74             | 92.85  | 15.13           |
| ENGINE 0013 - 0056 (100%) | Trench    | CAT 3520 DSL 2600 kW |                   | 52,000                            | 57,200       | NG        | 8,760           | 246.69                                                        | 0.00            | 127.08   | 287.22           | 287.22           | 287.22            | 208.53 | 8.38            |
| ENGINE 0007 - 0012        | Hardshell | CAT C18, 589 bkW     | 6                 | 2,730                             | 3,534        | Diesel    | 8,760           | 21.37                                                         | 10.68           | 109.59   | 1.87             | 1.87             | 1.87              | 41.10  | 2.27E-03        |
|                           |           | CAT C18, 589 bkW     | 6                 | 2,730                             | 3,534        | Diesel    | 8,760           | 21.37                                                         | 10.68           | 109.59   | 1.87             | 1.87             | 1.87              | 41.10  | 2.27E-03        |
| ENGINE 0002 - 0006        | Taylor    | CAT C175 3000 kW     | 5                 | 3,000                             | 3,300        | Diesel    | 500             | 3055.61                                                       | 3055.61         | 34.92    | 34.92            | 34.92            | 34.92             | 165.88 | 6.44            |
| ENGINE 0001               | WW1       | C2000.2RE            | 1                 | 198                               | 213          | Diesel    | 8,760           | 4.51                                                          | 4.51            | 39.45    | 0.23             | 0.23             | 0.23              | 2.14   | 14.05           |
| Total Daily Emissions     |           |                      |                   |                                   |              |           |                 | 3,722.14                                                      | 3,140.50        | 3,441.31 | 326.10           | 326.10           | 326.10            | 568.90 | 35.63           |

Table A-16e. Generator - Criteria Pollutant Emissions (Hourly)

| Emission Point Number     | Location  | Equipment Name       | Number of Engines | Engine Rating (kW) <sup>1,2</sup> |              | Fuel Type | Operation Hours | Criteria Pollutants Hourly Emissions (lb/hr) <sup>3,4,5</sup> |                 |        |       |                  |                   |       |                 |
|---------------------------|-----------|----------------------|-------------------|-----------------------------------|--------------|-----------|-----------------|---------------------------------------------------------------|-----------------|--------|-------|------------------|-------------------|-------|-----------------|
|                           |           |                      |                   | (Electrical)                      | (Mechanical) |           | (hrs/yr)        | NO <sub>x</sub>                                               | NO <sub>x</sub> | CO     | PM    | PM <sub>10</sub> | PM <sub>2.5</sub> | VOC   | SO <sub>x</sub> |
| ENGINE 0013 - 0056 (50%)  | Trench    | CAT 3520 DSL 2600 kW | 40                | 78,000                            | 85,800       | NG        | 8,760           | 12.93                                                         | 0.07            | 4.62   | 5.43  | 5.43             | 5.43              | 13.28 | 0.49            |
| ENGINE 0013 - 0056 (75%)  | Trench    | CAT 3520 DSL 2600 kW |                   | 104,000                           | 114,400      | NG        | 8,760           | 25.80                                                         | 2.46            | 4.39   | 0.66  | 0.66             | 0.66              | 3.87  | 0.63            |
| ENGINE 0013 - 0056 (100%) | Trench    | CAT 3520 DSL 2600 kW |                   | 52,000                            | 57,200       | NG        | 8,760           | 10.28                                                         | 0.00            | 5.30   | 11.97 | 11.97            | 11.97             | 8.69  | 0.35            |
| ENGINE 0007 - 0012        | Hardshell | CAT C18, 589 bkW     | 6                 | 2,730                             | 3,534        | Diesel    | 8760            | 0.89                                                          | 0.45            | 4.57   | 0.08  | 0.08             | 0.08              | 1.71  | 9.45E-05        |
|                           |           | CAT C18, 589 bkW     | 6                 | 2,730                             | 3,534        | Diesel    | 8760            | 0.89                                                          | 0.45            | 4.57   | 0.08  | 0.08             | 0.08              | 1.71  | 9.45E-05        |
| ENGINE 0002 - 0006        | Taylor    | CAT C175 3000 kW     | 5                 | 3,000                             | 3,300        | Diesel    | 500             | 127.32                                                        | 127.32          | 1.46   | 1.46  | 1.46             | 1.46              | 6.91  | 0.27            |
| ENGINE 0001               | WW1       | C2000.2RE            | 1                 | 198                               | 213          | Diesel    | 8760            | 0.19                                                          | 0.19            | 1.64   | 0.01  | 0.01             | 0.01              | 0.09  | 0.59            |
| Total Hourly Emissions    |           |                      |                   |                                   |              |           |                 | 155.09                                                        | 130.85          | 143.39 | 13.59 | 13.59            | 13.59             | 23.70 | 1.48            |

1. A 10% increase in rating in the 2.6MW engines has been accounted for the change in electrical to mechanical rating.

2. Engine ratings per Request for Information dated 02/16/2021

3. Average brake specific fuel consumption of

7,000

1.34

1020

Btu/lp-hr, Per AP-42 Chapter 3.3, is used to convert from lb/MMBtu to lb/lp-hr for diesel generators

lb/lp-hr, per AP-42 Chapter 1.4 for natural gas engines

4. GHG emissions were converted to CO<sub>2</sub>e emissions based on the GWP for each GHG.

GWP of CO<sub>2</sub> 1

GWP of CH<sub>4</sub> 25

GWP of N<sub>2</sub>O 298

5. Safety factor of 30% has been added to the emission factors for 2.6MW NG engines.

30.00%

Increase

Table A-16f. Number of Generators

|                                      |       |                   |
|--------------------------------------|-------|-------------------|
| Power Supplied by CAT 3520 DSL       | 2,500 | kW                |
| Parasitic <sup>1</sup>               | 2,600 | kW                |
| Number of Engines                    | 40    | Generators        |
| Power Supplied by CAT XQ1140 - 910kW | 910   | kW                |
| Engines per CAT XQ1140 Generator     | 2     | Engines/Generator |
| Engine mechanical rating             | 589   | bkW               |
| CAT 3520 DSL 2600 kW - Hardshell     | 6     | Generators        |

1. Actual output is 2,500 kW due to 100kW of parasitic load, per email from Sebastian Gutierrez on 5/1/2024. Engine certified to perform optimally up to 5,500 ft of elevation based on email from Sebastian Gutierrez on 5/1/2024. Parasitic load of 2,500 kW is used to determine the number of engine needed. The total output of 2,600 kW is used for emission calculations

**Mine Development  
Wind Erosion**

**Table A-17a. Wind Erosion Emission Factors**

| Type of Material    | Particulate Matter Emission Factors <sup>1,2,3,4</sup> |                  |                   |             | Particulate Matter Emission Factor Inputs <sup>5,6</sup> |                              |                |                | Notes                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------|--------------------------------------------------------|------------------|-------------------|-------------|----------------------------------------------------------|------------------------------|----------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     | PM/TSP                                                 | PM <sub>10</sub> | PM <sub>2.5</sub> | Units       | Max 5-minute wind speed (m/s)                            | u <sub>10</sub> <sup>+</sup> | u <sup>*</sup> | u <sub>t</sub> |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Aggregate/shotcrete | 0.02                                                   | 0.01             | 0.002             | ton/acre-yr | 16.71                                                    | 27.9                         | 1.48           | 1.33           | u <sup>*</sup> = (0.053)(u <sub>10</sub> <sup>+</sup> ), where u <sub>10</sub> <sup>+</sup> = fastest mile for the time period between disturbances (see below for information on fastest mile calculation).<br>The fastest mile was calculated using the linear regression proposed by ADEQ. The maximum 5-minute wind speed is the max 5-minute wind speed collected at the onsite meteorological station. |
| TSF                 | 0.33                                                   | 0.17             | 0.025             | ton/acre-yr | 16.71                                                    | 27.9                         | 1.48           | 0.54           |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Rock/Ore/ROM        | 0.10                                                   | 0.05             | 0.008             | ton/acre-yr | 16.71                                                    | 27.9                         | 1.48           | 1.02           |                                                                                                                                                                                                                                                                                                                                                                                                              |

1. u<sub>10</sub><sup>+</sup> is calculated as 1.662 \* the max 5-minute wind speed + 0.0913. The 1.662 and 0.0913 value was determined from the linear regression analysis.

2. Per AP-42 13.2.5 Equation 3:

$$P = 58 (u^* - u_t^*)^2 + 25 (u^* - u_t^*)$$

$$P = 0 \text{ for } u^* \leq u_t^*$$

where

u<sub>t</sub> = threshold velocity

3. Threshold friction velocity per AP-42 Table 13.2.5-2:

|      |     |                                                                                          |
|------|-----|------------------------------------------------------------------------------------------|
| 1.02 | m/s | Overburden can be used to represent Rock/Ore/ROM                                         |
| 1.33 | m/s | Roadbed material can be used to represent TSFs/aggregate/shotcrete                       |
| 0.54 | m/s | Conservatively assumed that fine coal dust on concrete pad can be used to represent TSFs |

4. Particle size multiplier for emission factors per AP-42 13.2.5:

|                   |       |
|-------------------|-------|
| PM                | 1     |
| PM <sub>10</sub>  | 0.5   |
| PM <sub>2.5</sub> | 0.075 |

5. k = particle size multiplier, u<sup>\*</sup> = friction velocity, u<sub>t</sub> = threshold friction velocity

6. The fastest mile was calculated using linear regression method historically accepted by ADEQ for other facilities. The maximum 5-minute wind speed is the max 5-minute wind speed collected at the onsite meteorological station.

**Mine Development  
Wind Erosion**

**Table A-17b. Wind Erosion Emissions**

| Emission Point Number | Location                   | Annual Potential Emissions <sup>1,2,3</sup><br>(tpy) |                  |                   |                | Daily Potential Emissions <sup>1,2,3</sup><br>(lb/day) |                  |                   |                | Hourly Potential Emissions <sup>1,2,3</sup><br>(lb/hr) |                  |                   |                |
|-----------------------|----------------------------|------------------------------------------------------|------------------|-------------------|----------------|--------------------------------------------------------|------------------|-------------------|----------------|--------------------------------------------------------|------------------|-------------------|----------------|
|                       |                            | PM                                                   | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| TSF_1                 | Tailing Storage Facility   | 16.45                                                | 8.23             | 1.23              | 0.07           | 90.15                                                  | 45.08            | 6.76              | 3.84E-01       | 3.76                                                   | 1.88             | 0.28              | 0.02           |
| WRS                   | West Rock Stockpile        | 0.67                                                 | 0.34             | 0.05              | 0.0024         | 3.67                                                   | 1.84             | 0.28              | 1.30E-02       | 0.15                                                   | 0.08             | 0.01              | 0.001          |
| EOS                   | East Ore Stockpile         | 0.74                                                 | 0.37             | 0.06              | 0.04           | 4.07                                                   | 2.03             | 0.30              | 1.92E-01       | 0.17                                                   | 0.08             | 0.01              | 0.008          |
| TAGG                  | Taylor Agg Stockpile       | 0.0005                                               | 0.0002           | 0.0000            | --             | 0.00                                                   | 0.00             | 0.00              | --             | 0.00                                                   | 0.00             | 0.00              | --             |
| TSHOT                 | Taylor Shotcrete Stockpile | 0.0008                                               | 0.0004           | 0.0001            | --             | 0.00                                                   | 0.00             | 0.00              | --             | 0.00                                                   | 0.00             | 0.00              | --             |
| HRS                   | Hardshell Rock Stockpile   | 3.95                                                 | 1.98             | 0.30              | 2.24E-02       | 21.66                                                  | 10.83            | 1.62              | 0.12           | 0.90                                                   | 0.45             | 0.07              | 0.005          |
| ORE                   | Clark Ore Stockpile        | 0.12                                                 | 0.06             | 0.01              | 2.12E-03       | 0.66                                                   | 0.33             | 0.05              | 1.16E-02       | 0.03                                                   | 0.01             | 0.00              | 0.0005         |
| ROM                   | Clark ROM Stockpile        | 0.0357                                               | 0.0179           | 0.0027            | 6.29E-04       | 0.20                                                   | 0.10             | 0.01              | 3.45E-03       | 0.01                                                   | 0.00             | 0.00              | 0.0001         |
| AGG                   | Clark Agg Stockpile        | 0.0005                                               | 0.0002           | 0.0000            | --             | 0.00                                                   | 0.00             | 0.00              | --             | 0.00                                                   | 0.00             | 0.00              | --             |
| SHOT                  | Clark Shotcrete Stockpile  | 0.0008                                               | 0.0004           | 0.0001            | --             | 0.00                                                   | 0.00             | 0.00              | --             | 0.00                                                   | 0.00             | 0.00              | --             |
| CHUTE                 | Waste Chute Stockpile      | 2.59E-03                                             | 1.30E-03         | 1.94E-04          | 1.49E-05       | 1.42E-02                                               | 7.10E-03         | 1.07E-03          | 8.14E-05       | 5.92E-04                                               | 2.96E-04         | 4.44E-05          | 3.39E-06       |
| <b>Total</b>          |                            | <b>21.98</b>                                         | <b>10.99</b>     | <b>1.65</b>       | <b>0.13</b>    | <b>120.43</b>                                          | <b>60.22</b>     | <b>9.03</b>       | <b>0.73</b>    | <b>5.02</b>                                            | <b>2.51</b>      | <b>0.38</b>       | <b>0.03</b>    |

1. Emissions based on maximum hours

2. Conversion from grams to pounds

3. Percent of lead in PM emissions and total exposed surface are in table below

|                            |            |            |                 |                           |            |                                 |                 |
|----------------------------|------------|------------|-----------------|---------------------------|------------|---------------------------------|-----------------|
| 8760 hrs<br>453.6 g/lb     |            |            |                 |                           |            |                                 |                 |
| Taylor Shotcrete Stockpile | Lead       | 0.00       | %               | Tailings Storage Facility | Lead       | 0.43%                           | %               |
|                            | Material   | Shotcrete  |                 |                           | Material   | Tailings                        |                 |
|                            | Area       | 1,600      | ft <sup>2</sup> |                           | Area       | 2,161,944                       | ft <sup>2</sup> |
|                            |            | 0.04       | acre            |                           |            | 50                              | acre            |
| Taylor Agg Stockpile       | Lead       | 0.00       | %               | East Ore Stockpile        | Lead Grade | 4.73%                           |                 |
|                            | Material   | Aggregate  |                 |                           | Material   | Stope Ore & Developmental Ore   |                 |
|                            | Area       | 900        | ft <sup>2</sup> |                           | Area       | 308,126                         | ft <sup>2</sup> |
|                            |            | 0.02       | acre            |                           |            | 7                               | acre            |
| Hardshell Rock Stockpile   | Lead Grade | 0.57       | %               | West Rock Stockpile       | Lead       | 0.35                            | %               |
|                            | Material   | Waste Rock |                 |                           | Material   | Waste Rock                      |                 |
|                            | Area       | 1,641,033  | ft <sup>2</sup> |                           | Area       | 278,225                         | ft <sup>2</sup> |
|                            |            | 37.7       | acre            |                           |            | 6                               | acre            |
| Clark Shotcrete Stockpile  | Lead       | 0.00       | %               | Clark Ore Stockpile       | Lead       | 1.76                            | %               |
|                            | Material   | Shotcrete  |                 |                           | Material   | Clark Stope & Developmental Ore |                 |
|                            | Area       | 1,600      | ft <sup>2</sup> |                           | Area       | 50,001                          | ft <sup>2</sup> |
|                            |            | 0.04       | acre            |                           |            | 1.15                            | acre            |
| Clark Agg Stockpile        | Lead       | 0.00       | %               | Clark ROM Stockpile       | Lead       | 1.76                            | %               |
|                            | Material   | Aggregate  |                 |                           | Material   | Clark Stope & Developmental Ore |                 |
|                            | Area       | 900        | ft <sup>2</sup> |                           | Area       | 14,842                          | ft <sup>2</sup> |
|                            |            | 0.02       | acre            |                           |            | 0.34                            | acre            |
|                            |            |            |                 | Waste Chute Stockpile     | Lead Grade | 0.57%                           |                 |
|                            |            |            |                 |                           | Material   | Waste Chute Material            |                 |
|                            |            |            |                 |                           | Area       | 1,076                           | ft <sup>2</sup> |
|                            |            | 0.02       | acre            |                           |            | 0.02                            | acre            |

**Mine Development  
WTP2 CT**

**Table A-18a. WTP2 Cooling Tower Parameters**

| <b>Emission Point Number</b> | <b>Flowrate <sup>1</sup><br/>(gal/min)</b> | <b>Drift <sup>2</sup><br/>(%)</b> | <b>TDS <sup>3</sup><br/>(ppm)</b> |
|------------------------------|--------------------------------------------|-----------------------------------|-----------------------------------|
| WTP2CT                       | 4500                                       | 0.0005                            | 455                               |

1. Flowrate per July 18th, 2022 email from Sarah Richman
2. Drift % per July 18th, 2022 email from Sarah Richman
3. Influent TDS (455 ppm) concentration per July 18th, 2022 email from Sarah Richman

Drift loss

|         |
|---------|
| 0.0005% |
|---------|

|                 |
|-----------------|
| High Efficiency |
|-----------------|

Circulating water flow rate

|       |     |
|-------|-----|
| 4,500 | gpm |
|-------|-----|

Total dissolved solids

|     |     |
|-----|-----|
| 455 | ppm |
|-----|-----|

Density of TDS constituents

2.5 g/cc

*Average density of common salts (CaCO<sub>3</sub>, CaSO<sub>4</sub>, CaCl<sub>2</sub>, NaCl, Na<sub>2</sub>SO<sub>4</sub>, Na<sub>2</sub>CO<sub>3</sub>)*

Volume of a sphere

$$V = \frac{4}{3} \pi r^3$$

Annual drift

11 lb H<sub>2</sub>O/hr

**Mine Development  
WTP2 CT**

**Table A-18b. Water Drop Size Distribution for Low Efficiency Drift Eliminators\***

*Based on a drift rate of 0.001%*

| Droplet          |        | H <sub>2</sub> O Droplet |             | Solids       |                  | Emissions     |                             |                              |
|------------------|--------|--------------------------|-------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass | % mass<br>smaller        | Mass<br>(g) | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 22               | 0.43   | 0.43                     | 5.6E-09     | 1.0E-12      | 1.2              |               |                             |                              |
| 29               | 1.49   | 1.92                     | 1.3E-08     | 2.3E-12      | 1.6              |               |                             |                              |
| 44               | 3.76   | 5.68                     | 4.5E-08     | 8.1E-12      | 2.5              |               |                             |                              |
| 58               | 2.09   | 7.77                     | 1.0E-07     | 1.9E-11      | 3.3              |               |                             | 7.8%                         |
| 65               | 1.86   | 9.63                     | 1.4E-07     | 2.6E-11      | 3.7              |               |                             |                              |
| 87               | 1.56   | 11.19                    | 3.4E-07     | 6.3E-11      | 4.9              |               |                             |                              |
| 108              | 1.43   | 12.62                    | 6.6E-07     | 1.2E-10      | 6.1              |               |                             |                              |
| 120              | 1.26   | 13.88                    | 9.0E-07     | 1.6E-10      | 6.8              |               |                             |                              |
| 132              | 1.09   | 14.97                    | 1.2E-06     | 2.2E-10      | 7.5              |               |                             |                              |
| 144              | 1.32   | 16.29                    | 1.6E-06     | 2.8E-10      | 8.2              |               |                             |                              |
| 174              | 5.81   | 22.1                     | 2.8E-06     | 5.0E-10      | 9.9              |               |                             |                              |
| 300              | 5.04   | 27.14                    | 1.4E-05     | 2.6E-09      | 17.0             |               | 27.1%                       |                              |
| 450**            | 4.17   | 31.31                    | 4.8E-05     | 8.7E-09      | 25.5             | 31.3%         |                             |                              |
| 600              | 4.01   | 35.32                    | 1.1E-04     | 2.1E-08      | 34.0             |               |                             |                              |
| 750              | 4.00   | 39.32                    | 2.2E-04     | 4.0E-08      | 42.5             |               |                             |                              |
| 900              | 4.03   | 43.35                    | 3.8E-04     | 6.9E-08      | 51.0             |               |                             |                              |
| 1,050            | 4.57   | 47.92                    | 6.1E-04     | 1.1E-07      | 59.5             |               |                             |                              |
| 1,200            | 5.46   | 53.38                    | 9.0E-04     | 1.6E-07      | 68.0             |               |                             |                              |
| 1,350            | 6.80   | 60.18                    | 1.3E-03     | 2.3E-07      | 76.5             |               |                             |                              |
| 2,250            | 17.99  | 78.17                    | 6.0E-03     | 1.1E-06      | 127.5            |               |                             |                              |
| 2,400            | 21.83  | 100                      | 7.2E-03     | 1.3E-06      | 136.0            |               |                             |                              |

\* EPA. 1979. *Effects of Pathogenic and Toxic Material Transport Via Cooling Device Drift - Vol. 1*  
Technical Report. EPA-600/7-79-251a. November 1979.

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).



**Mine Development  
WTP2 CT**

**Table A-18c. Water Drop Size Distribution for High Efficiency Drift Eliminators\***

*Based on a drift rate of 0.0003%*

| Droplet          |                   | H <sub>2</sub> O Droplet | Solids       |                  | Emissions     |                             |                              |
|------------------|-------------------|--------------------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass<br>smaller | Mass<br>(g)              | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 10               | 0                 | 5.2E-10                  | 9.5E-14      | 0.6              |               |                             |                              |
| 20               | 0.196             | 4.2E-09                  | 7.6E-13      | 1.1              |               |                             |                              |
| 30               | 0.226             | 1.4E-08                  | 2.6E-12      | 1.7              |               |                             |                              |
| 40               | 0.514             | 3.4E-08                  | 6.1E-12      | 2.3              |               |                             |                              |
| 50               | 1.816             | 6.5E-08                  | 1.2E-11      | 2.8              |               |                             | 1.8%                         |
| 60               | 5.702             | 1.1E-07                  | 2.1E-11      | 3.4              |               |                             |                              |
| 70               | 21.348            | 1.8E-07                  | 3.3E-11      | 4.0              |               |                             |                              |
| 90               | 49.812            | 3.8E-07                  | 6.9E-11      | 5.1              |               |                             |                              |
| 110              | 70.509            | 7.0E-07                  | 1.3E-10      | 6.2              |               |                             |                              |
| 130              | 82.023            | 1.2E-06                  | 2.1E-10      | 7.4              |               |                             |                              |
| 150              | 88.012            | 1.8E-06                  | 3.2E-10      | 8.5              |               |                             |                              |
| 180              | 91.032            | 3.1E-06                  | 5.6E-10      | 10.2             |               | 91.0%                       |                              |
| 210              | 92.468            | 4.8E-06                  | 8.8E-10      | 11.9             |               |                             |                              |
| 240              | 94.091            | 7.2E-06                  | 1.3E-09      | 13.6             |               |                             |                              |
| 270              | 94.689            | 1.0E-05                  | 1.9E-09      | 15.3             |               |                             |                              |
| 300              | 96.288            | 1.4E-05                  | 2.6E-09      | 17.0             |               |                             |                              |
| 350              | 97.011            | 2.2E-05                  | 4.1E-09      | 19.8             |               |                             |                              |
| 400              | 98.34             | 3.4E-05                  | 6.1E-09      | 22.7             |               |                             |                              |
| 450**            | 99.071            | 4.8E-05                  | 8.7E-09      | 25.5             | 99.1%         |                             |                              |
| 500              | 99.071            | 6.5E-05                  | 1.2E-08      | 28.3             |               |                             |                              |
| 600              | 100               | 1.1E-04                  | 2.1E-08      | 34.0             |               |                             |                              |

\* Reisman, J. and G. Frisbie. 2002. "Calculating Realistic PM10 Emissions from Cooling Towers."

*Environmental Progress & Sustainable Energy. American Institute of Chemical Engineers. Volume 21, Issue 2, pp. 127-130. July 2002.*

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).

**Mine Development  
WTP2 CT**

**Table A-18d. WTP2 Cooling Towers - Emissions**

| Emission Point Number | Annual Emissions (tpy) |                  |                   | Daily Emissions (lb/day) |                  |                   | Hourly Emissions (lb/hr) |                  |                   |
|-----------------------|------------------------|------------------|-------------------|--------------------------|------------------|-------------------|--------------------------|------------------|-------------------|
|                       | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> |
| WTP2CT                | 2.22E-02               | 2.04E-02         | 4.07E-04          | 1.22E-01                 | 1.12E-01         | 2.23E-03          | 5.07E-03                 | 4.66E-03         | 9.29E-05          |
| <b>TOTAL</b>          | <b>0.0222</b>          | <b>0.0204</b>    | <b>4.07E-04</b>   | <b>0.122</b>             | <b>0.112</b>     | <b>2.23E-03</b>   | <b>0.0051</b>            | <b>4.66E-03</b>  | <b>9.29E-05</b>   |

**Mine Development  
Surface Refrigeration Plant**

**Table A-19a. Surface Refrigeration Plant Parameters**

| Emission Point Number | Flowrate <sup>1</sup><br>(gal/min) | Drift <sup>2</sup><br>(%) | TDS <sup>2,3</sup><br>(ppm) |
|-----------------------|------------------------------------|---------------------------|-----------------------------|
| PRODREF               | 7,529                              | 0.001                     | 1000                        |
| BBREF                 | 11,095                             | 0.001                     | 1000                        |
| MILLREF               | 512                                | 0.001                     | 1000                        |

1. Provided by Ross Wilson (BBE Consulting) on 07/06/2023 via email.

2. Per parameters provided by South32 on 09/07/2021.

3. MILLREF TDS Provided by Matt Novak on 04/26/2024 via RFI

**PRODREF:**

|                             |                               |                                                                                                                                                                        |
|-----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drift loss                  | 0.0010%                       | Low Efficiency                                                                                                                                                         |
| Circulating water flow rate | 7,529 gpm                     |                                                                                                                                                                        |
| Total dissolved solids      | 1,000 ppm                     |                                                                                                                                                                        |
| Density of TDS constituents | 2.5 g/cc                      | Average density of common salts (CaCO <sub>3</sub> , CaSO <sub>4</sub> , CaCl <sub>2</sub> , NaCl, Na <sub>2</sub> SO <sub>4</sub> , Na <sub>2</sub> CO <sub>3</sub> ) |
| Volume of a sphere          | $V = 4/3 \cdot \pi \cdot r^3$ |                                                                                                                                                                        |
| Annual drift                | 38 lb H <sub>2</sub> O/hr     |                                                                                                                                                                        |

**BBREF:**

|                             |                               |                                                                                                                                                                        |
|-----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drift loss                  | 0.0010%                       | Low Efficiency                                                                                                                                                         |
| Circulating water flow rate | 11,095 gpm                    |                                                                                                                                                                        |
| Total dissolved solids      | 1,000 ppm                     |                                                                                                                                                                        |
| Density of TDS constituents | 2.5 g/cc                      | Average density of common salts (CaCO <sub>3</sub> , CaSO <sub>4</sub> , CaCl <sub>2</sub> , NaCl, Na <sub>2</sub> SO <sub>4</sub> , Na <sub>2</sub> CO <sub>3</sub> ) |
| Volume of a sphere          | $V = 4/3 \cdot \pi \cdot r^3$ |                                                                                                                                                                        |
| Annual drift                | 55 lb H <sub>2</sub> O/hr     |                                                                                                                                                                        |

**MILLREF**

|                             |                               |                                                                                                                                                                        |
|-----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drift loss                  | 0.0010%                       | Low Efficiency                                                                                                                                                         |
| Circulating water flow rate | 512 gpm                       |                                                                                                                                                                        |
| Total dissolved solids      | 1,000 ppm                     |                                                                                                                                                                        |
| Density of TDS constituents | 2.5 g/cc                      | Average density of common salts (CaCO <sub>3</sub> , CaSO <sub>4</sub> , CaCl <sub>2</sub> , NaCl, Na <sub>2</sub> SO <sub>4</sub> , Na <sub>2</sub> CO <sub>3</sub> ) |
| Volume of a sphere          | $V = 4/3 \cdot \pi \cdot r^3$ |                                                                                                                                                                        |
| Annual drift                | 0 lb H <sub>2</sub> O/hr      |                                                                                                                                                                        |

**Mine Development  
Surface Refrigeration Plant**

**Table A-19b. Water Drop Size Distribution for Low Efficiency Drift Eliminators\***

*Based on a drift rate of 0.001%*

| Droplet          |        | H <sub>2</sub> O Droplet |             | Solids       |                  | Emissions     |                             |                              |
|------------------|--------|--------------------------|-------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass | % mass<br>smaller        | Mass<br>(g) | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 22               | 0.43   | 0.43                     | 5.6E-09     | 2.2E-12      | 1.6              |               |                             |                              |
| 29               | 1.49   | 1.92                     | 1.3E-08     | 5.1E-12      | 2.1              |               |                             |                              |
| 44               | 3.76   | 5.68                     | 4.5E-08     | 1.8E-11      | 3.2              |               |                             | 5.7%                         |
| 58               | 2.09   | 7.77                     | 1.0E-07     | 4.1E-11      | 4.3              |               |                             |                              |
| 65               | 1.86   | 9.63                     | 1.4E-07     | 5.8E-11      | 4.8              |               |                             |                              |
| 87               | 1.56   | 11.19                    | 3.4E-07     | 1.4E-10      | 6.4              |               |                             |                              |
| 108              | 1.43   | 12.62                    | 6.6E-07     | 2.6E-10      | 8.0              |               |                             |                              |
| 120              | 1.26   | 13.88                    | 9.0E-07     | 3.6E-10      | 8.8              |               |                             |                              |
| 132              | 1.09   | 14.97                    | 1.2E-06     | 4.8E-10      | 9.7              |               |                             |                              |
| 144              | 1.32   | 16.29                    | 1.6E-06     | 6.3E-10      | 10.6             |               | 16.3%                       |                              |
| 174              | 5.81   | 22.1                     | 2.8E-06     | 1.1E-09      | 12.8             |               |                             |                              |
| 300              | 5.04   | 27.14                    | 1.4E-05     | 5.7E-09      | 22.1             |               |                             |                              |
| 450**            | 4.17   | 31.31                    | 4.8E-05     | 1.9E-08      | 33.2             | 31.3%         |                             |                              |
| 600              | 4.01   | 35.32                    | 1.1E-04     | 4.5E-08      | 44.2             |               |                             |                              |
| 750              | 4.00   | 39.32                    | 2.2E-04     | 8.8E-08      | 55.3             |               |                             |                              |
| 900              | 4.03   | 43.35                    | 3.8E-04     | 1.5E-07      | 66.3             |               |                             |                              |
| 1,050            | 4.57   | 47.92                    | 6.1E-04     | 2.4E-07      | 77.4             |               |                             |                              |
| 1,200            | 5.46   | 53.38                    | 9.0E-04     | 3.6E-07      | 88.4             |               |                             |                              |
| 1,350            | 6.80   | 60.18                    | 1.3E-03     | 5.2E-07      | 99.5             |               |                             |                              |
| 2,250            | 17.99  | 78.17                    | 6.0E-03     | 2.4E-06      | 165.8            |               |                             |                              |
| 2,400            | 21.83  | 100                      | 7.2E-03     | 2.9E-06      | 176.8            |               |                             |                              |

\* EPA. 1979. *Effects of Pathogenic and Toxic Material Transport Via Cooling Device Drift - Vol. 1*  
Technical Report. EPA-600/7-79-251a. November 1979.

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).

**Mine Development  
Surface Refrigeration Plant**

**Table A-19c. Water Drop Size Distribution for High Efficiency Drift Eliminators\***

*Based on a drift rate of 0.0003%*

| Droplet          |                   | H <sub>2</sub> O Droplet | Solids       |                  | Emissions     |                             |                              |
|------------------|-------------------|--------------------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass<br>smaller | Mass<br>(g)              | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 10               | 0                 | 5.2E-10                  | 2.1E-13      | 0.7              |               |                             |                              |
| 20               | 0.196             | 4.2E-09                  | 1.7E-12      | 1.5              |               |                             |                              |
| 30               | 0.226             | 1.4E-08                  | 5.7E-12      | 2.2              |               |                             |                              |
| 40               | 0.514             | 3.4E-08                  | 1.3E-11      | 2.9              |               |                             | 0.5%                         |
| 50               | 1.816             | 6.5E-08                  | 2.6E-11      | 3.7              |               |                             |                              |
| 60               | 5.702             | 1.1E-07                  | 4.5E-11      | 4.4              |               |                             |                              |
| 70               | 21.348            | 1.8E-07                  | 7.2E-11      | 5.2              |               |                             |                              |
| 90               | 49.812            | 3.8E-07                  | 1.5E-10      | 6.6              |               |                             |                              |
| 110              | 70.509            | 7.0E-07                  | 2.8E-10      | 8.1              |               |                             |                              |
| 130              | 82.023            | 1.2E-06                  | 4.6E-10      | 9.6              |               |                             |                              |
| 150              | 88.012            | 1.8E-06                  | 7.1E-10      | 11.1             |               | 88.0%                       |                              |
| 180              | 91.032            | 3.1E-06                  | 1.2E-09      | 13.3             |               |                             |                              |
| 210              | 92.468            | 4.8E-06                  | 1.9E-09      | 15.5             |               |                             |                              |
| 240              | 94.091            | 7.2E-06                  | 2.9E-09      | 17.7             |               |                             |                              |
| 270              | 94.689            | 1.0E-05                  | 4.1E-09      | 19.9             |               |                             |                              |
| 300              | 96.288            | 1.4E-05                  | 5.7E-09      | 22.1             |               |                             |                              |
| 350              | 97.011            | 2.2E-05                  | 9.0E-09      | 25.8             |               |                             |                              |
| 400              | 98.34             | 3.4E-05                  | 1.3E-08      | 29.5             |               |                             |                              |
| 450**            | 99.071            | 4.8E-05                  | 1.9E-08      | 33.2             | 99.1%         |                             |                              |
| 500              | 99.071            | 6.5E-05                  | 2.6E-08      | 36.8             |               |                             |                              |
| 600              | 100               | 1.1E-04                  | 4.5E-08      | 44.2             |               |                             |                              |

\* Reisman, J. and G. Frisbie. 2002. "Calculating Realistic PM<sub>10</sub> Emissions from Cooling Towers." *Environmental Progress & Sustainable Energy. American Institute of Chemical Engineers. Volume 21, Issue 2, pp. 127-130. July 2002.*

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).

**Mine Development  
Surface Refrigeration Plant**

**EXAMPLE CALCULATIONS:**      *Low Efficiency*

**Annual drift:**

$$\frac{7,529 \text{ gal water}}{1 \text{ min}} \times \frac{8.33 \text{ lb}}{1 \text{ gal water}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times 0.001\% \text{ (drift)} = \underline{\underline{38 \text{ lb water drift}}}$$

**hr**

**Total Particulate Emissions**

$$\frac{38 \text{ lb water}}{\text{hr}} \times \frac{1,000 \text{ lb PM}}{1\text{E}+6 \text{ lb water}} \times 31.3\% \text{ PM} = \frac{0.012 \text{ lb PM}}{\text{hr}} = \underline{\underline{0.052 \text{ ton PM}}}$$

**yr**

**PM<sub>10</sub> Emissions**

$$\frac{38 \text{ lb water}}{\text{hr}} \times \frac{1,000 \text{ lb PM}}{1\text{E}+6 \text{ lb water}} \times 16.3\% \text{ PM}_{10} = \frac{0.006 \text{ lb PM}_{10}}{\text{hr}} = \underline{\underline{0.027 \text{ ton PM}_{10}}}$$

**yr**

**PM<sub>2.5</sub> Emissions**

$$\frac{38 \text{ lb water}}{\text{hr}} \times \frac{1,000 \text{ lb PM}}{1\text{E}+6 \text{ lb water}} \times 5.7\% \text{ PM}_{2.5} = \frac{0.002 \text{ lb PM}_{2.5}}{\text{hr}} = \underline{\underline{0.009 \text{ ton PM}_{2.5}}}$$

**yr**

**Mine Development  
Surface Refrigeration Plant**

**Water Drop Size Distribution for Low Efficiency Drift Eliminators\***

*Based on a drift rate of 0.001%*

| Droplet          |        | H <sub>2</sub> O Droplet |             | Solids       |                  | Emissions     |                             |                              |
|------------------|--------|--------------------------|-------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass | % mass<br>smaller        | Mass<br>(g) | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 22               | 0.43   | 0.43                     | 5.6E-09     | 2.2E-12      | 1.6              |               |                             |                              |
| 29               | 1.49   | 1384.139                 | 1.3E-08     | 5.1E-12      | 2.1              |               |                             |                              |
| 44               | 3.76   | 5.68                     | 4.5E-08     | 1.8E-11      | 3.2              |               |                             | 5.7%                         |
| 58               | 2.09   | 7.77                     | 1.0E-07     | 4.1E-11      | 4.3              |               |                             |                              |
| 65               | 1.86   | 9.63                     | 1.4E-07     | 5.8E-11      | 4.8              |               |                             |                              |
| 87               | 1.56   | 11.19                    | 3.4E-07     | 1.4E-10      | 6.4              |               |                             |                              |
| 108              | 1.43   | 12.62                    | 6.6E-07     | 2.6E-10      | 8.0              |               |                             |                              |
| 120              | 1.26   | 13.88                    | 9.0E-07     | 3.6E-10      | 8.8              |               |                             |                              |
| 132              | 1.09   | 14.97                    | 1.2E-06     | 4.8E-10      | 9.7              |               |                             |                              |
| 144              | 1.32   | 16.29                    | 1.6E-06     | 6.3E-10      | 10.6             |               | 16.3%                       |                              |
| 174              | 5.81   | 22.1                     | 2.8E-06     | 1.1E-09      | 12.8             |               |                             |                              |
| 300              | 5.04   | 27.14                    | 1.4E-05     | 5.7E-09      | 22.1             |               |                             |                              |
| 450**            | 4.17   | 31.31                    | 4.8E-05     | 1.9E-08      | 33.2             | 31.3%         |                             |                              |
| 600              | 4.01   | 35.32                    | 1.1E-04     | 4.5E-08      | 44.2             |               |                             |                              |
| 750              | 4.00   | 39.32                    | 2.2E-04     | 8.8E-08      | 55.3             |               |                             |                              |
| 900              | 4.03   | 43.35                    | 3.8E-04     | 1.5E-07      | 66.3             |               |                             |                              |
| 1,050            | 4.57   | 47.92                    | 6.1E-04     | 2.4E-07      | 77.4             |               |                             |                              |
| 1,200            | 5.46   | 53.38                    | 9.0E-04     | 3.6E-07      | 88.4             |               |                             |                              |
| 1,350            | 6.80   | 60.18                    | 1.3E-03     | 5.2E-07      | 99.5             |               |                             |                              |
| 2,250            | 17.99  | 78.17                    | 6.0E-03     | 2.4E-06      | 165.8            |               |                             |                              |
| 2,400            | 21.83  | 100                      | 7.2E-03     | 2.9E-06      | 176.8            |               |                             |                              |

\* EPA. 1979. *Effects of Pathogenic and Toxic Material Transport Via Cooling Device Drift - Vol. 1*

*Technical Report. EPA-600/7-79-251a. November 1979.*

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).

**Mine Development  
Surface Refrigeration Plant**

**Water Drop Size Distribution for High Efficiency Drift Eliminators\***

*Based on a drift rate of 0.0003%*

| Droplet          |                   | H <sub>2</sub> O Droplet | Solids       |                  | Emissions     |                             |                              |
|------------------|-------------------|--------------------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass<br>smaller | Mass<br>(g)              | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 10               | 0                 | 5.2E-10                  | 2.1E-13      | 0.7              |               |                             |                              |
| 20               | 0.196             | 4.2E-09                  | 1.7E-12      | 1.5              |               |                             |                              |
| 30               | 0.226             | 1.4E-08                  | 5.7E-12      | 2.2              |               |                             |                              |
| 40               | 0.514             | 3.4E-08                  | 1.3E-11      | 2.9              |               |                             | 0.5%                         |
| 50               | 1.816             | 6.5E-08                  | 2.6E-11      | 3.7              |               |                             |                              |
| 60               | 5.702             | 1.1E-07                  | 4.5E-11      | 4.4              |               |                             |                              |
| 70               | 21.348            | 1.8E-07                  | 7.2E-11      | 5.2              |               |                             |                              |
| 90               | 49.812            | 3.8E-07                  | 1.5E-10      | 6.6              |               |                             |                              |
| 110              | 70.509            | 7.0E-07                  | 2.8E-10      | 8.1              |               |                             |                              |
| 130              | 82.023            | 1.2E-06                  | 4.6E-10      | 9.6              |               |                             |                              |
| 150              | 88.012            | 1.8E-06                  | 7.1E-10      | 11.1             |               | 88.0%                       |                              |
| 180              | 91.032            | 3.1E-06                  | 1.2E-09      | 13.3             |               |                             |                              |
| 210              | 92.468            | 4.8E-06                  | 1.9E-09      | 15.5             |               |                             |                              |
| 240              | 94.091            | 7.2E-06                  | 2.9E-09      | 17.7             |               |                             |                              |
| 270              | 94.689            | 1.0E-05                  | 4.1E-09      | 19.9             |               |                             |                              |
| 300              | 96.288            | 1.4E-05                  | 5.7E-09      | 22.1             |               |                             |                              |
| 350              | 97.011            | 2.2E-05                  | 9.0E-09      | 25.8             |               |                             |                              |
| 400              | 98.34             | 3.4E-05                  | 1.3E-08      | 29.5             |               |                             |                              |
| 450**            | 99.071            | 4.8E-05                  | 1.9E-08      | 33.2             | 99.1%         |                             |                              |
| 500              | 99.071            | 6.5E-05                  | 2.6E-08      | 36.8             |               |                             |                              |
| 600              | 100               | 1.1E-04                  | 4.5E-08      | 44.2             |               |                             |                              |

\* Reisman, J. and G. Frisbie. 2002. "Calculating Realistic PM10 Emissions from Cooling Towers." *Environmental Progress & Sustainable Energy. American Institute of Chemical Engineers. Volume 21, Issue 2, pp. 127-130. July 2002.*

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).



**Mine Development  
Surface Refrigeration Plant**

**EXAMPLE CALCULATIONS:**      *Low Efficiency*

**Annual drift:**

|                           |                        |                |                |   |                                |
|---------------------------|------------------------|----------------|----------------|---|--------------------------------|
| 11,095 gal water<br>1 min | 8.33 lb<br>1 gal water | 60 min<br>1 hr | 0.001% (drift) | = | <b>55 lb water drift</b><br>hr |
|---------------------------|------------------------|----------------|----------------|---|--------------------------------|

**Total Particulate Emissions**

|                   |                              |          |   |                   |   |                           |
|-------------------|------------------------------|----------|---|-------------------|---|---------------------------|
| 55 lb water<br>hr | 1,000 lb PM<br>1E+6 lb water | 31.3% PM | = | 0.017 lb PM<br>hr | = | <b>0.076 ton PM</b><br>yr |
|-------------------|------------------------------|----------|---|-------------------|---|---------------------------|

**PM<sub>10</sub> Emissions**

|                   |                              |                        |   |                                 |   |                                        |
|-------------------|------------------------------|------------------------|---|---------------------------------|---|----------------------------------------|
| 55 lb water<br>hr | 1,000 lb PM<br>1E+6 lb water | 16.3% PM <sub>10</sub> | = | 0.009 lb PM <sub>10</sub><br>hr | = | <b>0.040 ton PM<sub>10</sub></b><br>yr |
|-------------------|------------------------------|------------------------|---|---------------------------------|---|----------------------------------------|

**PM<sub>2.5</sub> Emissions**

|                   |                              |                        |   |                                  |   |                                         |
|-------------------|------------------------------|------------------------|---|----------------------------------|---|-----------------------------------------|
| 55 lb water<br>hr | 1,000 lb PM<br>1E+6 lb water | 5.7% PM <sub>2.5</sub> | = | 0.003 lb PM <sub>2.5</sub><br>hr | = | <b>0.014 ton PM<sub>2.5</sub></b><br>yr |
|-------------------|------------------------------|------------------------|---|----------------------------------|---|-----------------------------------------|

**EXAMPLE CALCULATIONS:**      *Low Efficiency*      MILLREF

**Annual drift:**

|                        |                        |                |                |   |                               |
|------------------------|------------------------|----------------|----------------|---|-------------------------------|
| 512 gal water<br>1 min | 8.33 lb<br>1 gal water | 60 min<br>1 hr | 0.001% (drift) | = | <b>3 lb water drift</b><br>hr |
|------------------------|------------------------|----------------|----------------|---|-------------------------------|

**Total Particulate Emissions**

|                  |                              |          |   |                   |   |                           |
|------------------|------------------------------|----------|---|-------------------|---|---------------------------|
| 3 lb water<br>hr | 1,000 lb PM<br>1E+6 lb water | 31.3% PM | = | 0.001 lb PM<br>hr | = | <b>0.004 ton PM</b><br>yr |
|------------------|------------------------------|----------|---|-------------------|---|---------------------------|

**PM<sub>10</sub> Emissions**

**Mine Development  
Surface Refrigeration Plant**

|            |               |                        |   |               |   |                       |
|------------|---------------|------------------------|---|---------------|---|-----------------------|
| 3 lb water | 1,000 lb PM   | 16.3% PM <sub>10</sub> | = | 0.000 lb PM10 | = | <b>0.002 ton PM10</b> |
| hr         | 1E+6 lb water |                        |   | hr            |   | <b>yr</b>             |

**PM<sub>2.5</sub> Emissions**

|            |               |                        |   |                |   |                        |
|------------|---------------|------------------------|---|----------------|---|------------------------|
| 3 lb water | 1,000 lb PM   | 5.7% PM <sub>2.5</sub> | = | 0.000 lb PM2.5 | = | <b>0.001 ton PM2.5</b> |
| hr         | 1E+6 lb water |                        |   | hr             |   | <b>yr</b>              |

**Mine Development  
Surface Refrigeration Plant**

**Table A-19d. Surface Refrigeration Plant - Emissions**

| Emission Point Number | Annual Emissions (tpy) |                  |                   | Daily Emissions (lb/day) |                  |                   | Hourly Emissions (lb/hr) |                  |                   |
|-----------------------|------------------------|------------------|-------------------|--------------------------|------------------|-------------------|--------------------------|------------------|-------------------|
|                       | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> |
| PRODREF               | 0.052                  | 0.027            | 0.009             | 2.83E-01                 | 1.47E-01         | 5.13E-02          | 1.18E-02                 | 6.13E-03         | 2.14E-03          |
| BBREF                 | 0.076                  | 0.040            | 0.014             | 4.17E-01                 | 2.17E-01         | 7.56E-02          | 1.74E-02                 | 9.03E-03         | 3.15E-03          |
| MILLREF               | 0.004                  | 0.002            | 0.001             | 1.92E-02                 | 1.00E-02         | 3.49E-03          | 8.01E-04                 | 4.17E-04         | 1.45E-04          |
| <b>TOTAL:</b>         | <b>0.13</b>            | <b>0.07</b>      | <b>0.02</b>       | <b>0.72</b>              | <b>0.37</b>      | <b>0.13</b>       | <b>0.03</b>              | <b>0.02</b>      | <b>0.01</b>       |

**Mine Development  
CBP - Taylor**

**Table A-20a. Taylor Concrete Batch Plant Emission Factors and Parameters**

| Operation            | Equipment                                  | Activity                        | Material  | Maximum Rates<br>Capacity <sup>1</sup><br>(tpy) | Emission Factors <sup>2</sup> |                                     |        |
|----------------------|--------------------------------------------|---------------------------------|-----------|-------------------------------------------------|-------------------------------|-------------------------------------|--------|
|                      |                                            |                                 |           |                                                 | PM                            | PM <sub>10</sub> /PM <sub>2.5</sub> | Units  |
| Concrete Batch Plant | Aggregate delivery to ground storage       | Unloading of Aggregate Material | Aggregate | 18,666                                          | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand delivery to ground storage            | Unloading of Sand               | Sand      | 14,292                                          | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer to hopper               | Transferring aggregate material | Aggregate | 18,666                                          | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer to hopper                    | Transferring Sand               | Sand      | 14,292                                          | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer from hopper to conveyor | Transferring aggregate material | Aggregate | 18,666                                          | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer from hopper to conveyor      | Transferring Sand               | Sand      | 14,292                                          | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer to elevated storage     | Transferring aggregate material | Aggregate | 18,666                                          | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer to elevated storage          | Transferring Sand               | Sand      | 14,292                                          | 0.0021                        | 0.00099                             | lb/ton |
|                      | Cement delivery to silo                    | Unloading of Cement             | Cement    | 4,914                                           | 0.00099                       | 0.00034                             | lb/ton |
|                      | Cement supplement delivery to silo         | Unloading of Cement Supplement  | Cement    | 731                                             | 0.0089                        | 0.0049                              | lb/ton |
|                      | Weigh hopper loading                       | Loading of Weigh hopper         | Concrete  | 40,274                                          | 0.0048                        | 0.0028                              | lb/ton |
|                      | Central mix loading                        | Loading of Mixer                | Concrete  | 40,274                                          | 0.0184                        | 0.0055                              | lb/ton |

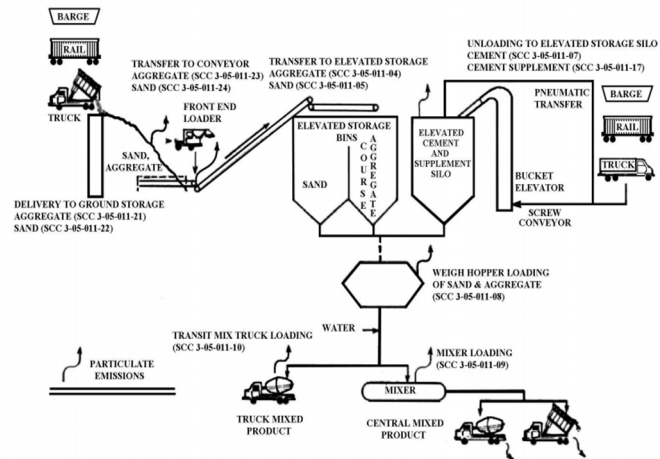
1. EPA AP-42 Section 11.12, mixing ratios used:

|                   |      |
|-------------------|------|
| Concrete          | 1    |
| Aggregate         | 0.46 |
| Sand              | 0.35 |
| Cement            | 0.12 |
| Cement Supplement | 0.02 |

2. EPA AP-42 Section 11.12, Table 11.12-2. emission factors were utilized. If a controlled emission factor was unavailable, an uncontrolled emission factor was used.

**Table A-20b. Taylor Concrete Batch Plant - Emissions**

| Operation            | Activity                        | Annual Emissions<br>(tpy) |                  |                   | Daily Emissions<br>(lb/day) |                  |                   | Hourly Emissions (lb/hr) |                  |                   |
|----------------------|---------------------------------|---------------------------|------------------|-------------------|-----------------------------|------------------|-------------------|--------------------------|------------------|-------------------|
|                      |                                 | PM                        | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                          | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> |
| Concrete Batch Plant | Unloading of Aggregate Material | 0.06                      | 0.03             | 0.03              | 0.35                        | 0.17             | 0.17              | 0.01                     | 0.01             | 0.01              |
|                      | Unloading of Sand               | 0.02                      | 0.01             | 0.01              | 0.08                        | 0.04             | 0.04              | 0.00                     | 0.00             | 0.00              |
|                      | Transferring aggregate material | 0.06                      | 0.03             | 0.03              | 0.35                        | 0.17             | 0.17              | 1.47E-02                 | 7.03E-03         | 7.03E-03          |
|                      | Transferring Sand               | 0.02                      | 0.01             | 0.01              | 0.08                        | 0.04             | 0.04              | 3.43E-03                 | 1.62E-03         | 1.62E-03          |
|                      | Transferring aggregate material | 0.06                      | 0.03             | 0.03              | 0.35                        | 0.17             | 0.17              | 0.01                     | 0.01             | 0.01              |
|                      | Transferring Sand               | 0.02                      | 0.01             | 0.01              | 0.08                        | 0.04             | 0.04              | 0.00                     | 0.00             | 0.00              |
|                      | Transferring aggregate material | 0.06                      | 0.03             | 0.03              | 0.35                        | 0.17             | 0.17              | 1.47E-02                 | 7.03E-03         | 7.03E-03          |
|                      | Transferring Sand               | 0.02                      | 0.01             | 0.01              | 0.08                        | 0.04             | 0.04              | 3.43E-03                 | 1.62E-03         | 1.62E-03          |
|                      | Unloading of Cement             | 2.43E-03                  | 8.35E-04         | 8.35E-04          | 0.01                        | 0.00             | 0.005             | 0.00                     | 0.00             | 0.00              |
|                      | Unloading of Cement Supplement  | 3.25E-03                  | 1.79E-03         | 1.79E-03          | 0.02                        | 0.01             | 0.01              | 0.00                     | 0.00             | 0.00              |
|                      | Loading of Weigh hopper         | 0.10                      | 0.06             | 0.06              | 0.53                        | 0.31             | 0.31              | 0.02                     | 0.01             | 0.01              |
|                      | Loading of Mixer                | 0.37                      | 0.11             | 0.11              | 2.03                        | 0.61             | 0.61              | 0.08                     | 0.03             | 0.03              |
| <b>Total:</b>        |                                 | <b>0.79</b>               | <b>0.32</b>      | <b>0.32</b>       | <b>4.33</b>                 | <b>1.76</b>      | <b>1.76</b>       | <b>0.18</b>              | <b>0.07</b>      | <b>0.07</b>       |



**Mine Development  
CBP - Clark**

**Table A-21a. Clark Concrete Batch Plant Emission Factors and Parameters**

| Operation            | Equipment                                  | Activity                        | Material  | Maximum Rates<br>Capacity <sup>1</sup><br>(tpy) | Emission Factors <sup>2</sup> |                                     |        |
|----------------------|--------------------------------------------|---------------------------------|-----------|-------------------------------------------------|-------------------------------|-------------------------------------|--------|
|                      |                                            |                                 |           |                                                 | PM                            | PM <sub>10</sub> /PM <sub>2.5</sub> | Units  |
| Concrete Batch Plant | Aggregate delivery to ground storage       | Unloading of Aggregate Material | Aggregate | 920                                             | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand delivery to ground storage            | Unloading of Sand               | Sand      | 704                                             | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer to hopper               | Transferring aggregate material | Aggregate | 920                                             | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer to hopper                    | Transferring Sand               | Sand      | 704                                             | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer from hopper to conveyor | Transferring aggregate material | Aggregate | 920                                             | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer from hopper to conveyor      | Transferring Sand               | Sand      | 704                                             | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer to elevated storage     | Transferring aggregate material | Aggregate | 920                                             | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer to elevated storage          | Transferring Sand               | Sand      | 704                                             | 0.0021                        | 0.00099                             | lb/ton |
|                      | Cement delivery to silo                    | Unloading of Cement             | Cement    | 242                                             | 0.00099                       | 0.00034                             | lb/ton |
|                      | Cement supplement delivery to silo         | Unloading of Cement Supplement  | Cement    | 242                                             | 0.0089                        | 0.0049                              | lb/ton |
|                      | Weigh hopper loading                       | Loading of Weigh hopper         | Concrete  | 1,984                                           | 0.0048                        | 0.0028                              | lb/ton |
|                      | Central mix loading                        | Loading of Mixer                | Concrete  | 1,984                                           | 0.0184                        | 0.0055                              | lb/ton |

1. EPA AP-42 Section 11.12, mixing ratios used:

|                   |      |
|-------------------|------|
| Concrete          | 1    |
| Aggregate         | 0.46 |
| Sand              | 0.35 |
| Cement            | 0.12 |
| Cement Supplement | 0.02 |

2. EPA AP-42 Section 11.12, Table 11.12-2. emission factors were utilized. If a controlled emission factor was unavailable, an uncontrolled emission factor was used.

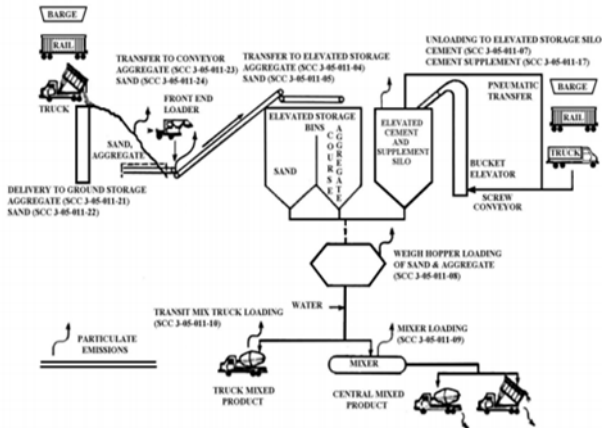
**Table A-21b. Clark Concrete Batch Plant - Emissions**

| Operation            | Activity                        | Annual Emissions<br>(tpy) |                  |                   | Daily Emissions<br>(lb/day) |                  |                   | Hourly Emissions<br>(lb/hr) |                  |                   |
|----------------------|---------------------------------|---------------------------|------------------|-------------------|-----------------------------|------------------|-------------------|-----------------------------|------------------|-------------------|
|                      |                                 | PM                        | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                          | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                          | PM <sub>10</sub> | PM <sub>2.5</sub> |
| Concrete Batch Plant | Unloading of Aggregate Material | 3.17E-03                  | 1.52E-03         | 1.52E-03          | 1.74E-02                    | 8.31E-03         | 8.31E-03          | 7.24E-04                    | 3.46E-04         | 3.46E-04          |
|                      | Unloading of Sand               | 7.39E-04                  | 3.49E-04         | 3.49E-04          | 4.05E-03                    | 1.91E-03         | 1.91E-03          | 1.69E-04                    | 7.96E-05         | 7.96E-05          |
|                      | Transferring aggregate material | 3.17E-03                  | 1.52E-03         | 1.52E-03          | 1.74E-02                    | 8.31E-03         | 8.31E-03          | 7.24E-04                    | 3.46E-04         | 3.46E-04          |
|                      | Transferring Sand               | 7.39E-04                  | 3.49E-04         | 3.49E-04          | 4.05E-03                    | 1.91E-03         | 1.91E-03          | 1.69E-04                    | 7.96E-05         | 7.96E-05          |
|                      | Transferring aggregate material | 3.17E-03                  | 1.52E-03         | 1.52E-03          | 1.74E-02                    | 8.31E-03         | 8.31E-03          | 7.24E-04                    | 3.46E-04         | 3.46E-04          |
|                      | Transferring Sand               | 7.39E-04                  | 3.49E-04         | 3.49E-04          | 4.05E-03                    | 1.91E-03         | 1.91E-03          | 1.69E-04                    | 7.96E-05         | 7.96E-05          |
|                      | Transferring aggregate material | 3.17E-03                  | 1.52E-03         | 1.52E-03          | 1.74E-02                    | 8.31E-03         | 8.31E-03          | 7.24E-04                    | 3.46E-04         | 3.46E-04          |
|                      | Transferring Sand               | 7.39E-04                  | 3.49E-04         | 3.49E-04          | 4.05E-03                    | 1.91E-03         | 1.91E-03          | 1.69E-04                    | 7.96E-05         | 7.96E-05          |
|                      | Unloading of Cement             | 1.20E-04                  | 4.12E-05         | 4.12E-05          | 6.57E-04                    | 2.26E-04         | 2.26E-04          | 2.74E-05                    | 9.40E-06         | 9.40E-06          |
|                      | Unloading of Cement Supplement  | 1.08E-03                  | 5.93E-04         | 5.93E-04          | 5.90E-03                    | 3.25E-03         | 3.25E-03          | 2.46E-04                    | 1.35E-04         | 1.35E-04          |
|                      | Loading of Weigh hopper         | 4.76E-03                  | 2.78E-03         | 2.78E-03          | 2.61E-02                    | 1.52E-02         | 1.52E-02          | 1.09E-03                    | 6.34E-04         | 6.34E-04          |
|                      | Loading of Mixer                | 1.83E-02                  | 5.46E-03         | 5.46E-03          | 1.00E-01                    | 2.99E-02         | 2.99E-02          | 4.17E-03                    | 1.25E-03         | 1.25E-03          |
| <b>Total:</b>        |                                 | <b>0.040</b>              | <b>0.016</b>     | <b>0.016</b>      | <b>0.22</b>                 | <b>0.09</b>      | <b>0.09</b>       | <b>0.009</b>                | <b>0.0037</b>    | <b>0.0037</b>     |

6.06

Figure 11.12-1. Typical Concrete Batching Process

11.12-3



**Mine Development  
Evaporator Emissions**

**Table A-22. Evaporation Pond Mechanical Evaporators - PM Emissions**

| Unit   | Evaporator Type | TDS Conc. (mg/L) | System Flow Rate <sup>1</sup> (gpm) | Operation Time <sup>2</sup> (hr/yr) | Calculated Emission Rate (lb/hr) <sup>3</sup> |                   | Calculated Emission Rate (lb/day) <sup>3,4</sup> |                   | Calculated Emission Rate (tpy) <sup>3</sup> |                   |
|--------|-----------------|------------------|-------------------------------------|-------------------------------------|-----------------------------------------------|-------------------|--------------------------------------------------|-------------------|---------------------------------------------|-------------------|
|        |                 |                  |                                     |                                     | PM <sub>10</sub>                              | PM <sub>2.5</sub> | PM <sub>10</sub>                                 | PM <sub>2.5</sub> | PM <sub>10</sub>                            | PM <sub>2.5</sub> |
| MEVAP1 | Nozzles         | 2,100            | 66                                  | 876                                 | 0.0911                                        | 0.014             | 1.30                                             | 0.19              | 3.99E-02                                    | 5.94E-03          |
| MEVAP2 | Nozzles         | 2,100            | 66                                  | 876                                 | 0.0911                                        | 0.014             | 1.30                                             | 0.19              | 3.99E-02                                    | 5.94E-03          |
| MEVAP3 | Nozzles         | 2,100            | 66                                  | 876                                 | 0.0911                                        | 0.014             | 1.30                                             | 0.19              | 3.99E-02                                    | 5.94E-03          |

1. Volume (gpm) calculated based on 66 gpm

2. Only 3 out of 4 units operating at once and 10% of the year based on meeting notes from 7/19/2022 with Sarah Richman

3. Emission rates are calculated using the following equation and parameters, provided by ADEQ via meeting on 5/30/2023:

$$PM = TDS \left( \frac{mg}{L} \right) \times \frac{Drift(\%)}{100\%} \times Q \text{ Rate} \left( \frac{gal}{min} \right) \times 3.78 \frac{L}{gal} \times \frac{2.2lb}{10^6 mg} \times \frac{60min}{hr}$$

Where:

Drift loss: 0.327%

PM<sub>10</sub>: 40.3% of PM

PM<sub>2.5</sub>: 6% of PM

4. For daily emissions, evaporators can run during the daylight hours only; conservatively, daylight hour of the summer solstice (14.25 hours) is used.



**Mine Development  
AGGDF -Taylor**

**Table A-23a. Aboveground Gasoline Dispensing Facility - Taylor - VOC Emissions**

| Emission Unit | Maximum Estimated Rate |            |                        | Emission Factor <sup>2</sup><br>(lbs/10 <sup>3</sup> gal) | VOC Emissions |             |             |
|---------------|------------------------|------------|------------------------|-----------------------------------------------------------|---------------|-------------|-------------|
|               | (gals/hr)              | (gals/day) | (gals/yr) <sup>1</sup> |                                                           | lb/hr         | lb/day      | ton/yr      |
| AGGDF-T       | 17                     | 411        | 150,000                | 11.3                                                      | 0.19          | 4.63        | 0.85        |
| <b>Total:</b> |                        |            |                        |                                                           | <b>0.19</b>   | <b>4.63</b> | <b>0.85</b> |

1. Based on aboveground annual gasoline usage provided by South32. All gasoline is treated as being emitted aboveground, despite some being dispensed underground.

2. Emission factor for gasoline is based on petroleum loading loss equation in USEPA publication AP-42, Table 5.2-7, Evaporative Emissions from Gasoline Service Station Operations (7/08). The loading loss equation is :

$$\text{Loading Loss (lb/1000 gal)} = 12.46 \times \text{SPM/T}$$

where,

S= saturation factor (assume 1.00 for submerged loading),

P = true vapor pressure of liquid loaded, pounds per square inch absolute (assume 7.4 psia for Gasoline RVP 10 @ 80°F),

M = molecular weight of vapors, pounds per pound-mole (assume 66 lb/lb-mole),

T = temperature of bulk liquid loaded, °R (80°F + 460 = 540°R), based on AP-42 Chapter 7 Tucson average daily maximum ambient temperature

**Sample Calculations**

VOC emissions (lb/hr) = 17.12 gal/day x 11.3 lb/1,000 gal x 1.0 day/24 hours = 0.19 lb/hr

VOC emissions (ton/yr) = 150000 gal/yr x 11.3 lb/1,000 gal x 1.0 ton/2,000 lbs = 0.85 ton/yr

**Table A-23b. Aboveground Gasoline Dispensing Facility - Taylor - HAP Emissions**

| Emission Unit               | Source Description                       | VOC Emissions <sup>1</sup> |        | HAP Emissions <sup>2</sup> |        |          |        |          |        |          |        |              |        |
|-----------------------------|------------------------------------------|----------------------------|--------|----------------------------|--------|----------|--------|----------|--------|----------|--------|--------------|--------|
|                             |                                          |                            |        | Benzene                    |        | Hexane   |        | Toluene  |        | Xylene   |        | Ethylbenzene |        |
|                             |                                          | lb/hr                      | ton/yr | lb/hr                      | ton/yr | lb/hr    | ton/yr | lb/hr    | ton/yr | lb/hr    | ton/yr | lb/hr        | ton/yr |
| AGGDF-T                     | Aboveground Gasoline Dispensing Facility | 0.19                       | 0.85   | 3.47E-03                   | 0.02   | 1.93E-03 | 0.01   | 1.35E-02 | 0.06   | 1.35E-02 | 0.06   | 2.70E-03     | 0.01   |
| <b>Total HAPs (ton/yr):</b> |                                          |                            |        | <b>0.15</b>                |        |          |        |          |        |          |        |              |        |

1. Based on emission calculations in Table A-23a

2. Mass percent is based on the average percent content of the HAP constituent in gasoline per TankESP Gasoline RVP\_X speciation:

| Storage Tank Content | HAP Mass Percent |        |         |        |              |
|----------------------|------------------|--------|---------|--------|--------------|
|                      | Benzene          | Hexane | Toluene | Xylene | Ethylbenzene |
| Gasoline             | 1.80%            | 1.00%  | 7.00%   | 7.00%  | 1.40%        |

**Mine Development  
AGGDF - Clark**

**Table A-24a. Aboveground Gasoline Dispensing Facility - Clark - VOC Emissions**

| Emission Unit | Maximum Estimated Rate |          |                      | Emission Factor <sup>2</sup><br>(lbs/10 <sup>3</sup> gal) | VOC Emissions |             |             |
|---------------|------------------------|----------|----------------------|-----------------------------------------------------------|---------------|-------------|-------------|
|               | gals/hr                | gals/day | gals/yr <sup>1</sup> |                                                           | lb/hr         | lb/day      | ton/yr      |
| AGGDF-C       | 8                      | 201      | 73,500               | 11.3                                                      | 0.09          | 2.27        | 0.41        |
| <b>Total:</b> |                        |          |                      |                                                           | <b>0.09</b>   | <b>2.27</b> | <b>0.41</b> |

1. Based on aboveground annual gasoline usage provided by South32. All gasoline is treated as being emitted aboveground, despite some being dispensed underground.

2. Emission factor for gasoline is based on petroleum loading loss equation in USEPA publication AP-42, Table 5.2-7, Evaporative Emissions from Gasoline Service Station Operations (7/08). The loading loss equation is :

$$\text{Loading Loss (lb/1000 gal)} = 12.46 \times \text{SPM/T}$$

where,

S= saturation factor (assume 1.00 for submerged loading),

P = true vapor pressure of liquid loaded, pounds per square inch absolute (assume 7.4 psia for Gasoline RVP 10 @ 80°F),

M = molecular weight of vapors, pounds per pound-mole (assume 66 lb/lb-mole),

T = temperature of bulk liquid loaded, °R (80°F + 460 = 540°R), based on AP-42 Chapter 7 Tucson average daily maximum ambient temperature

**Sample Calculations**

VOC emissions (lb/hr) = 8.39 gal/day x 11.3 lb/1,000 gal x 1.0 day/24 hours = 0.09 lb/hr

VOC emissions (ton/yr) = 73500 gal/yr x 11.3 lb/1,000 gal x 1.0 ton/2,000 lbs = 0.41 ton/yr

**Table A-24b. Aboveground Gasoline Dispensing Facility - Clark - HAP Emissions**

| Emission Unit               | Source Description                       | VOC Emissions <sup>1</sup> |        | HAP Emissions <sup>2</sup> |        |        |        |         |        |        |        |              |        |
|-----------------------------|------------------------------------------|----------------------------|--------|----------------------------|--------|--------|--------|---------|--------|--------|--------|--------------|--------|
|                             |                                          | lb/hr                      | ton/yr | Benzene                    |        | Hexane |        | Toluene |        | Xylene |        | Ethylbenzene |        |
|                             |                                          |                            |        | lb/hr                      | ton/yr | lb/hr  | ton/yr | lb/hr   | ton/yr | lb/hr  | ton/yr | lb/hr        | ton/yr |
| AGGDF-C                     | Aboveground Gasoline Dispensing Facility | 0.09                       | 0.41   | 0.002                      | 0.01   | 0.001  | 0.00   | 0.01    | 0.03   | 0.007  | 0.03   | 0.001        | 0.01   |
| <b>Total HAPs (ton/yr):</b> |                                          |                            |        | <b>0.08</b>                |        |        |        |         |        |        |        |              |        |

1. Based on emission calculations in Table A-24a

2. Mass percent is based on the average percent content of the HAP constituent in gasoline per TankESP Gasoline RVP\_X speciation:

| Storage Tank Content | HAP Mass Percent |        |         |        |              |
|----------------------|------------------|--------|---------|--------|--------------|
|                      | Benzene          | Hexane | Toluene | Xylene | Ethylbenzene |
| Gasoline             | 1.80%            | 1.00%  | 7.00%   | 7.00%  | 1.40%        |

**Mine Development  
Dozer**

**Table A-25a. Roads - Dozer - Input Parameters**

| Emission Point No. | Road Surface | Equipment | Total Combined Operation Hour <sup>1</sup> |                |                | Emission Factor (lb/hr) <sup>2</sup> |                  |                   |           |                  |                   | Material                      | Lead  | Control    |                |
|--------------------|--------------|-----------|--------------------------------------------|----------------|----------------|--------------------------------------|------------------|-------------------|-----------|------------------|-------------------|-------------------------------|-------|------------|----------------|
|                    |              |           | Hourly (hr/hr)                             | Daily (hr/day) | Annual (hr/yr) | Short Term                           |                  |                   | Long Term |                  |                   |                               |       | Type       | Efficiency (%) |
|                    |              |           |                                            |                |                | PM                                   | PM <sub>10</sub> | PM <sub>2.5</sub> | PM        | PM <sub>10</sub> | PM <sub>2.5</sub> |                               |       |            |                |
| DOZER-WRS          | Unpaved      | Bulldozer | 1                                          | 12             | 4,380          | 1.65                                 | 0.22             | 0.17              | 1.65      | 0.22             | 0.17              | Waste Rock                    | 0.35% | Watering   | 70%            |
| DOZER-HRS          | Unpaved      | Bulldozer | 1                                          | 12             | 4,380          | 1.65                                 | 0.22             | 0.17              | 1.65      | 0.22             | 0.17              | Clark Waste Rock              | 0.57% | Watering   | 70%            |
| DOZER-TSF          | Unpaved      | Bulldozer | 1                                          | 12             | 4,380          | 4.09                                 | 0.86             | 0.43              | 4.09      | 0.86             | 0.43              | Tailings                      | 0.43% | No Control | 0%             |
| DOZER-EOS          | Unpaved      | Bulldozer | 1                                          | 12             | 4,380          | 1.65                                 | 0.22             | 0.17              | 1.65      | 0.22             | 0.17              | Stope Ore & Developmental Ore | 4.73% | Watering   | 70%            |

1. Assumed to operate 12 hours a day and 365 days a year.

2. Emission factors for bulldozers per Table 11.9-1, U.S. EPA AP-42, Section 11.9 (Western Surface Coal Mining), October 1998

$$PM = TSP = k * \frac{5.7 (s)^{1.2}}{(M)^{1.3}}$$

$$PM_{10} = k * PM_{15} = k * \frac{1.0 (s)^{1.5}}{(M)^{1.4}}$$

$$PM_{2.5} = k * TSP = k * \frac{5.7 (s)^{1.2}}{(M)^{1.3}}$$

$$\text{where}$$

k = Scaling factor

|     |    |                  |                   |
|-----|----|------------------|-------------------|
|     | PM | PM <sub>10</sub> | PM <sub>2.5</sub> |
| k = | 1  | 0.75             | 0.105             |

Per AP-42, Table 11.9-1

s = Material silt content (%)

1.6 Rock silt content assumed as to be similar to Crushed limestone in Western Surface Coal Mining in AP-42, Section 13.2.4 (11/2006)

11 Tailings silt content assumed as to be similar to Taconite mining tailings in Western Surface Coal Mining in AP-42, Section 13.2.4 (11/2006)

M = Material moisture content (%)

11.80 for Tailings 4 for ore/rock

|     |     |                  |                   |
|-----|-----|------------------|-------------------|
|     | PM  | PM <sub>10</sub> | PM <sub>2.5</sub> |
| a = | 5.7 | 1                | 5.7               |
| b = | 1.2 | 1.5              | 1.2               |
| c = | 1.3 | 1.4              | 1.3               |

3. At South32, watering will be performed to sufficiently to achieve a control efficiency of

70%

**Table A-25b. Roads -Dozer - Controlled Emissions**

| Emission Point No. | Road Surface | Equipment | Controlled Emissions <sup>1,2</sup> |                  |                   |          |                |                  |                   |      |              |                  |                   |          | Uncontrolled Emissions (tpy) |                  |                   |          |
|--------------------|--------------|-----------|-------------------------------------|------------------|-------------------|----------|----------------|------------------|-------------------|------|--------------|------------------|-------------------|----------|------------------------------|------------------|-------------------|----------|
|                    |              |           | Hourly (lb/hr)                      |                  |                   |          | Daily (lb/day) |                  |                   |      | Annual (tpy) |                  |                   |          | Annual (tpy)                 |                  |                   |          |
|                    |              |           | PM                                  | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead | PM           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     |
| DOZER-WRS          | Unpaved      | Bulldozer | 0.50                                | 0.07             | 0.05              | 1.76E-03 | 5.95           | 0.78             | 0.62              | 0.02 | 1.09         | 0.14             | 0.11              | 3.84E-03 | 3.62                         | 0.48             | 0.38              | 1.28E-02 |
| DOZER-HRS          | Unpaved      | Bulldozer | 0.50                                | 0.07             | 0.052             | 2.81E-03 | 5.95           | 0.78             | 0.62              | 0.03 | 1.09         | 0.14             | 0.11              | 6.15E-03 | 3.62                         | 0.48             | 0.38              | 2.05E-02 |
| DOZER-TSF          | Unpaved      | Bulldozer | 4.09                                | 0.86             | 0.430             | 1.74E-02 | 49.12          | 10.37            | 5.16              | 0.21 | 8.96         | 1.89             | 0.94              | 3.82E-02 | 8.96                         | 1.89             | 0.94              | 3.82E-02 |
| DOZER-EOS          | Unpaved      | Bulldozer | 0.50                                | 0.07             | 0.052             | 2.35E-02 | 5.95           | 0.78             | 0.62              | 0.28 | 1.09         | 0.14             | 0.11              | 5.14E-02 | 3.62                         | 0.48             | 0.38              | 1.71E-01 |

1. Controlled hourly and daily emissions calculated based on short term emission factors and control efficiency.

2. Controlled annual emissions calculated based on long term emission factors and control efficiency.

**Mine Development  
Storage Tanks**

**Table A-26a. South32 Hermosa non-fuel Tank Emissions Summary †**

| Tank ID              | Max Capacity (gal) | Stock                               | Losses (tpy)     |             |             | Speciated HAP Emissions (tpy) |                                |                 | Total HAP (tpy) |
|----------------------|--------------------|-------------------------------------|------------------|-------------|-------------|-------------------------------|--------------------------------|-----------------|-----------------|
|                      |                    |                                     | Standing         | Working     | Total VOC   | Cresol                        | Ethylene Glycol Dimethyl Ether | Urethane        |                 |
| TNK-040 <sup>1</sup> | 5,283              | F549/MIBC                           | 0.166            | 0.122       | 0.289       | -                             | 0.262                          | -               | 0.262           |
| TNK-041 <sup>2</sup> | 2,642              | 3407-A                              | 4.65E-04         | 1.02E-03    | 1.48E-03    | 9.52E-05                      | -                              | -               | 9.52E-05        |
| TNK-044 <sup>3</sup> | 2,642              | Solvay 5100                         | 6.26E-03         | 8.67E-03    | 1.49E-02    | -                             | -                              | 3.67E-05        | 3.67E-05        |
| TNK-045              | 2,642              | Copper Sulphate                     | No VOC Emissions |             |             |                               |                                |                 |                 |
| TNK-046              | 3,963              | Copper Sulphate                     |                  |             |             |                               |                                |                 |                 |
| TNK-047              | 17,171             | Zinc Sulphate                       |                  |             |             |                               |                                |                 |                 |
| TNK-048              | 1,320              | Zinc Sulphate                       |                  |             |             |                               |                                |                 |                 |
| TNK-051              | 0                  | Zinc Cyanide                        |                  |             |             |                               |                                |                 |                 |
| TNK-052              | 1,000              | Zinc Cyanide                        |                  |             |             |                               |                                |                 |                 |
| TNK-053              | 5,000              | SMBS                                |                  |             |             |                               |                                |                 |                 |
| TNK-054              | 5,000              | SMBS                                |                  |             |             |                               |                                |                 |                 |
| TNK-057              | 12,000             | Tailings Flocculant (SNF AN910-VHM) |                  |             |             |                               |                                |                 |                 |
| TNK-058              | 1,000              | Tailings Flocculant (SNF AN910-VHM) |                  |             |             |                               |                                |                 |                 |
| TNK-059              | 1,000              | Tailings Flocculant (SNF AN910-VHM) |                  |             |             |                               |                                |                 |                 |
| TNK-060              | 10,000             | 3418-A                              | 2.14E-05         | 1.68E-04    | 1.90E-04    |                               |                                |                 |                 |
| TNK-061              | 10,000             | Shaft ANE                           | 1.43E-04         | 9.54E-05    | 2.38E-04    |                               |                                |                 |                 |
| <b>Total</b>         |                    |                                     | <b>0.17</b>      | <b>0.13</b> | <b>0.31</b> | <b>9.52E-05</b>               | <b>0.262</b>                   | <b>3.67E-05</b> | <b>0.263</b>    |

† Based on the SDS for tanks TNK-045 through TNK-059, there are no VOC or HAP emissions associated with these tanks.

1. This tank contains a 50/50 mixture of MIBC and F-549. F-549 is comprised of "mixed glycol ethers" according to Section 3 of the SDS. As such, it was conservatively modeled as 100% ethylene glycol dimethyl ether (1,2-dimethoxyethane), the lightest glycol ether.

2. The "test reagent" is not always the same stock, so a representative chemical, 3407-A, was used to estimate tank emissions. "Dithiophosphate" and "modified dithiophosphate" listed in Section 3 of the SDS are assumed to be sodium diisobutylidithiophosphinate. Due to the unavailability for Antoine coefficients of this chemical, the A and B coefficients for No. 6 fuel oil are used as a conservative estimate.

3. Due to unavailability of Antoine coefficients for the majority constituent chemical (Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester), the vapor pressure given in the SDS was assumed to be constant to generate usable Antoine coefficients.

**Table A-26b. Diesel & Gasoline Storage Tanks - VOC Emissions**

| Tank ID          | Max Capacity (gal) | Stock                      | VOC Emissions <sup>1</sup> |             |
|------------------|--------------------|----------------------------|----------------------------|-------------|
|                  |                    |                            | (lb/yr)                    | (tpy)       |
| T-01             | 1,000              | Unleaded Gasoline (S32)    | 750.03                     | 0.38        |
| T-02             | 5,000              | Diesel (Red Dyed S32)      | 3.27                       | 1.64E-03    |
| T-03             | 5,000              | Diesel (Red Dyed S32)      | 3.27                       | 1.64E-03    |
| T-04             | 12,000             | Diesel (Red Dyed Rummel)   | 4.08                       | 2.04E-03    |
| T-05             | 1,000              | Unleaded Gasoline (Rummel) | 650.59                     | 0.33        |
| T-06             | 1,000              | Diesel (Rummel)            | 0.95                       | 4.74E-04    |
| T-07             | 10,000             | Unleaded Gasoline          | 3831.10                    | 1.92        |
| T-08             | 10,000             | Unleaded Gasoline          | 3831.10                    | 1.92        |
| T-09             | 10,000             | Unleaded Gasoline          | 3831.10                    | 1.92        |
| T-10             | 50,000             | Diesel                     | 78.34                      | 0.04        |
| T-11             | 50,000             | Diesel                     | 71.75                      | 3.59E-02    |
| <b>Total VOC</b> |                    |                            | <b>13,055.59</b>           | <b>6.53</b> |
| <b>Max VOC</b>   |                    |                            | <b>3831.10</b>             | <b>1.92</b> |

1. VOC Emissions per EPA-approved TankESP Software (AP-42 Chapter 7.1, June 2020)

**Mine Development  
Storage Tanks**

**Table A-26c. Diesel & Gasoline Storage Tanks - HAP Weight Percent's**

| Tank ID | Stock                      | HAP Liquid Weight Percent's <sup>1</sup> |                          |        |              |         |                                         |             |        |         |        |
|---------|----------------------------|------------------------------------------|--------------------------|--------|--------------|---------|-----------------------------------------|-------------|--------|---------|--------|
|         |                            | Benzene                                  | Benzo(g,h,i)p<br>erylene | Cumene | Ethylbenzene | Hexane  | Iso-octane (2,2,4-<br>Trimethylpentane) | Naphthalene | PAC's  | Toluene | Xylene |
| T-01    | Unleaded Gasoline (S32)    | 1.80%                                    | 0.00%                    | 0.50%  | 1.40%        | 1.00%   | 4.00%                                   | 0.42%       | 0.00%  | 7.00%   | 7.00%  |
| T-02    | Diesel (Red Dyed S32)      | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.08%       | 0.002% | 0.03%   | 0.29%  |
| T-03    | Diesel (Red Dyed S32)      | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.08%       | 0.002% | 0.03%   | 0.29%  |
| T-04    | Diesel (Red Dyed Rummel)   | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.08%       | 0.002% | 0.03%   | 0.29%  |
| T-05    | Unleaded Gasoline (Rummel) | 1.80%                                    | 0.00%                    | 0.50%  | 1.40%        | 1.00%   | 4.00%                                   | 0.42%       | 0.00%  | 7.00%   | 7.00%  |
| T-06    | Diesel (Rummel)            | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.080%      | 0.002% | 0.030%  | 0.290% |
| T-07    | Unleaded Gasoline          | 1.80%                                    | 0.00%                    | 0.50%  | 1.40%        | 1.00%   | 4.00%                                   | 0.42%       | 0.00%  | 7.00%   | 7.00%  |
| T-08    | Unleaded Gasoline          | 1.80%                                    | 0.00%                    | 0.50%  | 1.40%        | 1.00%   | 4.00%                                   | 0.42%       | 0.00%  | 7.00%   | 7.00%  |
| T-09    | Unleaded Gasoline          | 1.80%                                    | 0.00%                    | 0.50%  | 1.40%        | 1.00%   | 4.00%                                   | 0.42%       | 0.00%  | 7.00%   | 7.00%  |
| T-10    | Diesel                     | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.08%       | 0.002% | 0.03%   | 0.29%  |
| T-11    | Diesel                     | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.08%       | 0.002% | 0.03%   | 0.29%  |

1. Speciation data for each HAP is based on individual content speciation.

**Table A-26d. Diesel and Gasoline Storage Tanks - HAP Emissions (lb/yr)**

| Tank ID           | Stock                      | HAP Emissions<br>(lb/yr) <sup>1</sup> |                          |                 |                 |                 |                 |                 |                 |                 |                 |               |
|-------------------|----------------------------|---------------------------------------|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------------|
|                   |                            | Benzene                               | Benzo(g,h,i)p<br>erylene | Cumene          | Ethylbenzene    | Hexane          | Isooctane       | Naphthalene     | PAC's           | Toluene         | Xylene          | Total HAPs    |
| T-01              | Unleaded Gasoline (S32)    | 4.05E+00                              | 2.98E-16                 | 5.19E-02        | 3.05E-01        | 3.05E-01        | 4.64E+00        | 2.36E-03        | 2.36E-03        | 4.64E+00        | 1.33E+00        | 15.33         |
| T-02              | Diesel (Red Dyed S32)      | 6.39E-03                              | 3.20E-15                 | 0.00E+00        | 1.01E-02        | 1.01E-02        | 0.00E+00        | 1.54E-03        | 1.54E-03        | 7.54E-02        | 1.96E-01        | 0.30          |
| T-03              | Diesel (Red Dyed S32)      | 6.39E-03                              | 3.20E-15                 | 0.00E+00        | 1.01E-02        | 1.01E-02        | 0.00E+00        | 1.54E-03        | 1.54E-03        | 7.54E-02        | 1.96E-01        | 0.30          |
| T-04              | Diesel (Red Dyed Rummel)   | 7.96E-03                              | 4.02E-15                 | 0.00E+00        | 1.25E-02        | 1.25E-02        | 0.00E+00        | 1.92E-03        | 1.92E-03        | 9.40E-02        | 2.45E-01        | 0.38          |
| T-05              | Unleaded Gasoline (Rummel) | 3.51E+00                              | 2.59E-16                 | 4.50E-02        | 2.64E-01        | 2.64E-01        | 4.03E+00        | 2.05E-03        | 2.05E-03        | 4.03E+00        | 1.16E+00        | 13.30         |
| T-06              | Diesel (Rummel)            | 1.85E-03                              | 9.22E-16                 | 0.00E+00        | 2.91E-03        | 2.91E-03        | 0.00E+00        | 4.45E-04        | 4.45E-04        | 2.18E-02        | 5.68E-02        | 0.09          |
| T-07              | Unleaded Gasoline          | 2.07E+01                              | 1.52E-15                 | 2.65E-01        | 1.56E+00        | 1.56E+00        | 2.37E+01        | 1.21E-02        | 1.21E-02        | 2.37E+01        | 6.80E+00        | 78.31         |
| T-08              | Unleaded Gasoline          | 2.07E+01                              | 1.52E-15                 | 2.65E-01        | 1.56E+00        | 1.56E+00        | 2.37E+01        | 1.21E-02        | 1.21E-02        | 2.37E+01        | 6.80E+00        | 78.31         |
| T-09              | Unleaded Gasoline          | 2.07E+01                              | 1.52E-15                 | 2.65E-01        | 1.56E+00        | 1.56E+00        | 2.37E+01        | 1.21E-02        | 1.21E-02        | 2.37E+01        | 6.80E+00        | 78.31         |
| T-10              | Diesel                     | 1.53E-01                              | 7.72E-14                 | 0.00E+00        | 2.41E-01        | 2.41E-01        | 0.00E+00        | 3.69E-02        | 3.69E-02        | 1.80E+00        | 4.69E+00        | 7.21          |
| T-11              | Diesel                     | 1.40E-01                              | 7.07E-14                 | 0.00E+00        | 2.20E-01        | 2.20E-01        | 0.00E+00        | 3.38E-02        | 3.38E-02        | 1.65E+00        | 4.30E+00        | 6.60          |
| <b>Total HAPs</b> |                            | <b>6.99E+01</b>                       | <b>1.64E-13</b>          | <b>8.92E-01</b> | <b>5.74E+00</b> | <b>5.74E+00</b> | <b>7.98E+01</b> | <b>1.17E-01</b> | <b>1.17E-01</b> | <b>8.35E+01</b> | <b>3.26E+01</b> | <b>278.42</b> |
| <b>Max HAP</b>    |                            | <b>-</b>                              | <b>-</b>                 | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>8.35E+01</b> | <b>-</b>        | <b>-</b>      |

1. HAP emissions are calculated based on the HAP weight percent of the content of the tank.

**Table A-26e. Diesel and Gasoline Storage Tanks - HAP Emissions (tpy)**

| Tank ID           | Stock                      | HAP Emissions<br>(tpy) |                          |                 |                 |                 |                 |                 |                 |                 |                 |                 |
|-------------------|----------------------------|------------------------|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                   |                            | Benzene                | Benzo(g,h,i)p<br>erylene | Cumene          | Ethylbenzene    | Hexane          | Isooctane       | Naphthalene     | PAC's           | Toluene         | Xylene          | Total HAPs      |
| T-01              | Unleaded Gasoline (S32)    | 2.02E-03               | 1.49E-19                 | 2.59E-05        | 1.52E-04        | 1.52E-04        | 2.32E-03        | 1.18E-06        | 1.18E-06        | 2.32E-03        | 6.66E-04        | 7.67E-03        |
| T-02              | Diesel (Red Dyed S32)      | 3.20E-06               | 1.60E-18                 | 0.00E+00        | 5.03E-06        | 5.03E-06        | 0.00E+00        | 7.69E-07        | 7.69E-07        | 3.77E-05        | 9.81E-05        | 1.51E-04        |
| T-03              | Diesel (Red Dyed S32)      | 3.20E-06               | 1.60E-18                 | 0.00E+00        | 5.03E-06        | 5.03E-06        | 0.00E+00        | 7.69E-07        | 7.69E-07        | 3.77E-05        | 9.81E-05        | 1.51E-04        |
| T-04              | Diesel (Red Dyed Rummel)   | 3.98E-06               | 2.01E-18                 | 0.00E+00        | 6.27E-06        | 6.27E-06        | 0.00E+00        | 9.61E-07        | 9.61E-07        | 4.70E-05        | 1.22E-04        | 1.88E-04        |
| T-05              | Unleaded Gasoline (Rummel) | 1.76E-03               | 1.29E-19                 | 2.25E-05        | 1.32E-04        | 1.32E-04        | 2.01E-03        | 1.02E-06        | 1.02E-06        | 2.01E-03        | 5.78E-04        | 6.65E-03        |
| T-06              | Diesel (Rummel)            | 9.26E-07               | 4.61E-19                 | 0.00E+00        | 1.46E-06        | 1.46E-06        | 0.00E+00        | 2.23E-07        | 2.23E-07        | 1.09E-05        | 2.84E-05        | 4.36E-05        |
| T-07              | Unleaded Gasoline          | 1.03E-02               | 7.62E-19                 | 1.33E-04        | 7.78E-04        | 7.78E-04        | 1.19E-02        | 6.03E-06        | 6.03E-06        | 1.19E-02        | 3.40E-03        | 3.92E-02        |
| T-08              | Unleaded Gasoline          | 1.03E-02               | 7.62E-19                 | 1.33E-04        | 7.78E-04        | 7.78E-04        | 1.19E-02        | 6.03E-06        | 6.03E-06        | 1.19E-02        | 3.40E-03        | 3.92E-02        |
| T-09              | Unleaded Gasoline          | 1.03E-02               | 7.62E-19                 | 1.33E-04        | 7.78E-04        | 7.78E-04        | 1.19E-02        | 6.03E-06        | 6.03E-06        | 1.19E-02        | 3.40E-03        | 3.92E-02        |
| T-10              | Diesel                     | 7.64E-05               | 3.86E-17                 | 0.00E+00        | 1.20E-04        | 1.20E-04        | 0.00E+00        | 1.84E-05        | 1.84E-05        | 9.02E-04        | 2.35E-03        | 3.60E-03        |
| T-11              | Diesel                     | 7.00E-05               | 3.54E-17                 | 0.00E+00        | 1.10E-04        | 1.10E-04        | 0.00E+00        | 1.69E-05        | 1.69E-05        | 8.26E-04        | 2.15E-03        | 3.30E-03        |
| <b>Total HAPs</b> |                            | <b>3.50E-02</b>        | <b>8.22E-17</b>          | <b>4.46E-04</b> | <b>2.87E-03</b> | <b>2.87E-03</b> | <b>3.99E-02</b> | <b>5.84E-05</b> | <b>5.84E-05</b> | <b>4.17E-02</b> | <b>1.63E-02</b> | <b>1.39E-01</b> |
| <b>Max HAP</b>    |                            | <b>-</b>               | <b>-</b>                 | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>4.17E-02</b> | <b>-</b>        | <b>-</b>        |

**Mine Development  
Process Tanks**

Table A-27. South32 Hermosa Process Tanks Emission Summary

| Tank           | Equipment Description        | CAS #      | Chemical                                                       | VOC? | HAP? | Pure Component Molecular Weight M (lb/lbmol) | Pure Component Vapor Pressure P (psia) | Henry's Law Solubility Constant H <sup>o</sup> <sub>v</sub> (Dimensionless) | Henry's Law Solubility Constant H <sup>o</sup> <sub>v</sub> (psi/mol% liq) | Liquid Mol% Liq. mol% (mol%liq) | Liquid Temperature T (°C) | Liquid Surface Area A (ft <sup>2</sup> ) | Pure Component Mass Transfer Coefficient K (ft/hr) | Vapor Partial Pressure pp (psia) | Hourly Emission Rate <sup>1,2</sup> E (lb/hr) | Annual Emissions <sup>1,2</sup> E (annual) |          |
|----------------|------------------------------|------------|----------------------------------------------------------------|------|------|----------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------|---------------------------|------------------------------------------|----------------------------------------------------|----------------------------------|-----------------------------------------------|--------------------------------------------|----------|
|                |                              |            |                                                                |      |      |                                              |                                        |                                                                             |                                                                            |                                 |                           |                                          |                                                    |                                  |                                               | (lb/yr)                                    | (tpy)    |
| 22310-FC-00001 | Lead Rougher                 | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 207.74                                   | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 2.67E-06                        | 301.54                    | 207.74                                   | 54.97                                              | 3.82E-05                         | 0.02                                          | 123.32                                     | 0.06     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 1.16E-06                        | 301.54                    | 207.74                                   | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 207.74                                   | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 207.74                                   | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-FC-00004 | Lead Rougher Scavenger       | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 207.74                                   | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 2.67E-06                        | 301.54                    | 207.74                                   | 54.97                                              | 3.76E-05                         | 0.02                                          | 121.38                                     | 0.06     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 1.14E-06                        | 301.54                    | 207.74                                   | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 207.74                                   | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 207.74                                   | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-FC-00008 | Lead Cleaner Scalper         | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 73.19                                    | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 2.30E-05                        | 301.54                    | 73.19                                    | 54.97                                              | 3.34E-04                         | 0.05                                          | 380.65                                     | 0.19     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 1.01E-05                        | 301.54                    | 73.19                                    | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 73.19                                    | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 73.19                                    | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-FC-00007 | Lead Cleaner                 | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 73.19                                    | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 1.97E-05                        | 301.54                    | 73.19                                    | 54.97                                              | 2.87E-04                         | 0.04                                          | 326.11                                     | 0.16     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 8.68E-06                        | 301.54                    | 73.19                                    | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 73.19                                    | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 73.19                                    | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-FC-00009 | Lead Cleaner Scavenger       | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 73.19                                    | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 1.84E-05                        | 301.54                    | 73.19                                    | 54.97                                              | 2.67E-04                         | 0.04                                          | 303.85                                     | 0.15     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 8.08E-06                        | 301.54                    | 73.19                                    | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 73.19                                    | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 73.19                                    | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-FC-00005 | Zinc Rougher                 | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 207.74                                   | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 4.74E-06                        | 301.54                    | 207.74                                   | 54.97                                              | 6.88E-05                         | 0.03                                          | 222.26                                     | 0.11     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 207.74                                   | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 7.37E-06                        | 301.54                    | 207.74                                   | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 2.38E-06                        | 301.54                    | 207.74                                   | 61.19                                              | 4.27E-06                         | 1.38E-03                                      | 11.12                                      | 0.01     |
| 22310-FC-00006 | Zinc Rougher Scavenger       | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 207.74                                   | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 4.63E-06                        | 301.54                    | 207.74                                   | 54.97                                              | 6.72E-05                         | 0.03                                          | 217.22                                     | 0.11     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 207.74                                   | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 7.21E-06                        | 301.54                    | 207.74                                   | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 2.30E-06                        | 301.54                    | 207.74                                   | 61.19                                              | 4.17E-06                         | 1.35E-03                                      | 10.87                                      | 0.01     |
| 22310-FC-00011 | Zinc Cleaner Scalper         | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 124.86                                   | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 8.12E-06                        | 301.54                    | 124.86                                   | 54.97                                              | 1.18E-04                         | 0.03                                          | 229.12                                     | 0.11     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 124.86                                   | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 1.26E-05                        | 301.54                    | 124.86                                   | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 4.03E-06                        | 301.54                    | 124.86                                   | 61.19                                              | 7.32E-06                         | 1.42E-03                                      | 11.47                                      | 0.01     |
| 22310-FC-00010 | Zinc Cleaner                 | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 124.86                                   | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 6.88E-06                        | 301.54                    | 124.86                                   | 54.97                                              | 1.00E-04                         | 0.02                                          | 194.10                                     | 0.10     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 124.86                                   | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 1.07E-05                        | 301.54                    | 124.86                                   | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 3.42E-06                        | 301.54                    | 124.86                                   | 61.19                                              | 6.20E-06                         | 1.21E-03                                      | 9.71                                       | 4.88E-03 |
| 22310-FC-00012 | Zinc Cleaner Scavenger       | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 124.86                                   | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 6.41E-06                        | 301.54                    | 124.86                                   | 54.97                                              | 9.31E-05                         | 0.02                                          | 180.70                                     | 0.09     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 124.86                                   | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 9.97E-06                        | 301.54                    | 124.86                                   | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 3.18E-06                        | 301.54                    | 124.86                                   | 61.19                                              | 5.77E-06                         | 1.12E-03                                      | 9.04                                       | 4.52E-03 |
| 22430-TN-00001 | Lead Concentrate Tank        | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 1,017.00                                 | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 5.14E-05                        | 301.54                    | 1,017.00                                 | 54.97                                              | 7.47E-04                         | 1.47                                          | 11819.26                                   | 5.91     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 4.72E-06                        | 301.54                    | 1,017.00                                 | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 2.93E-05                        | 301.54                    | 1,017.00                                 | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 9.33E-06                        | 301.54                    | 1,017.00                                 | 61.19                                              | 1.69E-05                         | 0.03                                          | 216.05                                     | 0.11     |
| 22430-TN-00002 | Zinc Concentrate Tank        | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 1,257.00                                 | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 5.26E-05                        | 301.54                    | 1,257.00                                 | 54.97                                              | 7.64E-04                         | 1.85                                          | 14931.99                                   | 7.47     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 4.82E-06                        | 301.54                    | 1,257.00                                 | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 2.99E-05                        | 301.54                    | 1,257.00                                 | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 9.53E-06                        | 301.54                    | 1,257.00                                 | 61.19                                              | 1.73E-05                         | 0.03                                          | 272.95                                     | 0.14     |
| 22310-TN-00003 | Lead Conditioning Tank       | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 294.07                                   | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 1.52E-05                        | 301.54                    | 294.07                                   | 54.97                                              | 2.21E-04                         | 0.13                                          | 1008.48                                    | 0.50     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4.37E-01                               | -                                                                           | -                                                                          | 3.99E-06                        | 301.54                    | 294.07                                   | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                       | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 294.07                                   | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                        | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 294.07                                   | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-TN-00001 | Zinc Conditioning Tank No. 1 | 7732-18-5  | Water                                                          | No   | No   | 18.02                                        | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 330.06                                   | 98.03                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                       | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 7.27E-06                        | 301.54                    | 330.06                                   | 54.97                                              | 1.06E-04                         | 0.07                                          | 542.33                                     | 0.27     |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                       | 4                                      |                                                                             |                                                                            |                                 |                           |                                          |                                                    |                                  |                                               |                                            |          |

Process Tank Emission Calculation Notes

|                                                                                                 |                                                                   |                                                           |  |
|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------|--|
| Emission Factors calculated using:                                                              |                                                                   |                                                           |  |
| Ref: Section 3.7.1 - Evaporation from an Open Top Vessel or a Spill                             |                                                                   |                                                           |  |
| Methods for Estimating Air Emissions from Chemical Manufacturing Facilities, Vol. II Chapter 16 |                                                                   |                                                           |  |
| STAPPA/ALAPCO/EPA EIIP, August 2007                                                             |                                                                   |                                                           |  |
| E                                                                                               | Hourly or Annual Emission Rate, lb/hr or lb/yr <sup>3</sup>       | = (M K A P) / (R T)                                       |  |
| M                                                                                               | Molecular Weight, lb/lb-mol                                       | See Table                                                 |  |
| K                                                                                               | Mass Transfer Coefficient, ft/hr <sup>4</sup>                     | = $K_0 (M_0/M)^{1/3}$                                     |  |
| K <sub>0</sub>                                                                                  | Reference Mass Transfer Coefficient of Water, ft/hr               | 0.83                                                      |  |
| M <sub>0</sub>                                                                                  | Molecular Weight of Water, lb/lb-mol                              | 18.02                                                     |  |
| A                                                                                               | Liquid Surface Area, ft <sup>2</sup>                              | See Table                                                 |  |
| P                                                                                               | Vapor Pressure, psia                                              | See Table                                                 |  |
| T                                                                                               | Liquid temperature, °R <sup>5</sup>                               | 542.77                                                    |  |
| R                                                                                               | Ideal Gas Constant, Psia-ft <sup>3</sup> /lb-mole °R <sup>6</sup> | 10.73159                                                  |  |
| H                                                                                               | Annual Hours of Operations, hrs/yr <sup>7</sup>                   | 8060                                                      |  |
| H <sup>solv</sup> <sub>v</sub>                                                                  | Henry's Law Volatility Constant, psi/(mol%) <sub>8</sub>          | = $H^{soln}_v \times R \times T \times d(soln) / M(soln)$ |  |
| pp <sup>9</sup> <sub>v</sub>                                                                    | Gas Partial Pressure using Henry's Law Constant, psi              | = Lq Mol% * H <sup>soln</sup> <sub>v</sub>                |  |
| H <sup>soln</sup> <sub>v</sub>                                                                  | Henry's Law Volatility Constant, Dimensionless <sup>9</sup>       | See Table                                                 |  |
| M(soln)                                                                                         | Mol. Wt. of Solvent, lb/lb-mol <sup>10</sup>                      | 18.02                                                     |  |
| d(soln)                                                                                         | Density of Solvent, lb/ft <sup>3</sup> <sup>10</sup>              | 62.42721972                                               |  |

1. 100% Safety factor added while calculating emission rate to account for any atomization from material movement at the surface, such as spraying
2. Emissions from low volatile compounds (sodium diisobutylidithiophosphinate & Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester) assumed to be negligible.
3. EIIP, Vol. II, Ch. 16, Eq. 3-24
4. EIIP, Vol. II, Ch. 16, Eq. 3-27
5. For conservative estimate - Hourly Average Max. Ambient Temperature for Tucson, AZ. As per AP 42 Section 7.1, Table 7.1-7 (Jun, 2020) is used
6. Table 1-9 Perry's Chemical Engineers' Handbook, 6th ed.
7. Provided by South32.
8. Referenced from <https://www.degruyter.com/document/doi/10.1515/pac-2020-0302/html?lang=en>
9. Referenced from Toxchem 4.4 Mar-25-2019
10. Assume as water

**Mine Development  
UG Taylor Roads - Inputs**

**Table A-28. Taylor Emission Factor Inputs**

| Road Surface | Max Miles Traveled Per Unit |        |      | Vehicle Type                               | Vehicle Model       | Max Vehicle Count | Particulate Matter Emission Factor Inputs <sup>1</sup> |                  |                   |         |        |     |           |     |                  |                   |      |                  |                   |
|--------------|-----------------------------|--------|------|--------------------------------------------|---------------------|-------------------|--------------------------------------------------------|------------------|-------------------|---------|--------|-----|-----------|-----|------------------|-------------------|------|------------------|-------------------|
|              | Day                         | Month  | Year |                                            |                     |                   | k                                                      |                  |                   | Avg. W  |        | s   | P         | a   |                  |                   | b    |                  |                   |
|              |                             |        |      |                                            |                     |                   | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | (kg)    | (ton)  | (%) | (days/yr) | PM  | PM <sub>10</sub> | PM <sub>2.5</sub> | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> |
| Unpaved      | 2                           | 60.83  | 730  | Dev Drill Rig                              | DD422i              | 3                 | 4.9                                                    | 1.5              | 0.15              | 26,000  | 28.66  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Support Drill Rig                          | DS412i              | 5                 | 4.9                                                    | 1.5              | 0.15              | 29,000  | 31.97  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Cable bolter                               | DS421               | 2                 | 4.9                                                    | 1.5              | 0.15              | 25,000  | 27.56  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | LHD (LH517i)                               | LH517i              | 2                 | 4.9                                                    | 1.5              | 0.15              | 46,500  | 51.26  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 20                          | 608.33 | 7300 | Haul Truck                                 | TH551i              | 4                 | 4.9                                                    | 1.5              | 0.15              | 97,870  | 107.88 | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Scissor lift                               | Utilift MF 540      | 2                 | 4.9                                                    | 1.5              | 0.15              | 13,100  | 14.44  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Light vehicle (general usage) Fleet 1      | Mahindra Roxor      | 2                 | 4.9                                                    | 1.5              | 0.15              | 1,678   | 1.85   | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Charging Rig Fleet 1                       | Charmec MF 605 D(V) | 2                 | 4.9                                                    | 1.5              | 0.15              | 14,600  | 16.09  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 1                           | 30.42  | 365  | LH Rigs                                    | DL422i              | 6                 | 4.9                                                    | 1.5              | 0.15              | 22,000  | 24.25  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 1                           | 30.42  | 365  | LH Rig (Ore Passes/Geo)                    | DL422i              | 1                 | 4.9                                                    | 1.5              | 0.15              | 22,000  | 24.25  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | LHD (LH518B)                               | LH518B              | 5                 | 4.9                                                    | 1.5              | 0.15              | 70,000  | 77.16  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 20                          | 608.33 | 7300 | Haul Trucks (Haul Loop)                    | TH663i              | 3                 | 4.9                                                    | 1.5              | 0.15              | 111,440 | 122.84 | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 20                          | 608.33 | 7300 | Haul Trucks                                | TH663i              | 5                 | 4.9                                                    | 1.5              | 0.15              | 111,440 | 122.84 | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Material transporter                       | Multimec MF100      | 2                 | 4.9                                                    | 1.5              | 0.15              | 22,200  | 24.47  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 4                           | 121.67 | 1460 | Light vehicle (general usage) Fleet 2      | Mahindra Roxor      | 2                 | 4.9                                                    | 1.5              | 0.15              | 1,678   | 1.85   | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Charging Rig Fleet 2                       | Charmec MF 605 D(V) | 2                 | 4.9                                                    | 1.5              | 0.15              | 14,600  | 16.09  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Personnel transporter                      | Utimec MF 205 PER   | 3                 | 4.9                                                    | 1.5              | 0.15              | 15,200  | 16.76  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Shotcreter                                 | Sprymec MF 050 D(V) | 2                 | 4.9                                                    | 1.5              | 0.15              | 18,000  | 19.84  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 16                          | 486.67 | 5840 | Transmixer                                 | Utimec MF 500       | 4                 | 4.9                                                    | 1.5              | 0.15              | 22,200  | 24.47  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Water vehicle                              | MF 350 Water        | 2                 | 4.9                                                    | 1.5              | 0.15              | 15,700  | 17.31  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 0.0027                      | 0.08   | 1    | Mobile rockbreaker                         | Maclean RB3         | 3                 | 4.9                                                    | 1.5              | 0.15              | 17,700  | 19.51  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Grader                                     | Maclean GRS         | 2                 | 4.9                                                    | 1.5              | 0.15              | 18,200  | 20.06  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 1                           | 30.42  | 365  | Skid Steer                                 | Manitou 4200 V      | 3                 | 4.9                                                    | 1.5              | 0.15              | 5,291   | 5.83   | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Light vehicle (tech services)              | Mahindra Roxor      | 4                 | 4.9                                                    | 1.5              | 0.15              | 1,678   | 1.85   | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Material transporter (logistics/Construct) | Multimec MF100      | 2                 | 4.9                                                    | 1.5              | 0.15              | 22,200  | 24.47  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Scissor lift (Construction)                | Utilift MF 540      | 2                 | 4.9                                                    | 1.5              | 0.15              | 13,100  | 14.44  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Telehandler                                | GTH - 1056          | 3                 | 4.9                                                    | 1.5              | 0.15              | 14,470  | 15.95  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 4                           | 121.67 | 1460 | Maintenance Vehicle                        | Maclean FL3         | 3                 | 4.9                                                    | 1.5              | 0.15              | 33,000  | 36.38  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 8                           | 243.33 | 2920 | Fuel/Lube vehicle                          | Maclean FL3         | 2                 | 4.9                                                    | 1.5              | 0.15              | 33,000  | 36.38  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 0.1                         | 3.04   | 36.5 | Mobile Grapple equipment                   | Brokk 900           | 3                 | 4.9                                                    | 1.5              | 0.15              | 11,600  | 12.79  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 1                           | 30.42  | 365  | Blind Bore Machine                         | Rhino               | 2                 | 4.9                                                    | 1.5              | 0.15              | 52,000  | 57.32  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |

<sup>1</sup> Emission factors for vehicular traffic on unpaved roads per U.S. EPA AP-42, Section 13.2.2 (Unpaved Roads), November 2006.

Short-Term  $E = k (s/12)^a (W/3)^b$

(1a)

Annual  $E_{\text{tot}} = E [(365 - P)/365]$

(2)

where E = Size-specific emission factor (lb/VMT)

k, a, b = Constants for equation 1a

|          |                  |                   |
|----------|------------------|-------------------|
| PM       | PM <sub>10</sub> | PM <sub>2.5</sub> |
| k = 4.9  | 1.5              | 0.15              |
| a = 0.7  | 0.9              | 0.9               |
| b = 0.45 | 0.45             | 0.45              |

Per AP-42 Table 13.2.2-2, November 2006

s = surface material silt content (%), per AP-42 Table 13.2.2-1, 11/06, Western surface coal mining Plant Road

5.1

W = Mean vehicle weight (tons)

P = Days per year with at least 0.01 inch precipitation, based on precipitation data from 2019-2021 for Hermosa Trench Met Station, using the lowest annual value between 2019-2021.

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**Mine Development  
UG Taylor Roads EF**

**Table A-29. Taylor Underground Roads - Emission Factors**

| Road Surface | Vehicle Type                               | Averaging Period | Emission Factor <sup>1</sup> |                  |                   |        | Process Rate Unit | Particulate Matter Emission Factor Inputs <sup>1</sup> |                  |                   |        |      |           |      |                  |                   |      |                  |                   | Reference                                                                                           |
|--------------|--------------------------------------------|------------------|------------------------------|------------------|-------------------|--------|-------------------|--------------------------------------------------------|------------------|-------------------|--------|------|-----------|------|------------------|-------------------|------|------------------|-------------------|-----------------------------------------------------------------------------------------------------|
|              |                                            |                  | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Unit   |                   | k                                                      |                  | W                 |        | s    |           | P    |                  | a                 |      | b                |                   |                                                                                                     |
|              |                                            |                  |                              |                  |                   |        |                   | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | (ton)  | (%)  | (days/yr) | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> |                                                                                                     |
| Unpaved      | Dev Drill Rig                              | Hourly/Daily     | 7.43                         | 1.92             | 0.19              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 28.66  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              | AP-42, Section 13.2.2, Expression 1a (11/06)<br>AP-42, Section 13.2.2, Expressions 1a and 2 (11/06) |
| Unpaved      | Dev Drill Rig                              | Annual           | 6.17                         | 1.59             | 0.16              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Support Drill Rig                          | Hourly/Daily     | 7.81                         | 2.01             | 0.20              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 31.97  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Support Drill Rig                          | Annual           | 6.48                         | 1.67             | 0.17              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Cable bolter                               | Hourly/Daily     | 7.30                         | 1.88             | 0.19              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 27.56  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Cable bolter                               | Annual           | 6.06                         | 1.56             | 0.16              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | LHD (LH517)                                | Hourly/Daily     | 9.66                         | 2.49             | 0.25              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 51.26  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | LHD (LH517)                                | Annual           | 8.02                         | 2.07             | 0.21              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Haul Truck                                 | Hourly/Daily     | 13.50                        | 3.48             | 0.35              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 107.88 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Haul Truck                                 | Annual           | 11.20                        | 2.89             | 0.29              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Scissor lift                               | Hourly/Daily     | 5.46                         | 1.41             | 0.14              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 14.44  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Scissor lift                               | Annual           | 4.53                         | 1.17             | 0.12              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Light vehicle (general usage) Fleet 1      | Hourly/Daily     | 2.17                         | 0.56             | 0.06              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 1.85   | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Light vehicle (general usage) Fleet 1      | Annual           | 1.80                         | 0.46             | 0.05              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Charging Rig Fleet 1                       | Hourly/Daily     | 5.73                         | 1.48             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 16.09  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Charging Rig Fleet 1                       | Annual           | 4.76                         | 1.23             | 0.12              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | LH Rigs                                    | Hourly/Daily     | 6.89                         | 1.78             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 24.25  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | LH Rigs                                    | Annual           | 5.72                         | 1.48             | 0.15              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | LH Rig (Ore Passes/Geo)                    | Hourly/Daily     | 6.89                         | 1.78             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 24.25  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | LH Rig (Ore Passes/Geo)                    | Annual           | 5.72                         | 1.48             | 0.15              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | LHD (LH518B)                               | Hourly/Daily     | 11.61                        | 2.99             | 0.30              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 77.16  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | LHD (LH518B)                               | Annual           | 9.63                         | 2.49             | 0.25              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Haul Trucks (Haul Loop)                    | Hourly/Daily     | 14.31                        | 3.69             | 0.37              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 122.84 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Haul Trucks (Haul Loop)                    | Annual           | 11.88                        | 3.06             | 0.31              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Haul Trucks                                | Hourly/Daily     | 14.31                        | 3.69             | 0.37              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 122.84 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Haul Trucks                                | Annual           | 11.88                        | 3.06             | 0.31              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Material transporter                       | Hourly/Daily     | 6.92                         | 1.79             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 24.47  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Material transporter                       | Annual           | 5.75                         | 1.48             | 0.15              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Light vehicle (general usage) Fleet 2      | Hourly/Daily     | 2.17                         | 0.56             | 0.06              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 1.85   | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Light vehicle (general usage) Fleet 2      | Annual           | 1.80                         | 0.46             | 0.05              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Charging Rig Fleet 2                       | Hourly/Daily     | 5.73                         | 1.48             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 16.09  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Charging Rig Fleet 2                       | Annual           | 4.76                         | 1.23             | 0.12              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Personnel transporter                      | Hourly/Daily     | 5.84                         | 1.51             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 16.76  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Personnel transporter                      | Annual           | 4.85                         | 1.25             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Shotcrete                                  | Hourly/Daily     | 6.30                         | 1.62             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 19.84  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Shotcrete                                  | Annual           | 5.23                         | 1.35             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Transmixer                                 | Hourly/Daily     | 6.92                         | 1.79             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 24.47  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Transmixer                                 | Annual           | 5.75                         | 1.48             | 0.15              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Water vehicle                              | Hourly/Daily     | 5.92                         | 1.53             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 17.31  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Water vehicle                              | Annual           | 4.92                         | 1.27             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Mobile rockbreaker                         | Hourly/Daily     | 6.25                         | 1.61             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 19.51  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Mobile rockbreaker                         | Annual           | 5.19                         | 1.34             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Grader                                     | Hourly/Daily     | 6.33                         | 1.63             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 20.06  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Grader                                     | Annual           | 5.26                         | 1.36             | 0.14              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Skid Steer                                 | Hourly/Daily     | 3.63                         | 0.94             | 0.09              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 5.83   | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Skid Steer                                 | Annual           | 3.01                         | 0.78             | 0.08              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Light vehicle (tech services)              | Hourly/Daily     | 2.17                         | 0.56             | 0.06              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 1.85   | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Light vehicle (tech services)              | Annual           | 1.80                         | 0.46             | 0.05              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Material transporter (logistics/Construct) | Hourly/Daily     | 6.92                         | 1.79             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 24.47  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Material transporter (logistics/Construct) | Annual           | 5.75                         | 1.48             | 0.15              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Scissor lift (Construction)                | Hourly/Daily     | 5.46                         | 1.41             | 0.14              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 14.44  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Scissor lift (Construction)                | Annual           | 4.53                         | 1.17             | 0.12              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Telehandler                                | Hourly/Daily     | 5.71                         | 1.47             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 15.95  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Telehandler                                | Annual           | 4.74                         | 1.22             | 0.12              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Maintenance Vehicle                        | Hourly/Daily     | 8.27                         | 2.13             | 0.21              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 36.38  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Maintenance Vehicle                        | Annual           | 6.87                         | 1.77             | 0.18              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Fuel/Lube vehicle                          | Hourly/Daily     | 8.27                         | 2.13             | 0.21              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 36.38  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Fuel/Lube vehicle                          | Annual           | 6.87                         | 1.77             | 0.18              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Mobile Grapple equipment                   | Hourly/Daily     | 5.17                         | 1.33             | 0.13              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 12.79  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Mobile Grapple equipment                   | Annual           | 4.29                         | 1.11             | 0.11              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |
| Unpaved      | Blind Bore Machine                         | Hourly/Daily     | 10.15                        | 2.62             | 0.26              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 57.32  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |
| Unpaved      | Blind Bore Machine                         | Annual           | 8.43                         | 2.17             | 0.22              | lb/VMT | VMT               | -                                                      | -                | -                 | -      | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |

<sup>1</sup> Emission factors for vehicular traffic on unpaved roads per II S FPA AP-42, Section 13.2.2 (Innervated Roads), November 2006.

$$\text{Short-Term } E = k \left( \frac{W}{12} \right)^a \left( \frac{W}{3} \right)^b \quad (1a)$$

$$\text{Annual } E_{\text{est}} = E [(365 - P)/365] \quad (2)$$

where E = Size-specific emission factor (lb/VMT) (Per AP-42 Table 13.2.2-2, November 2006)

k, a, b = Constants for equation 1a

k = 4.9 1.5 0.15

a = 0.7 0.9 0.9

b = 0.45 0.45 0.45

s = surface material silt content (%) (Silt content assumed as to be similar to Plant Road in Western Surface Coal Mining in AP-42, Section 13.2.4 (11/2006) per conversation with AMI, 10/14/22)

5.1

W = Mean vehicle weight (tons)

P = 62 Days per year with at least 0.01 inch precipitation, based on precipitation data from 2019-2021 for Hermosa Trench Met Station, using the lowest annual value between 2019-2021.

Table A-30a. Taylor Roads - Vehicles - Input Parameters

| Road Surface | Vehicle Type                               | Trip Type | Number of Vehicles | Trip Distance (miles/vehicle/day) | Vehicle Miles Travelled (VMT) |           |          | Uncontrolled Emission Factor (lb/VMT) |                   |                   |                  |                   |                   | Control  |                               |
|--------------|--------------------------------------------|-----------|--------------------|-----------------------------------|-------------------------------|-----------|----------|---------------------------------------|-------------------|-------------------|------------------|-------------------|-------------------|----------|-------------------------------|
|              |                                            |           |                    |                                   |                               |           |          | Short Term                            |                   |                   | Long Term        |                   |                   | Type     | Efficiency <sup>1,2</sup> (%) |
|              |                                            |           |                    |                                   | (VMT/hr)                      | (VMT/day) | (VMT/yr) | PM <sub>10</sub>                      | PM <sub>2.5</sub> | PM <sub>2.5</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | PM <sub>2.5</sub> |          |                               |
| Unpaved      | Dev Drill Rig                              | Round     | 3                  | 2                                 | 0.250                         | 6.00      | 2,190    | 7.43                                  | 1.52              | 0.15              | 6.17             | 1.58              | 0.16              | Watering | 90%                           |
| Unpaved      | Support Drill Rig                          | Round     | 5                  | 2                                 | 0.417                         | 10.00     | 3,650    | 7.81                                  | 2.01              | 0.20              | 6.48             | 1.67              | 0.17              | Watering | 90%                           |
| Unpaved      | Cable bolter                               | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 7.30                                  | 1.88              | 0.19              | 6.06             | 1.56              | 0.16              | Watering | 90%                           |
| Unpaved      | LHD (LH570)                                | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 9.66                                  | 2.49              | 0.25              | 8.02             | 2.07              | 0.21              | Watering | 90%                           |
| Unpaved      | Haul Truck                                 | Round     | 4                  | 20                                | 3.333                         | 80.00     | 29,200   | 13.50                                 | 3.48              | 0.35              | 11.20            | 2.89              | 0.29              | Watering | 90%                           |
| Unpaved      | Scissor lift                               | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 5.46                                  | 1.41              | 0.14              | 4.53             | 1.17              | 0.12              | Watering | 90%                           |
| Unpaved      | Light vehicle (general usage) Fleet 1      | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 5.73                                  | 1.48              | 0.15              | 4.76             | 1.23              | 0.12              | Watering | 90%                           |
| Unpaved      | Chamino Rig Fleet 1                        | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 5.73                                  | 1.48              | 0.15              | 4.76             | 1.23              | 0.12              | Watering | 90%                           |
| Unpaved      | LH Rig                                     | Round     | 6                  | 1                                 | 0.250                         | 6.00      | 2,190    | 6.89                                  | 1.78              | 0.18              | 5.72             | 1.48              | 0.15              | Watering | 90%                           |
| Unpaved      | LH Rig (One Passes/Geo)                    | Round     | 1                  | 1                                 | 0.042                         | 1.00      | 365      | 6.89                                  | 1.78              | 0.18              | 5.72             | 1.48              | 0.15              | Watering | 90%                           |
| Unpaved      | LHD (LH518B)                               | Round     | 5                  | 2                                 | 0.417                         | 10.00     | 3,650    | 11.61                                 | 2.99              | 0.30              | 9.63             | 2.49              | 0.25              | Watering | 90%                           |
| Unpaved      | Haul Trucks (Haul Loco)                    | Round     | 3                  | 20                                | 2.500                         | 60.00     | 21,900   | 14.31                                 | 3.69              | 0.37              | 11.88            | 3.06              | 0.31              | Watering | 90%                           |
| Unpaved      | Haul Trucks                                | Round     | 5                  | 20                                | 4.167                         | 100.00    | 36,500   | 14.31                                 | 3.69              | 0.37              | 11.88            | 3.06              | 0.31              | Watering | 90%                           |
| Unpaved      | Material transporter                       | Round     | 2                  | 4                                 | 0.500                         | 12.00     | 4,380    | 6.92                                  | 1.79              | 0.18              | 5.75             | 1.48              | 0.15              | Watering | 90%                           |
| Unpaved      | Light vehicle (general usage) Fleet 2      | Round     | 2                  | 4                                 | 0.333                         | 8.00      | 2,920    | 2.17                                  | 0.56              | 0.06              | 1.80             | 0.46              | 0.05              | Watering | 90%                           |
| Unpaved      | Chamino Rig Fleet 2                        | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 5.73                                  | 1.48              | 0.15              | 4.76             | 1.23              | 0.12              | Watering | 90%                           |
| Unpaved      | Personnel transporter                      | Round     | 3                  | 6                                 | 0.750                         | 18.00     | 6,570    | 5.84                                  | 1.51              | 0.15              | 4.85             | 1.25              | 0.13              | Watering | 90%                           |
| Unpaved      | Shotcreter                                 | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 6.30                                  | 1.62              | 0.16              | 5.23             | 1.35              | 0.13              | Watering | 90%                           |
| Unpaved      | Transmixer                                 | Round     | 4                  | 16                                | 2.667                         | 64.00     | 23,360   | 6.92                                  | 1.79              | 0.18              | 5.72             | 1.48              | 0.15              | Watering | 90%                           |
| Unpaved      | Water vehicle                              | Round     | 2                  | 6                                 | 0.500                         | 12.00     | 4,380    | 5.92                                  | 1.53              | 0.15              | 4.92             | 1.25              | 0.13              | Watering | 90%                           |
| Unpaved      | Mobile rockbreaker                         | Round     | 3                  | 0.0027                            | 0.0034                        | 0.01      | 3        | 6.25                                  | 1.61              | 0.16              | 5.19             | 1.34              | 0.13              | Watering | 90%                           |
| Unpaved      | Grader                                     | Round     | 2                  | 6                                 | 0.500                         | 12.00     | 4,380    | 6.33                                  | 1.63              | 0.16              | 5.26             | 1.36              | 0.14              | Watering | 90%                           |
| Unpaved      | Skid Steer                                 | Round     | 3                  | 1                                 | 0.125                         | 3.00      | 1,095    | 3.63                                  | 0.94              | 0.09              | 3.01             | 0.78              | 0.08              | Watering | 90%                           |
| Unpaved      | Light vehicle /tech service)               | Round     | 4                  | 2                                 | 0.333                         | 8.00      | 2,920    | 2.17                                  | 0.56              | 0.06              | 1.80             | 0.46              | 0.05              | Watering | 90%                           |
| Unpaved      | Material transporter (logistics/construct) | Round     | 2                  | 6                                 | 0.500                         | 12.00     | 4,380    | 6.92                                  | 1.79              | 0.18              | 5.75             | 1.48              | 0.15              | Watering | 90%                           |
| Unpaved      | Scissor lift (Construction)                | Round     | 2                  | 6                                 | 0.500                         | 12.00     | 4,380    | 5.46                                  | 1.41              | 0.14              | 4.53             | 1.17              | 0.12              | Watering | 90%                           |
| Unpaved      | Telehandler                                | Round     | 2                  | 2                                 | 0.250                         | 6.00      | 2,190    | 5.71                                  | 1.47              | 0.15              | 4.74             | 1.22              | 0.12              | Watering | 90%                           |
| Unpaved      | Maintenance Vehicle                        | Round     | 3                  | 4                                 | 0.500                         | 12.00     | 4,380    | 8.27                                  | 2.13              | 0.21              | 6.87             | 1.77              | 0.18              | Watering | 90%                           |
| Unpaved      | Fuel/Lube vehicle                          | Round     | 2                  | 8                                 | 0.667                         | 16.00     | 5,840    | 8.27                                  | 2.13              | 0.21              | 6.87             | 1.77              | 0.18              | Watering | 90%                           |
| Unpaved      | Mobile Granite equipment                   | Round     | 3                  | 0.1                               | 0.011                         | 0.30      | 110      | 5.17                                  | 1.33              | 0.13              | 4.29             | 1.11              | 0.11              | Watering | 90%                           |
| Unpaved      | Blind Bore Machine                         | Round     | 2                  | 1                                 | 0.083                         | 2.00      | 730      | 10.15                                 | 2.62              | 0.26              | 8.43             | 2.17              | 0.22              | Watering | 90%                           |

1. Road Watering is not contemplated every hour, but only as needed to maintain control levels.

2. At South32, the roads will be watered sufficiently to achieve a control efficiency of 90%  
Lead Content = 3.54E-03 kg/kg

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Table A-30b. Taylor Roads -Vehicles - Emissions

| Vehicle Type                                  | Road Surface | Uncontrolled Emissions         |                  |                   |             |                                |                  |                   |              |                              |                  |                   |             | Controlled Emissions           |                  |                   |                  |                                |                  |                   |                  |                           |                  |                   |                 |          |
|-----------------------------------------------|--------------|--------------------------------|------------------|-------------------|-------------|--------------------------------|------------------|-------------------|--------------|------------------------------|------------------|-------------------|-------------|--------------------------------|------------------|-------------------|------------------|--------------------------------|------------------|-------------------|------------------|---------------------------|------------------|-------------------|-----------------|----------|
|                                               |              | Hourly<br>(lb/hr) <sup>1</sup> |                  |                   |             | Daily<br>(lb/day) <sup>1</sup> |                  |                   |              | Annual<br>(tpy) <sup>2</sup> |                  |                   |             | Hourly<br>(lb/hr) <sup>1</sup> |                  |                   |                  | Daily<br>(lb/day) <sup>2</sup> |                  |                   |                  | Annual (tpy) <sup>2</sup> |                  |                   |                 |          |
|                                               |              | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead        | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead         | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead        | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead             | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead             | PM                        | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead            |          |
| Dev Drill Rig                                 | Unpaved      | 1.86                           | 0.48             | 0.05              | 6.58E-03    | 44.60                          | 11.50            | 1.15              | 0.16         | 6.76                         | 1.74             | 0.17              | 0.02        | 0.19                           | 0.05             | 0.00              | 6.58E-04         | 4.46                           | 1.15             | 0.12              | 1.58E-02         | 0.68                      | 0.17             | 0.02              | 2.38E-03        |          |
| Support Drill Rig                             | Unpaved      | 3.25                           | 0.84             | 0.08              | 0.01        | 78.07                          | 20.14            | 2.01              | 0.28         | 11.83                        | 3.05             | 0.31              | 0.04        | 0.33                           | 0.08             | 0.01              | 1.15E-03         | 7.81                           | 2.01             | 0.20              | 2.76E-02         | 1.18                      | 0.31             | 0.03              | 4.19E-03        |          |
| Cable boiler                                  | Unpaved      | 1.22                           | 0.31             | 0.03              | 4.31E-03    | 29.21                          | 7.54             | 0.75              | 0.10         | 4.43                         | 1.14             | 0.11              | 0.02        | 0.12                           | 0.03             | 0.00              | 4.31E-04         | 2.92                           | 0.75             | 0.08              | 1.03E-02         | 0.44                      | 0.11             | 0.01              | 1.57E-03        |          |
| ULD (LHS/7)                                   | Unpaved      | 1.61                           | 0.42             | 0.04              | 5.70E-03    | 38.61                          | 9.96             | 1.00              | 0.14         | 5.85                         | 1.51             | 0.15              | 0.02        | 0.16                           | 0.04             | 0.00              | 5.70E-04         | 3.86                           | 1.00             | 0.10              | 1.37E-02         | 0.59                      | 0.15             | 0.02              | 2.07E-03        |          |
| Haul Truck                                    | Unpaved      | 44.99                          | 11.60            | 1.16              | 0.16        | 1079.65                        | 278.52           | 27.85             | 3.82         | 163.57                       | 42.30            | 4.22              | 0.58        | 4.50                           | 1.16             | 0.12              | 1.59E-02         | 107.96                         | 27.85            | 2.79              | 3.82E-01         | 16.36                     | 4.22             | 0.42              | 5.79E-02        |          |
| Scissor lift                                  | Unpaved      | 0.91                           | 0.23             | 0.02              | 3.22E-03    | 21.84                          | 5.63             | 0.56              | 0.08         | 3.31                         | 0.85             | 0.09              | 0.01        | 0.09                           | 0.02             | 0.00              | 3.22E-04         | 2.18                           | 0.56             | 0.05              | 7.73E-03         | 0.33                      | 0.09             | 0.01              | 1.17E-03        |          |
| Light vehicle (general usage)                 | Unpaved      | 0.36                           | 0.09             | 0.01              | 1.28E-03    | 8.66                           | 2.23             | 0.22              | 0.03         | 1.31                         | 0.34             | 0.03              | 4.65E-03    | 0.04                           | 0.01             | 0.00              | 1.28E-04         | 0.87                           | 0.22             | 0.02              | 3.67E-03         | 0.13                      | 0.03             | 0.00              | 4.69E-04        |          |
| Fleet 1                                       | Unpaved      | 0.96                           | 0.25             | 0.02              | 3.38E-03    | 22.93                          | 5.92             | 0.59              | 0.08         | 3.47                         | 0.90             | 0.09              | 0.01        | 0.10                           | 0.02             | 0.00              | 3.38E-04         | 2.29                           | 0.59             | 0.06              | 8.12E-03         | 0.35                      | 0.09             | 0.01              | 1.23E-03        |          |
| Charanno Rio Fleet 1                          | Unpaved      | 1.72                           | 0.44             | 0.04              | 6.10E-03    | 41.37                          | 10.67            | 1.07              | 0.15         | 6.27                         | 1.62             | 0.16              | 0.02        | 0.17                           | 0.04             | 0.00              | 6.10E-04         | 4.14                           | 1.07             | 0.11              | 1.46E-02         | 0.63                      | 0.16             | 0.02              | 2.22E-03        |          |
| LH Rig (On Pavement/Gravel)                   | Unpaved      | 0.29                           | 0.07             | 0.01              | 1.02E-03    | 1.89                           | 1.78             | 0.18              | 0.02         | 1.04                         | 0.27             | 0.03              | 3.79E-03    | 0.03                           | 0.01             | 0.00              | 1.02E-04         | 0.69                           | 0.18             | 0.02              | 2.44E-03         | 0.10                      | 0.03             | 0.00              | 3.79E-04        |          |
| LH Rig (LHS/BB)                               | Unpaved      | 4.84                           | 1.25             | 0.12              | 0.02        | 116.06                         | 29.94            | 2.99              | 0.41         | 17.58                        | 4.54             | 0.45              | 0.06        | 0.48                           | 0.12             | 0.01              | 1.71E-03         | 116.1                          | 29.94            | 0.63              | 2.44E-01         | 1.76                      | 0.45             | 0.05              | 6.23E-03        |          |
| Haul Trucks (Haul Loose)                      | Unpaved      | 35.77                          | 9.23             | 0.92              | 0.13        | 858.46                         | 221.46           | 22.15             | 3.04         | 130.06                       | 33.55            | 3.36              | 0.46        | 3.58                           | 0.92             | 0.09              | 1.27E-02         | 85.85                          | 22.15            | 2.21              | 3.04E-01         | 13.01                     | 3.36             | 0.34              | 4.61E-02        |          |
| Haul Trucks                                   | Unpaved      | 59.62                          | 15.38            | 1.54              | 0.21        | 1430.77                        | 369.10           | 36.91             | 5.07         | 216.76                       | 55.92            | 5.59              | 0.77        | 5.96                           | 1.54             | 0.15              | 2.11E-02         | 143.08                         | 36.91            | 3.69              | 5.07E-01         | 21.68                     | 5.59             | 0.56              | 7.68E-02        |          |
| Material transporter                          | Unpaved      | 3.46                           | 0.89             | 0.09              | 0.01        | 83.07                          | 21.43            | 2.14              | 0.29         | 12.59                        | 3.25             | 0.32              | 0.04        | 0.35                           | 0.09             | 0.01              | 1.23E-03         | 8.31                           | 2.14             | 0.21              | 2.94E-02         | 1.26                      | 0.32             | 0.03              | 4.46E-03        |          |
| Light vehicle (general usage)                 | Unpaved      | 0.72                           | 0.19             | 0.02              | 2.56E-03    | 17.33                          | 4.47             | 0.45              | 0.06         | 2.62                         | 0.68             | 0.07              | 9.29E-03    | 0.07                           | 0.02             | 0.00              | 2.56E-04         | 1.73                           | 0.45             | 0.04              | 6.14E-03         | 0.26                      | 0.07             | 0.01              | 9.29E-04        |          |
| Fleet 2                                       | Unpaved      | 0.96                           | 0.25             | 0.02              | 3.38E-03    | 22.93                          | 5.92             | 0.59              | 0.08         | 3.47                         | 0.90             | 0.09              | 0.01        | 0.10                           | 0.02             | 0.00              | 3.38E-04         | 2.29                           | 0.59             | 0.06              | 8.12E-03         | 0.35                      | 0.09             | 0.01              | 1.23E-03        |          |
| Charanno Rio Fleet 2                          | Unpaved      | 4.98                           | 1.13             | 0.11              | 0.02        | 105.08                         | 27.11            | 2.71              | 0.37         | 15.92                        | 4.11             | 0.41              | 0.06        | 0.44                           | 0.11             | 0.01              | 1.55E-03         | 105.1                          | 27.11            | 0.76              | 2.71E-01         | 1.59                      | 0.41             | 0.04              | 5.64E-03        |          |
| Personnel transporter                         | Unpaved      | 1.05                           | 0.27             | 0.03              | 3.72E-03    | 25.20                          | 6.50             | 0.65              | 0.09         | 3.82                         | 0.98             | 0.10              | 0.01        | 0.10                           | 0.03             | 0.00              | 3.72E-04         | 2.52                           | 0.65             | 0.06              | 8.52E-03         | 0.38                      | 0.10             | 0.01              | 1.35E-03        |          |
| Shovelcrane                                   | Unpaved      | 18.46                          | 4.76             | 0.48              | 0.07        | 443.04                         | 114.29           | 11.43             | 1.57         | 67.12                        | 17.32            | 1.73              | 0.24        | 1.85                           | 0.48             | 0.05              | 6.54E-03         | 44.30                          | 11.43            | 1.14              | 1.57E-01         | 6.71                      | 1.73             | 0.17              | 2.38E-02        |          |
| Water vehicle                                 | Unpaved      | 2.86                           | 0.76             | 0.08              | 0.01        | 71.08                          | 18.34            | 1.83              | 0.25         | 10.77                        | 2.78             | 0.28              | 0.04        | 0.30                           | 0.08             | 0.01              | 1.05E-03         | 7.11                           | 1.83             | 0.18              | 2.53E-02         | 1.08                      | 0.28             | 0.03              | 3.81E-03        |          |
| Mobile rockbreaker                            | Unpaved      | 0.00                           | 0.00             | 0.00              | 7.58E-06    | 0.05                           | 0.01             | 0.00              | 0.00         | 1.82E-04                     | 0.01             | 0.00              | 0.00        | 2.76E-05                       | 0.00             | 0.00              | 0.00             | 7.58E-07                       | 0.01             | 0.00              | 0.00             | 1.82E-05                  | 0.00             | 0.00              | 0.00            | 2.76E-06 |
| Grader                                        | Unpaved      | 3.17                           | 0.82             | 0.08              | 0.01        | 75.57                          | 19.60            | 1.96              | 0.27         | 11.51                        | 2.97             | 0.30              | 0.04        | 0.32                           | 0.08             | 0.01              | 1.12E-03         | 7.60                           | 1.96             | 0.20              | 2.66E-02         | 1.15                      | 0.30             | 0.03              | 4.06E-03        |          |
| Skid Steer                                    | Unpaved      | 0.45                           | 0.12             | 0.01              | 1.61E-03    | 10.89                          | 2.81             | 0.28              | 0.04         | 1.65                         | 0.43             | 0.04              | 5.84E-03    | 0.05                           | 0.01             | 0.00              | 1.61E-04         | 1.09                           | 0.28             | 0.03              | 3.86E-03         | 0.17                      | 0.04             | 0.00              | 5.84E-04        |          |
| Light vehicle (tech services)                 | Unpaved      | 0.72                           | 0.19             | 0.02              | 2.56E-03    | 17.33                          | 4.47             | 0.45              | 0.06         | 2.62                         | 0.68             | 0.07              | 9.29E-03    | 0.07                           | 0.02             | 0.00              | 2.56E-04         | 1.73                           | 0.45             | 0.04              | 6.14E-03         | 0.26                      | 0.07             | 0.01              | 9.29E-04        |          |
| Material transporter (logistics/Construction) | Unpaved      | 3.46                           | 0.89             | 0.09              | 0.01        | 83.07                          | 21.43            | 2.14              | 0.29         | 12.59                        | 3.25             | 0.32              | 0.04        | 0.35                           | 0.09             | 0.01              | 1.23E-03         | 8.31                           | 2.14             | 0.21              | 2.94E-02         | 1.26                      | 0.32             | 0.03              | 4.46E-03        |          |
| Scissor lift (Construction)                   | Unpaved      | 2.73                           | 0.70             | 0.07              | 9.67E-03    | 65.52                          | 16.90            | 1.69              | 0.23         | 9.93                         | 2.56             | 0.26              | 0.04        | 0.27                           | 0.07             | 0.01              | 9.67E-04         | 6.55                           | 1.69             | 0.17              | 2.32E-02         | 0.99                      | 0.26             | 0.03              | 3.51E-03        |          |
| Telehandler                                   | Unpaved      | 1.43                           | 0.37             | 0.04              | 5.05E-03    | 34.26                          | 8.84             | 0.88              | 0.12         | 5.19                         | 1.34             | 0.13              | 0.02        | 0.14                           | 0.04             | 0.00              | 5.05E-04         | 3.43                           | 0.88             | 0.09              | 1.21E-02         | 0.52                      | 0.13             | 0.01              | 1.84E-03        |          |
| Maintenance Vehicle                           | Unpaved      | 4.14                           | 1.07             | 0.11              | 0.01        | 99.29                          | 25.61            | 2.56              | 0.35         | 15.04                        | 3.88             | 0.39              | 0.05        | 0.41                           | 0.11             | 0.01              | 1.47E-03         | 9.93                           | 2.56             | 0.26              | 3.52E-02         | 1.50                      | 0.39             | 0.04              | 5.33E-03        |          |
| Fuel/Lube vehicle                             | Unpaved      | 3.52                           | 1.42             | 0.14              | 0.02        | 131.39                         | 34.15            | 3.42              | 0.47         | 20.06                        | 5.17             | 0.52              | 0.07        | 0.55                           | 0.14             | 0.01              | 1.92E-03         | 131.4                          | 34.15            | 0.74              | 4.68E-02         | 2.01                      | 0.52             | 0.05              | 7.10E-03        |          |
| Mobile Grapple equipment                      | Unpaved      | 0.06                           | 0.02             | 0.00              | 2.70E-04    | 0.15                           | 0.40             | 0.04              | 5.49E-03     | 0.23                         | 0.06             | 0.01              | 8.72E-04    | 0.01                           | 0.00             | 0.00              | 2.70E-05         | 0.16                           | 0.04             | 0.00              | 5.49E-04         | 0.02                      | 0.01             | 0.00              | 8.72E-05        |          |
| Blind Bore Machine                            | Unpaved      | 0.85                           | 0.22             | 0.02              | 3.00E-03    | 20.31                          | 5.24             | 0.52              | 0.07         | 3.08                         | 0.79             | 0.08              | 0.01        | 0.08                           | 0.02             | 0.00              | 3.00E-04         | 2.03                           | 0.52             | 0.05              | 7.19E-03         | 0.31                      | 0.08             | 0.01              | 1.09E-03        |          |
| <b>Total Emissions</b>                        |              | <b>211.89</b>                  | <b>54.66</b>     | <b>5.47</b>       | <b>0.75</b> | <b>5,085.46</b>                | <b>1,311.91</b>  | <b>131.19</b>     | <b>18.01</b> | <b>770.45</b>                | <b>198.75</b>    | <b>19.88</b>      | <b>2.73</b> | <b>21.19</b>                   | <b>5.47</b>      | <b>0.55</b>       | <b>7,500E-02</b> | <b>508.55</b>                  | <b>131.19</b>    | <b>13.12</b>      | <b>1,860E-00</b> | <b>77.04</b>              | <b>19.88</b>     | <b>1.99</b>       | <b>2.73E-01</b> |          |

1. Controlled hourly and daily emissions calculated based on short term emission factors and control efficiency.  
2. Controlled annual emissions calculated based on long term emission factors and control efficiency.

Mine Development  
UG Clark Roads - Inputs

Table A-31. Clark Emission Factor Inputs

| Table A-5.1. Clark Emission Factor Inputs |                    |        |       |                   |               |                   |                                                        |                  |                   |          |       |     |           |     |                  |                   |      |                  |                   |  |
|-------------------------------------------|--------------------|--------|-------|-------------------|---------------|-------------------|--------------------------------------------------------|------------------|-------------------|----------|-------|-----|-----------|-----|------------------|-------------------|------|------------------|-------------------|--|
| Road Surface                              | Max Miles Traveled |        |       | Vehicle Type      | Vehicle Model | Max Vehicle Count | Particulate Matter Emission Factor Inputs <sup>1</sup> |                  |                   |          |       |     |           |     |                  |                   |      |                  |                   |  |
|                                           | Day                | Month  | Year  |                   |               |                   | k                                                      |                  |                   | p        |       | s   |           |     | a                |                   |      | b                |                   |  |
|                                           |                    |        |       |                   |               |                   | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Avg (kg) | (ton) | (%) | (days/yr) | PM  | PM <sub>10</sub> | PM <sub>2.5</sub> | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> |  |
| Unpaved                                   | 8                  | 243.3  | 2920  | Jumbo             | DD422i        | 2                 | 4.9                                                    | 1.5              | 0.15              | 26,000   | 28.7  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 8                  | 243.3  | 2920  | Bolter            | DD411         | 3                 | 4.9                                                    | 1.5              | 0.15              | 23,000   | 25.4  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 60                 | 1825.0 | 21900 | Haul Truck        | TH430         | 5                 | 4.9                                                    | 1.5              | 0.15              | 44,500   | 49.1  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 16                 | 486.7  | 5840  | LHD               | LH410         | 4                 | 4.9                                                    | 1.5              | 0.15              | 33,500   | 36.9  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 8                  | 243.3  | 2920  | Production Drill  | Simba ME7C    | 2                 | 4.9                                                    | 1.5              | 0.15              | 29,500   | 32.5  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 8                  | 243.3  | 2920  | Slot-Raise Drill  | Easer L       | 1                 | 4.9                                                    | 1.5              | 0.15              | 37,300   | 41.1  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 8                  | 243.3  | 2920  | Blockholer        | BH3           | 1                 | 4.9                                                    | 1.5              | 0.15              | 28,000   | 30.9  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 16                 | 486.7  | 5840  | Powder Truck      | EC3           | 2                 | 4.9                                                    | 1.5              | 0.15              | 17,950   | 19.8  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 16                 | 486.7  | 5840  | Grader            | 120 AWD       | 1                 | 4.9                                                    | 1.5              | 0.15              | 16,700   | 18.4  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 16                 | 486.7  | 5840  | Lube Truck        | FL3           | 1                 | 4.9                                                    | 1.5              | 0.15              | 13,600   | 15.0  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 16                 | 486.7  | 5840  | Shotcrete Sprayer | SSX & SS3 T4F | 1                 | 4.9                                                    | 1.5              | 0.15              | 19,200   | 21.2  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 16                 | 486.7  | 5840  | Transit Mixer     | TM3           | 2                 | 4.9                                                    | 1.5              | 0.15              | 25,050   | 27.6  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 16                 | 486.7  | 5840  | Scissor Deck      | SL3           | 2                 | 4.9                                                    | 1.5              | 0.15              | 15,400   | 17.0  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 16                 | 486.7  | 5840  | Boom Truck        | BT3           | 1                 | 4.9                                                    | 1.5              | 0.15              | 17,300   | 19.1  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 16                 | 486.7  | 5840  | Light Vehicle     | F-250         | 6                 | 4.9                                                    | 1.5              | 0.15              | 3,750    | 4.1   | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |
| Unpaved                                   | 24                 | 730.0  | 8760  | Water Vehicle     | WS3           | 1                 | 4.9                                                    | 1.5              | 0.15              | 16,100   | 17.7  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |  |

<sup>1</sup> Emission factors for vehicular traffic on unpaved roads per U.S. EPA AP-42, Section 13.2.2 (Unpaved Roads), November 2006.

Short-Term  $E = k (g/12)^a (W/3)^b$  (1a)

Annual  $E_{\text{adj}} = E [(365 - P)/365]$  (2)

where E = Size-specific emission factor (lb/VMT)  
k, a, b = Constants for equation 1a

|     | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> |
|-----|------|------------------|-------------------|
| k = | 4.9  | 1.5              | 0.15              |
| a = | 0.7  | 0.9              | 0.9               |
| b = | 0.45 | 0.45             | 0.45              |

Per AP-42 Table 13.2.2-2, November 2006

s = surface material silt content (%), per AP-42 Table 13.2.2-1, 11/06, Western surface coal mining Plant Road 5.1

W = Mean vehicle weight (tons)

P = Days per year with at least 0.01 inch precipitation, based on precipitation data from 2019-2021 for Hermosa Trench Met Station, using the lowest annual value between 2019-2021.

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UG Clark Roads EF**

**Table A-32. Clark Underground Roads - Emission Factors**

| Road Surface | Vehicle Type      | Averaging Period | Emission Factor <sup>1</sup> |                  |                   |        | Process Rate Unit | Particulate Matter Emission Factor Inputs <sup>1</sup> |                  |                   |       |      |           |      |                  |                   |      |                  |                   | Reference                                                                                           |   |  |  |
|--------------|-------------------|------------------|------------------------------|------------------|-------------------|--------|-------------------|--------------------------------------------------------|------------------|-------------------|-------|------|-----------|------|------------------|-------------------|------|------------------|-------------------|-----------------------------------------------------------------------------------------------------|---|--|--|
|              |                   |                  | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Unit   |                   | k                                                      |                  |                   | W     |      |           | P    |                  |                   | a    |                  |                   |                                                                                                     | b |  |  |
|              |                   |                  |                              |                  |                   |        |                   | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | (ton) | (%)  | (days/yr) | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> |                                                                                                     |   |  |  |
| Unpaved      | Jumbo             | Hourly/Daily     | 7.43                         | 1.92             | 0.19              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 28.66 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              | AP-42, Section 13.2.2, Expression 1a (11/06)<br>AP-42, Section 13.2.2, Expressions 1a and 2 (11/06) |   |  |  |
| Unpaved      | Jumbo             | Annual           | 6.17                         | 1.59             | 0.16              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Bolter            | Hourly/Daily     | 7.03                         | 1.81             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 25.35 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Bolter            | Annual           | 5.84                         | 1.51             | 0.15              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Haul Truck        | Hourly/Daily     | 9.47                         | 2.44             | 0.24              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 49.05 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Haul Truck        | Annual           | 7.86                         | 2.03             | 0.20              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | LHD               | Hourly/Daily     | 8.33                         | 2.15             | 0.21              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 36.93 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | LHD               | Annual           | 6.92                         | 1.78             | 0.18              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Production Drill  | Hourly/Daily     | 7.87                         | 2.03             | 0.20              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 32.52 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Production Drill  | Annual           | 6.53                         | 1.68             | 0.17              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Slot-Raise Drill  | Hourly/Daily     | 8.74                         | 2.26             | 0.23              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 41.12 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Slot-Raise Drill  | Annual           | 7.26                         | 1.87             | 0.19              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Blockholer        | Hourly/Daily     | 7.68                         | 1.98             | 0.20              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 30.86 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Blockholer        | Annual           | 6.38                         | 1.65             | 0.16              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Powder Truck      | Hourly/Daily     | 6.29                         | 1.62             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 19.79 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Powder Truck      | Annual           | 5.22                         | 1.35             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Grader            | Hourly/Daily     | 6.09                         | 1.57             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 18.41 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Grader            | Annual           | 5.06                         | 1.30             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Lube Truck        | Hourly/Daily     | 5.55                         | 1.43             | 0.14              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 14.99 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Lube Truck        | Annual           | 4.61                         | 1.19             | 0.12              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Shotcrete Sprayer | Hourly/Daily     | 6.48                         | 1.67             | 0.17              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 21.16 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Shotcrete Sprayer | Annual           | 5.38                         | 1.39             | 0.14              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Transit Mixer     | Hourly/Daily     | 7.31                         | 1.89             | 0.19              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 27.61 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Transit Mixer     | Annual           | 6.07                         | 1.57             | 0.16              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Scissor Deck      | Hourly/Daily     | 5.87                         | 1.51             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 16.98 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Scissor Deck      | Annual           | 4.87                         | 1.26             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Boom Truck        | Hourly/Daily     | 6.19                         | 1.60             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 19.07 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Boom Truck        | Annual           | 5.14                         | 1.33             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Light Vehicle     | Hourly/Daily     | 3.11                         | 0.80             | 0.08              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 4.13  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Light Vehicle     | Annual           | 2.58                         | 0.67             | 0.07              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |
| Unpaved      | Water Vehicle     | Hourly/Daily     | 5.99                         | 1.55             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 17.75 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |   |  |  |
| Unpaved      | Water Vehicle     | Annual           | 4.97                         | 1.28             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |   |  |  |

<sup>1</sup> Emission factors for vehicular traffic on unpaved roads per U.S. EPA AP-42, Section 13.2.2 (Unpaved Roads), November 2006.

$$\text{Short-Term } E = k \left( \frac{a}{12} \right)^b (W/3)^b \quad (1a)$$

$$\text{Annual } E_{\text{est}} = E \left[ \frac{365 - P}{365} \right] \quad (2)$$

where E = Size-specific emission factor (lb/VMT)

k, a, b = Constants for equation 1a

PM PM<sub>10</sub> PM<sub>2.5</sub>

k = 4.9 1.5 0.15

a = 0.7 0.9 0.9

b = 0.45 0.45 0.45

Per AP-42 Table 13.2.2-2, November 2006

s = surface material silt content (%)

5.1

Silt content assumed as to be similar to Plant Road in Western Surface Coal Mining in AP-42, Section 13.2.4 (11/2006) per conversation with AMI, 10/14/22.

W = Mean vehicle weight (tons)

P = Days per year with at least 0.01 inch precipitation, based on precipitation data from 2019-2021 for Hermosa Trench Met Station, using the lowest annual value between 2019-2021.

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Table A-33a. Clark Roads - Vehicles - Input Parameters

| Road Surface | Vehicle Type      | Trip Type | Number of Vehicles | Trip Distance (miles/vehicle/day) | Vehicle Miles Travelled (VMT) |           |          | Uncontrolled Emission Factor (lb/VMT) |                  |                   |           |                  |                   | Control  |                               |
|--------------|-------------------|-----------|--------------------|-----------------------------------|-------------------------------|-----------|----------|---------------------------------------|------------------|-------------------|-----------|------------------|-------------------|----------|-------------------------------|
|              |                   |           |                    |                                   |                               |           |          | Short Term                            |                  |                   | Long Term |                  |                   | Type     | Efficiency <sup>1,2</sup> (%) |
|              |                   |           |                    |                                   | (VMT/hr)                      | (VMT/day) | (VMT/yr) | PM                                    | PM <sub>10</sub> | PM <sub>2.5</sub> | PM        | PM <sub>10</sub> | PM <sub>2.5</sub> |          |                               |
| Unpaved      | Jumbo             | Round     | 2                  | 8                                 | 0.667                         | 16.00     | 5,840    | 7.43                                  | 1.92             | 0.19              | 6.17      | 1.59             | 0.16              | Watering | 90%                           |
| Unpaved      | Boiler            | Round     | 3                  | 8                                 | 1.000                         | 24.00     | 8,760    | 7.03                                  | 1.81             | 0.18              | 5.84      | 1.51             | 0.15              | Watering | 90%                           |
| Unpaved      | Haul Truck        | Round     | 5                  | 60                                | 12.500                        | 300.00    | 109,500  | 9.47                                  | 2.44             | 0.24              | 7.86      | 2.03             | 0.20              | Watering | 90%                           |
| Unpaved      | LHD               | Round     | 4                  | 16                                | 2.667                         | 64.00     | 23,360   | 8.33                                  | 2.15             | 0.21              | 6.92      | 1.78             | 0.18              | Watering | 90%                           |
| Unpaved      | Production Drill  | Round     | 2                  | 8                                 | 0.667                         | 16.00     | 5,840    | 7.87                                  | 2.03             | 0.20              | 6.53      | 1.68             | 0.17              | Watering | 90%                           |
| Unpaved      | Sage-Baker Drill  | Round     | 1                  | 8                                 | 0.333                         | 8.00      | 2,920    | 8.74                                  | 2.26             | 0.23              | 7.26      | 1.87             | 0.19              | Watering | 90%                           |
| Unpaved      | Blockholer        | Round     | 1                  | 8                                 | 0.333                         | 8.00      | 2,920    | 7.68                                  | 1.98             | 0.20              | 6.38      | 1.65             | 0.16              | Watering | 90%                           |
| Unpaved      | Powder Truck      | Round     | 2                  | 16                                | 1.333                         | 32.00     | 11,680   | 6.29                                  | 1.62             | 0.16              | 5.22      | 1.35             | 0.13              | Watering | 90%                           |
| Unpaved      | Grader            | Round     | 1                  | 16                                | 0.667                         | 16.00     | 5,840    | 6.09                                  | 1.57             | 0.16              | 5.06      | 1.30             | 0.13              | Watering | 90%                           |
| Unpaved      | Lube Truck        | Round     | 1                  | 16                                | 0.667                         | 16.00     | 5,840    | 5.55                                  | 1.43             | 0.14              | 4.61      | 1.19             | 0.12              | Watering | 90%                           |
| Unpaved      | Shotcrete Sprayer | Round     | 1                  | 16                                | 0.667                         | 16.00     | 5,840    | 6.48                                  | 1.67             | 0.17              | 5.38      | 1.39             | 0.14              | Watering | 90%                           |
| Unpaved      | Transit Mixer     | Round     | 2                  | 16                                | 1.333                         | 32.00     | 11,680   | 7.31                                  | 1.89             | 0.19              | 6.07      | 1.57             | 0.16              | Watering | 90%                           |
| Unpaved      | Scissor Deck      | Round     | 2                  | 16                                | 1.333                         | 32.00     | 11,680   | 5.87                                  | 1.51             | 0.15              | 4.87      | 1.26             | 0.13              | Watering | 90%                           |
| Unpaved      | Boom Truck        | Round     | 1                  | 16                                | 0.667                         | 16.00     | 5,840    | 6.19                                  | 1.60             | 0.16              | 5.14      | 1.33             | 0.13              | Watering | 90%                           |
| Unpaved      | Light Vehicle     | Round     | 6                  | 16                                | 4.000                         | 96.00     | 35,040   | 3.11                                  | 0.80             | 0.08              | 2.58      | 0.67             | 0.07              | Watering | 90%                           |
| Unpaved      | Water Vehicle     | Round     | 1                  | 24                                | 1.000                         | 24.00     | 8,760    | 5.99                                  | 1.55             | 0.15              | 4.97      | 1.28             | 0.13              | Watering | 90%                           |

1. Road Watering is not contemplated every hour, but only as needed to maintain control levels.

2. At South32, the roads will be watered sufficiently to achieve a control efficiency of 90%

Lead Content = 5.67E-03 kg/kg

Table A-33b. Clark Roads -Vehicles - Emissions

| Vehicle Type      | Road Surface | Uncontrolled Emissions         |                  |                   |          |                                |                  |                   |          |                              |                  |                   |          | Controlled Emissions           |                  |                   |          |                                |                  |                   |          |                              |                  |                   |          |
|-------------------|--------------|--------------------------------|------------------|-------------------|----------|--------------------------------|------------------|-------------------|----------|------------------------------|------------------|-------------------|----------|--------------------------------|------------------|-------------------|----------|--------------------------------|------------------|-------------------|----------|------------------------------|------------------|-------------------|----------|
|                   |              | Hourly<br>(lb/hr) <sup>1</sup> |                  |                   |          | Daily<br>(lb/day) <sup>1</sup> |                  |                   |          | Annual<br>(tpy) <sup>1</sup> |                  |                   |          | Hourly<br>(lb/hr) <sup>1</sup> |                  |                   |          | Daily<br>(lb/day) <sup>1</sup> |                  |                   |          | Annual<br>(tpy) <sup>1</sup> |                  |                   |          |
|                   |              | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     |
| Junco             | Unpaved      | 4.96                           | 1.28             | 0.13              | 0.03     | 118.92                         | 30.68            | 3.07              | 0.67     | 18.02                        | 4.65             | 0.46              | 0.10     | 0.50                           | 0.13             | 0.01              | 2.81E-03 | 11.89                          | 3.07             | 0.31              | 6.74E-02 | 1.80                         | 0.46             | 0.05              | 1.02E-02 |
| Boter             | Unpaved      | 7.03                           | 1.81             | 0.18              | 0.04     | 168.81                         | 43.55            | 4.35              | 0.96     | 25.57                        | 6.60             | 0.66              | 0.14     | 0.70                           | 0.18             | 0.02              | 3.98E-03 | 16.88                          | 4.35             | 0.44              | 9.57E-02 | 2.56                         | 0.66             | 0.07              | 1.45E-02 |
| Haul Truck        | Unpaved      | 118.32                         | 30.52            | 3.05              | 0.67     | 2839.78                        | 723.58           | 73.26             | 16.10    | 430.23                       | 110.99           | 11.10             | 2.44     | 11.83                          | 3.05             | 0.31              | 6.71E-02 | 283.98                         | 73.26            | 7.33              | 1.61E+00 | 43.02                        | 11.10            | 1.11              | 2.44E-01 |
| LHD               | Unpaved      | 22.21                          | 5.73             | 0.57              | 0.13     | 533.15                         | 137.54           | 13.75             | 3.02     | 80.77                        | 20.84            | 2.08              | 0.46     | 2.22                           | 0.57             | 0.06              | 1.26E-02 | 53.32                          | 13.75            | 1.38              | 3.02E-01 | 8.08                         | 2.08             | 0.21              | 4.58E-02 |
| Production Drill  | Unpaved      | 5.24                           | 1.35             | 0.14              | 0.03     | 125.88                         | 32.47            | 3.25              | 0.71     | 19.07                        | 4.92             | 0.49              | 0.11     | 0.52                           | 0.14             | 0.01              | 2.97E-03 | 12.59                          | 3.25             | 0.32              | 7.14E-02 | 1.91                         | 0.49             | 0.05              | 1.08E-02 |
| Slot-Raise Drill  | Unpaved      | 2.91                           | 0.75             | 0.08              | 0.02     | 69.95                          | 18.04            | 1.80              | 0.40     | 10.60                        | 2.73             | 0.27              | 0.06     | 0.29                           | 0.08             | 0.01              | 1.65E-03 | 6.99                           | 1.80             | 0.18              | 3.97E-02 | 1.06                         | 0.27             | 0.03              | 6.01E-03 |
| Backhoe           | Unpaved      | 2.56                           | 0.66             | 0.07              | 0.01     | 61.48                          | 15.86            | 1.59              | 0.35     | 9.31                         | 2.40             | 0.24              | 0.05     | 0.26                           | 0.07             | 0.01              | 1.45E-03 | 6.15                           | 1.59             | 0.16              | 3.49E-02 | 0.93                         | 0.24             | 0.02              | 5.38E-03 |
| Powder Truck      | Unpaved      | 8.39                           | 2.16             | 0.22              | 0.05     | 201.32                         | 51.93            | 5.19              | 1.14     | 30.50                        | 7.87             | 0.79              | 0.17     | 0.84                           | 0.22             | 0.02              | 4.76E-03 | 20.13                          | 5.19             | 0.52              | 1.14E-01 | 3.05                         | 0.79             | 0.08              | 1.73E-02 |
| Grader            | Unpaved      | 4.06                           | 1.05             | 0.10              | 0.02     | 97.44                          | 25.14            | 2.51              | 0.55     | 14.76                        | 3.81             | 0.38              | 0.08     | 0.41                           | 0.10             | 0.01              | 2.30E-03 | 9.74                           | 2.51             | 0.25              | 5.52E-02 | 1.48                         | 0.38             | 0.04              | 8.37E-03 |
| Lube Truck        | Unpaved      | 3.70                           | 0.95             | 0.10              | 0.02     | 88.94                          | 22.92            | 2.29              | 0.50     | 13.46                        | 3.47             | 0.35              | 0.08     | 0.37                           | 0.10             | 0.01              | 2.10E-03 | 8.89                           | 2.29             | 0.23              | 5.04E-02 | 1.35                         | 0.35             | 0.03              | 7.63E-03 |
| Shotcrete Sprayer | Unpaved      | 4.32                           | 1.12             | 0.11              | 0.02     | 103.75                         | 26.77            | 2.68              | 0.59     | 15.72                        | 4.06             | 0.41              | 0.09     | 0.43                           | 0.11             | 0.01              | 2.45E-03 | 10.38                          | 2.68             | 0.27              | 5.88E-02 | 1.57                         | 0.41             | 0.04              | 8.91E-03 |
| Transit Mixer     | Unpaved      | 9.75                           | 2.51             | 0.25              | 0.06     | 233.89                         | 60.34            | 6.03              | 1.33     | 35.43                        | 9.14             | 0.91              | 0.20     | 0.97                           | 0.25             | 0.03              | 5.52E-03 | 23.39                          | 6.03             | 0.60              | 1.33E-01 | 3.54                         | 0.91             | 0.09              | 2.01E-02 |
| Scissor Deck      | Unpaved      | 7.83                           | 2.02             | 0.20              | 0.04     | 187.90                         | 48.47            | 4.85              | 1.07     | 28.47                        | 7.34             | 0.73              | 0.16     | 0.78                           | 0.20             | 0.02              | 4.44E-03 | 18.79                          | 4.85             | 0.48              | 1.07E-01 | 2.85                         | 0.73             | 0.07              | 1.61E-02 |
| Boom Truck        | Unpaved      | 4.13                           | 1.06             | 0.11              | 0.02     | 99.00                          | 25.54            | 2.55              | 0.56     | 15.00                        | 3.87             | 0.39              | 0.09     | 0.41                           | 0.11             | 0.01              | 2.34E-03 | 9.90                           | 2.55             | 0.26              | 5.61E-02 | 1.50                         | 0.39             | 0.04              | 8.50E-03 |
| Light Vehicle     | Unpaved      | 12.44                          | 3.21             | 0.32              | 0.07     | 298.53                         | 77.01            | 7.70              | 1.69     | 45.23                        | 11.67            | 1.17              | 0.26     | 1.24                           | 0.32             | 0.03              | 7.05E-03 | 29.85                          | 7.70             | 0.77              | 1.69E-01 | 4.52                         | 1.17             | 0.12              | 2.56E-02 |
| Water Vehicle     | Unpaved      | 5.99                           | 1.55             | 0.15              | 0.03     | 143.78                         | 37.09            | 3.71              | 0.82     | 21.78                        | 5.62             | 0.56              | 0.12     | 0.60                           | 0.15             | 0.02              | 3.40E-03 | 14.38                          | 3.71             | 0.37              | 8.15E-02 | 2.18                         | 0.56             | 0.06              | 1.23E-02 |
| Total Emissions   |              | 223.85                         | 57.75            | 5.77              | 1.27E+00 | 5,372.41                       | 1,385.93         | 138.59            | 3.05E+01 | 813.92                       | 209.97           | 21.00             | 4.61E+00 | 22.39                          | 5.77             | 0.58              | 1.27E-01 | 537.24                         | 138.59           | 13.86             | 3.05E+00 | 81.39                        | 21.00            | 2.10              | 4.61E-01 |

1. Controlled hourly and daily emissions calculated based on short term emission factors and control efficiency.  
2. Controlled annual emissions calculated based on long term emission factors and control efficiency.

## Mine Development Paste Plant

### Table A-34. Truck Pneumatic Loadout Emissions

| Emission Point Number | Description                       | Max Daily Throughput (ton/day) | Max Yearly Throughput (ton/yr) | Hourly Emissions <sup>1,2</sup> |                          |                           | Daily Emissions <sup>1,2</sup> |                           |                            | Annual Emissions <sup>1,2</sup> |                        |                         |
|-----------------------|-----------------------------------|--------------------------------|--------------------------------|---------------------------------|--------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|---------------------------------|------------------------|-------------------------|
|                       |                                   |                                |                                | PM (lb/hr)                      | PM <sub>10</sub> (lb/hr) | PM <sub>2.5</sub> (lb/hr) | PM (lb/day)                    | PM <sub>10</sub> (lb/day) | PM <sub>2.5</sub> (lb/day) | PM (tpy)                        | PM <sub>10</sub> (tpy) | PM <sub>2.5</sub> (tpy) |
| Taylor                |                                   |                                |                                |                                 |                          |                           |                                |                           |                            |                                 |                        |                         |
| PP-1                  | Truck Pneumatic Loadout to Silo 1 | 235                            | 85,746                         | 9.69E-03                        | 3.33E-03                 | 6.94E-04                  | 2.33E-01                       | 7.99E-02                  | 1.67E-02                   | 4.24E-02                        | 1.46E-02               | 3.04E-03                |
| PP-2                  | Truck Pneumatic Loadout to Silo 2 | 235                            | 85,746                         | 9.69E-03                        | 3.33E-03                 | 6.94E-04                  | 2.33E-01                       | 7.99E-02                  | 1.67E-02                   | 4.24E-02                        | 1.46E-02               | 3.04E-03                |
| Clark                 |                                   |                                |                                |                                 |                          |                           |                                |                           |                            |                                 |                        |                         |
| PP-3                  | Truck Pneumatic Loadout to Silo 1 | 117                            | 42,873                         | 4.85E-03                        | 1.66E-03                 | 3.47E-04                  | 1.16E-01                       | 3.99E-02                  | 8.33E-03                   | 2.12E-02                        | 7.29E-03               | 1.52E-03                |
| PP-4                  | Truck Pneumatic Loadout to Silo 2 | 117                            | 42,873                         | 4.85E-03                        | 1.66E-03                 | 3.47E-04                  | 1.16E-01                       | 3.99E-02                  | 8.33E-03                   | 2.12E-02                        | 7.29E-03               | 1.52E-03                |

1. Emission factors based on AP-42 Chapter 11 Section 12, Table 11.12-2.

2. Throughput based on email from South32 on June 14, 2023.

k = Particle size multiplier (dimensionless)

| PM      | PM10    | PM2.5      |                                 |
|---------|---------|------------|---------------------------------|
| 0.00099 | 0.00034 | 7.0905E-05 | lb of pollutant/ton of material |

|      |                  |                   |
|------|------------------|-------------------|
| PM   | PM <sub>10</sub> | PM <sub>2.5</sub> |
| 0.74 | 0.35             | 0.053             |

TABLE 11.12-2 (ENGLISH UNITS)  
EMISSION FACTORS FOR CONCRETE BATCHING <sup>a</sup>

[illegible]

<sup>g</sup> The uncontrolled PM & PM-10 emission factors were developed from Reference 9. The controlled emission factor for PM was developed from References 9, 10, 11, and 12. The controlled emission factor for PM-10 was developed from References 9 and 10.

<sup>d</sup> The controlled PM emission factor was developed from Reference 10 and Reference 12, whereas the controlled PM-10 emission factor was developed from only Reference 10.

Reference 10:

Tanker trucks are contracted from outside sources to deliver cement to the storage silos of the Johnson and Erie batch plants. The Johnson plant has a single cement storage silo. The Erie plant has two cement storage silos designated east and west. To transport the cement from the tanker to the silo, a 4-inch flexible line is attached to the rear of the tanker truck. The cement is then pneumatically conveyed to the top of the storage silo. It takes approximately 45-minutes to unload one tanker truck.

Each storage silo has its own dust collector attached to its roof. The dust collectors vent to the atmosphere and are not equipped with any fans or blowers. The air flow out of each silo is a result of the air being displaced by the incoming cement.

Reference 11:

### TEST RESULTS

During the test, a truck load of cement (44,340 lbs. net) was conveyed into the cement storage silo being tested, by an air compressor mounted on the truck. The air was exhausted through two identical Tiberi Engineering Company dust collectors mounted on top of the bin. Only one of the dust collectors was tested. The test results are as follows:



**Mine Development  
Scrubber**

**Table A-35. WTP2 Scrubber Emissions**

| Emission Point Number | Unit                         | CN Concentration <sup>1</sup><br>(ppm) | Gas Flow Rate <sup>1</sup><br>(cfm) | Operating Hours <sup>2</sup><br>(hrs/yr) | HCN Emissions <sup>3</sup><br>(lb/hr) | HCN Emissions<br>(stpy) |
|-----------------------|------------------------------|----------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------|-------------------------|
| SCRUBBER-1            | Tank Exhaust HCN<br>Scrubber | 600                                    | 500                                 | 8760                                     | 1.23                                  | 5.38                    |
| Tanks Exhaust         | Process Tanks Exhaust        | 39                                     | 50                                  | 8760                                     | 7.98E-03                              | 3.50E-02                |

<sup>1</sup> Cyanide concentration uncontrolled is 2,000 ppm based on discussion with Eric H. and gas flow rate assumed to be 500 cfm based on engineering judgement.  
39 ppm based on discussion with Eric H. and 50 cfm based on engineering judgment (minimal flow rate for natural ventilation).

<sup>2</sup> Control Efficiency of scrubber 70% conservative assumption

<sup>3</sup> Assumed the following output parameters

542.77 Rankine

*Based on the temperature in the Process Tanks tab of "S32 - Mine Development - Emis Calc - 2024-1105".*

0.73 ft<sup>3</sup>.atm/R.lbmol

1 atm

27.03 Molecular Weight of Hydrogen Cyanide (g/mol)

**Mine Development  
Plan II PTE**

**Mine Development  
Project Summary**

**Table A-1a. Criteria Pollutants & GHG Emission Summary**

| Change                                                                        | Fugitive? <sup>2</sup> (Y/N) | PM     | PM <sub>10</sub> | PM <sub>2.5</sub> | NO <sub>x</sub> | SO <sub>2</sub> | CO     | VOC    | Lead Compounds | Max Single HAP (Acetaldehyde) | Total HAPs | CO <sub>2</sub> e |
|-------------------------------------------------------------------------------|------------------------------|--------|------------------|-------------------|-----------------|-----------------|--------|--------|----------------|-------------------------------|------------|-------------------|
| <b>Project Emissions</b>                                                      |                              |        |                  |                   |                 |                 |        |        |                |                               |            |                   |
| Permitted NG Engines PTE <sup>1</sup>                                         | N                            | 38.13  | 38.13            | 38.13             | 163.88          | 1.22            | 72.84  | 84.33  | 0.00           | 39.80                         | 68.00      | 1,133,794         |
| Proposed NG Engines PTE                                                       |                              | 52.42  | 52.42            | 52.42             | 113.02          | 2.76            | 23.19  | 58.16  | 0.00           | 27.46                         | 40.98      | 781,927           |
| Change to PTE - NG Engines                                                    |                              | 14.28  | 14.28            | 14.28             | -50.86          | 1.54            | -49.65 | -26.17 | 0.00           | -12.34                        | -27.02     | -351,867          |
| Permitted Diesel Engine PTE                                                   | N                            | 0.99   | 0.99             | 0.99              | 40.47           | 3.12            | 79.19  | 16.77  | 0.00           | 0.01                          | 0.44       | 43,135            |
| Proposed Diesel Engine PTE                                                    |                              | 1.09   | 1.09             | 1.09              | 40.45           | 2.63            | 79.03  | 17.12  | 0.00           | 0.01                          | 0.51       | 50,247            |
| Change to PTE - Diesel Engines                                                |                              | 0.10   | 0.10             | 0.10              | -0.02           | -0.49           | -0.16  | 0.35   | 0.00           | 9.49E-04                      | 6.97E-02   | 7,112             |
| Permitted Aboveground Road PTE                                                | Y                            | 316.99 | 81.78            | 8.18              | --              | --              | --     | --     | 0.03           | --                            | 0.29       | --                |
| Proposed Aboveground Road PTE                                                 |                              | 311.25 | 80.29            | 8.03              | --              | --              | --     | --     | 0.03           | --                            | 0.29       | --                |
| Change to PTE - Aboveground Roads                                             |                              | -5.74  | -1.48            | -0.15             | --              | --              | --     | --     | -5.86E-04      | --                            | -5.32E-03  | --                |
| Permitted Tailings Operations PTE                                             | Y                            | 88.43  | 35.69            | 7.51              | --              | --              | --     | --     | 0.38           | --                            | 4.36       | --                |
| Proposed Tailings Operations PTE                                              |                              | 85.67  | 35.01            | 7.23              | --              | --              | --     | --     | 0.36           | --                            | 4.22       | --                |
| Change to PTE - Tailings Operations                                           |                              | -2.76  | -0.68            | -0.28             | --              | --              | --     | --     | -0.01          | --                            | -0.14      | --                |
| Project Non-Fugitive PTE                                                      |                              | 14.39  | 14.39            | 14.39             | -50.88          | 1.05            | -49.81 | -25.82 | 0.00           | -12.33                        | -26.95     | -344,755          |
| Project Fugitive PTE                                                          |                              | -8.50  | -2.16            | -0.43             | 0.00            | 0.00            | 0.00   | 0.00   | -0.01          | 0.00                          | -0.14      | 0.00              |
| <b>Permitting Threshold Comparison</b>                                        |                              |        |                  |                   |                 |                 |        |        |                |                               |            |                   |
| Minor New Source Review (mNSR) Thresholds <sup>1</sup>                        |                              | --     | 7.50             | 5.00              | 20.00           | 20.00           | 50.00  | 20.00  | 0.30           | --                            | --         | --                |
| Does Non-Fugitive PTE exceed mNSR Thresholds?                                 |                              | --     | Yes              | Yes               | No              | No              | No     | No     | No             | --                            | --         | --                |
| Permitted Non-Fugitive PTE <sup>2</sup>                                       |                              | 212.39 | 92.33            | 54.59             | 205.61          | 6.87            | 220.37 | 107.94 | 2.09           | 39.84                         | 81.58      | 1,176,929         |
| Permitted Non-Fugitive PTE + Project Non-Fugitive PTE Increases               |                              | 226.78 | 106.71           | 68.97             | 154.74          | 7.92            | 170.56 | 82.11  | 2.09           | 27.51                         | 54.63      | 832,174           |
| Class I Title V Major Source Thresholds <sup>1</sup>                          |                              | 100    | 100              | 100               | 100             | 100             | 100    | 100    | 10             | 10                            | 25         | --                |
| Does Non-Fugitive PTE exceed Title V Major Source Thresholds?                 |                              | Yes    | Yes              | No                | Yes             | No              | Yes    | No     | No             | Yes                           | Yes        | No                |
| Class I PSD Major Source Thresholds                                           |                              | 250    | 250              | 250               | 250             | 250             | 250    | 250    | --             | --                            | --         | 100,000           |
| Does Non-Fugitive PTE exceed Class I PSD Major Source Thresholds <sup>3</sup> |                              | No     | No               | No                | No              | No              | No     | No     | --             | --                            | --         | No                |

1. Per Arizona Administrative Code (A.A.C.)

R18-2-101.110 - For "Potential to emit" (PTE)

R18-2-101.75 - For "Major Source"

R18-2-101.101 - For "Permitting Exemption Thresholds" which is the mNSR Threshold per R18-2-334.A.3

2. Permitted PTE is based on post MPR No. 109292 PTE.

3. Sources exceeding 100,000 tons of CO<sub>2</sub>e are only subject to PSD if they also trigger PSD for another regulated NSR pollutant. The Hermosa Project does not trigger PSD for any other NSR pollutant. While CO<sub>2</sub>e is not included under the definition of "regulated NSR pollutant" at A.A.C. R18-2-101.124, GHGs are considered a "regulated NSR"

**Mine Development  
Summary**

**Table A-1b. Total Site-Wide Emissions**

| Pollutant                      | Regulated NSR Pollutant? <sup>2</sup> | Estimated Potential Emissions (tpy) <sup>1,2</sup> |                         |
|--------------------------------|---------------------------------------|----------------------------------------------------|-------------------------|
|                                |                                       | Non-Fugitive                                       | Non-Fugitive & Fugitive |
| PM                             | Yes                                   | 228.47                                             | 649.75                  |
| PM <sub>10</sub>               | Yes                                   | 108.02                                             | 234.02                  |
| PM <sub>2.5</sub>              | Yes                                   | 69.82                                              | 86.97                   |
| NO <sub>x</sub>                | Yes                                   | 154.74                                             | 154.74                  |
| SO <sub>x</sub>                | Yes                                   | 7.92                                               | 7.92                    |
| CO                             | Yes                                   | 170.56                                             | 170.56                  |
| VOC                            | Yes                                   | 82.11                                              | 99.23                   |
| Lead compounds                 | No                                    | 1.15                                               | 1.85                    |
| Elemental Lead                 | Yes                                   | 1.15                                               | 1.85                    |
| Total HAPs                     | No                                    | 50.81                                              | 56.80                   |
| HCN                            | No                                    | 5.38                                               | 5.41                    |
| H <sub>2</sub> S               | Yes                                   | 10.12                                              | 10.12                   |
| CO <sub>2</sub> e <sup>4</sup> | -                                     | 833,346                                            | 833,346                 |

1. PM, PM<sub>10</sub>, and PM<sub>2.5</sub> include both filterable and condensable fractions, which conservatively overestimates PM emissions from an NSR perspective.

2. Per Arizona Administrative Code (A.A.C.)

R18-2-101.110 - For "Potential to emit"

R18-2-101.124 - For "Regulated NSR Pollutant"

**Table A-1c. Total Emissions - Source Specific**

| Emission Point Number | Emissions Activity                                                                                                    | Include? Yes/No | Source Type <sup>1</sup> | Underground/A boveground? | Controlled Emissions Summary - Annual |                  |                   |                |                 |       |                 |     |            |                  |                   |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|---------------------------|---------------------------------------|------------------|-------------------|----------------|-----------------|-------|-----------------|-----|------------|------------------|-------------------|
|                       |                                                                                                                       |                 |                          |                           | PM                                    | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | NO <sub>x</sub> | CO    | SO <sub>x</sub> | VOC | Total HAPs | H <sub>2</sub> S | CO <sub>2</sub> e |
| DRILL-1               | Drilling                                                                                                              | Yes             | Non-fugitive             | Underground               | 0.06                                  | 0.03             | 0.03              | 3.02E-03       | --              | --    | --              | --  | 0.01       | --               | --                |
| BLAST-1               | Blasting                                                                                                              | Yes             | Non-fugitive             | Underground               | 0.55                                  | 0.28             | 0.11              | 0.03           | 1.13            | 60.75 | 2.25            | --  | 0.05       | 9.00             | 1,042.15          |
| CRUSH-1               | Primary Crushing                                                                                                      | Yes             | Non-fugitive             | Underground               | 0.35                                  | 0.16             | 0.19              | 0.02           | --              | --    | --              | --  | 0.03       | --               | --                |
| BREAK-1               | Clark Rock Breaker                                                                                                    | Yes             | Non-fugitive             | Aboveground               | 3.99E-03                              | 1.89E-03         | 2.85E-04          | 7.01E-05       | --              | --    | --              | --  | 7.74E-04   | --               | --                |
| BREAK-2               | Underground Waste Rock Breaker                                                                                        | Yes             | Non-fugitive             | Underground               | 0.01                                  | 2.45E-03         | 3.70E-04          | 1.83E-05       | --              | --    | --              | --  | 4.92E-05   | --               | --                |
| BREAK-3 - BREAK-7     | Various Underground Ore Rock Breakers                                                                                 | Yes             | Non-fugitive             | Underground               | 0.05                                  | 0.02             | 3.64E-03          | 2.40E-03       | --              | --    | --              | --  | 4.69E-03   | --               | --                |
| BREAK-8               | Underground Crusher Rock Breaker                                                                                      | Yes             | Non-fugitive             | Underground               | 0.14                                  | 0.06             | 0.01              | 0.01           | --              | --    | --              | --  | 0.01       | --               | --                |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                       | Yes             | Non-fugitive             | Aboveground               | 2.47                                  | 1.17             | 0.18              | 0.10           | --              | --    | --              | --  | 0.19       | --               | --                |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                        | Yes             | Fugitive                 | Aboveground               | 0.96                                  | 0.46             | 0.07              | 0.01           | --              | --    | --              | --  | 0.01       | --               | --                |
| DP-21                 | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                              | Yes             | Fugitive                 | Aboveground               | 0.36                                  | 0.17             | 0.03              | 0.02           | --              | --    | --              | --  | 0.03       | --               | --                |
| DP-22                 | Transfer from face to loader                                                                                          | Yes             | Non-Fugitive             | Underground               | 0.02                                  | 0.01             | 0.01              | 7.08E-04       | --              | --    | --              | --  | 1.39E-03   | --               | --                |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                         | Yes             | Non-Fugitive             | Underground               | 0.02                                  | 0.01             | 0.01              | 7.08E-04       | --              | --    | --              | --  | 1.39E-03   | --               | --                |
| DP-24                 | Drop from loader or haul truck through grizzly to ore pass                                                            | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 0.01             | 0.01              | 6.69E-04       | --              | --    | --              | --  | 1.28E-03   | --               | --                |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                       | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 0.01             | 0.01              | 6.69E-04       | --              | --    | --              | --  | 1.28E-03   | --               | --                |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                   | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 0.01             | 0.01              | 6.95E-04       | --              | --    | --              | --  | 1.36E-03   | --               | --                |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 0.01             | 0.01              | 6.95E-04       | --              | --    | --              | --  | 1.36E-03   | --               | --                |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                      | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 0.01             | 0.01              | 6.95E-04       | --              | --    | --              | --  | 1.36E-03   | --               | --                |
| DP-29                 | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3              | Yes             | Non-Fugitive             | Underground               | 0.10                                  | 0.05             | 0.05              | 4.88E-03       | --              | --    | --              | --  | 0.01       | --               | --                |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                     | Yes             | Non-Fugitive             | Underground               | 0.03                                  | 0.01             | 0.01              | 8.87E-05       | --              | --    | --              | --  | 2.38E-04   | --               | --                |
| DP-31                 | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor                           | Yes             | Non-Fugitive             | Underground               | 0.02                                  | 0.01             | 0.01              | 1.05E-03       | --              | --    | --              | --  | 2.06E-03   | --               | --                |
| DP-32                 | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                                 | Yes             | Non-Fugitive             | Underground               | 0.01                                  | 2.56E-03         | 2.56E-03          | 1.92E-05       | --              | --    | --              | --  | 5.14E-05   | --               | --                |
| DP-33                 | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes                           | Yes             | Non-Fugitive             | Underground               | 0.03                                  | 0.01             | 0.01              | 1.07E-03       | --              | --    | --              | --  | 2.11E-03   | --               | --                |
| DP-34                 | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                                   | Yes             | Non-Fugitive             | Underground               | 0.03                                  | 0.01             | 0.01              | 1.07E-03       | --              | --    | --              | --  | 2.11E-03   | --               | --                |
| DP-82                 | Drop on West Rock Stockpile                                                                                           | Yes             | Fugitive                 | Aboveground               | 0.32                                  | 0.15             | 0.02              | 1.13E-03       | --              | --    | --              | --  | 3.03E-03   | --               | --                |
| DP-83                 | Drop on East Ore Stockpile                                                                                            | Yes             | Fugitive                 | Aboveground               | 0.36                                  | 0.17             | 0.03              | 0.02           | --              | --    | --              | --  | 0.03       | --               | --                |
| DP-84                 | Drop on TSF                                                                                                           | Yes             | Fugitive                 | Aboveground               | 0.60                                  | 0.28             | 0.04              | 2.54E-03       | --              | --    | --              | --  | 0.03       | --               | --                |

**Mine Development  
Summary**

| Emission Point Number | Emissions Activity                                                                                   | Include? Yes/No | Source Type <sup>1</sup> | Underground/Aboveground? | Controlled Emissions Summary - Annual |                  |                   |                |                 |    |                 |      |            |                  |                   |
|-----------------------|------------------------------------------------------------------------------------------------------|-----------------|--------------------------|--------------------------|---------------------------------------|------------------|-------------------|----------------|-----------------|----|-----------------|------|------------|------------------|-------------------|
|                       |                                                                                                      |                 |                          |                          | PM                                    | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | NO <sub>x</sub> | CO | SO <sub>x</sub> | VOC  | Total HAPs | H <sub>2</sub> S | CO <sub>2</sub> e |
| DP-85                 | Drops on TSF2                                                                                        | Yes             | Fugitive                 | Aboveground              | 1.25                                  | 0.59             | 0.09              | 0.01           | --              | -- | --              | --   | 0.06       | --               | --                |
| DP-94                 | Transfer from Agg Stockpile to Loader                                                                | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | -- | --              | --   | --         | --               | --                |
| DP-95                 | Transfer of Agg Material from Loader to Haul Truck                                                   | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | -- | --              | --   | --         | --               | --                |
| DP-96                 | Transfer of Shotcrete Aggregate from Stockpile to Loader                                             | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | -- | --              | --   | --         | --               | --                |
| DP-97                 | Transfer from East Ore Stockpile to Loader                                                           | Yes             | Fugitive                 | Aboveground              | 0.36                                  | 0.17             | 0.03              | 0.02           | --              | -- | --              | --   | 0.03       | --               | --                |
| DP-98                 | Transfer of Ore from Loader to Haul Truck                                                            | Yes             | Fugitive                 | Aboveground              | 0.36                                  | 0.17             | 0.03              | 0.02           | --              | -- | --              | --   | 0.03       | --               | --                |
| DP-99                 | Transfer from Waste Chute Stockpile to Loader                                                        | Yes             | Fugitive                 | Aboveground              | 3.21                                  | 1.52             | 0.23              | 0.02           | --              | -- | --              | --   | 0.04       | --               | --                |
| DP-100                | Transfer of Waste Chute Material from Loader to Haul Truck                                           | Yes             | Fugitive                 | Aboveground              | 3.21                                  | 1.52             | 0.23              | 0.02           | --              | -- | --              | --   | 0.04       | --               | --                |
| DP-138                | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                               | Yes             | Fugitive                 | Aboveground              | 7.92E-05                              | 3.75E-05         | 5.68E-06          | --             | --              | -- | --              | --   | --         | --               | --                |
| DP-139                | Drop of Dry Cationic Flocculant via Manual Addition                                                  | Yes             | Fugitive                 | Aboveground              | 3.57E-08                              | 1.69E-08         | 2.56E-09          | --             | --              | -- | --              | --   | --         | --               | --                |
| DP-143                | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module | Yes             | Fugitive                 | Aboveground              | 9.97E-04                              | 4.71E-04         | 7.14E-05          | --             | --              | -- | --              | --   | --         | --               | --                |
| DP-144                | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                 | Yes             | Fugitive                 | Aboveground              | 2.26E-03                              | 1.07E-03         | 1.62E-04          | --             | --              | -- | --              | --   | --         | --               | --                |
| DP-145                | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module | Yes             | Fugitive                 | Aboveground              | 1.09E-03                              | 5.13E-04         | 7.77E-05          | --             | --              | -- | --              | --   | --         | --               | --                |
| DP-148                | Drop of Anionic Flocculant (Hydrex 6161)                                                             | Yes             | Fugitive                 | Aboveground              | 1.18E-05                              | 5.58E-06         | 8.45E-07          | --             | --              | -- | --              | --   | --         | --               | --                |
| DP-149                | Drop of Sodium Bicarbonate                                                                           | Yes             | Fugitive                 | Aboveground              | 1.18E-05                              | 5.58E-06         | 8.45E-07          | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-1                  | 21210-CX-00002 Main Shaft Ore Discharge Dust Collector 7                                             | Yes             | Non-fugitive             | Aboveground              | 0.24                                  | 0.24             | 0.24              | 0.01           | --              | -- | --              | --   | 0.02       | --               | --                |
| DC-2                  | 21210-CX-00001 Coarse Ore Overland Dust Collector 7                                                  | Yes             | Non-fugitive             | Aboveground              | 0.38                                  | 0.38             | 0.38              | 0.02           | --              | -- | --              | --   | 0.03       | --               | --                |
| DC-3                  | 21210-CX-00003 Transfer Tower Silo Dust Collector 4                                                  | Yes             | Non-fugitive             | Aboveground              | 2.25                                  | 2.25             | 2.25              | 0.09           | --              | -- | --              | --   | 0.17       | --               | --                |
| DC-4                  | 21510-CX-00001 Coarse Ore Silo Dust Collector 4                                                      | Yes             | Non-fugitive             | Aboveground              | 0.83                                  | 0.83             | 0.83              | 0.04           | --              | -- | --              | --   | 0.08       | --               | --                |
| DC-5                  | 21710-CX-00002 Silo Discharge Dust Collector 5                                                       | Yes             | Non-fugitive             | Aboveground              | 0.81                                  | 0.81             | 0.81              | 0.04           | --              | -- | --              | --   | 0.08       | --               | --                |
| DC-12                 | 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector                                               | Yes             | Non-fugitive             | Aboveground              | 0.30                                  | 0.30             | 0.30              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-13                 | 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector                                             | Yes             | Non-fugitive             | Aboveground              | 0.30                                  | 0.30             | 0.30              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-14                 | 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector                                             | Yes             | Non-fugitive             | Aboveground              | 0.30                                  | 0.30             | 0.30              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-15                 | 22620-CX-00004 Caustic Mix Tank Dust Collector                                                       | Yes             | Non-fugitive             | Aboveground              | 0.30                                  | 0.30             | 0.30              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-16                 | 22210-CX-00001 Pebble Crusher Dust Collector 4                                                       | Yes             | Non-fugitive             | Aboveground              | 0.93                                  | 0.93             | 0.93              | 0.04           | --              | -- | --              | --   | 0.09       | --               | --                |
| DC-PPBSS1             | 18610-SI-00001 Paste Plant Binder Storage Silo 1 6                                                   | Yes             | Non-fugitive             | Aboveground              | 0.14                                  | 0.14             | 0.14              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-PPBSS2             | 18610-SI-00002 Paste Plant Binder Storage Silo 2 6                                                   | Yes             | Non-fugitive             | Aboveground              | 0.14                                  | 0.14             | 0.14              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-PPBDS3             | 18610-SI-10003 Paste Plant Binder Dosage Silo 3 6                                                    | Yes             | Non-fugitive             | Aboveground              | 0.28                                  | 0.28             | 0.28              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-PPBDS4             | 18610-SI-20004 Paste Plant Binder Dosage Silo 4 6                                                    | Yes             | Non-fugitive             | Aboveground              | 0.28                                  | 0.28             | 0.28              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-PPM1M              | 18610-DC-20002 Paste Plant Module 1 Mixer 6                                                          | Yes             | Non-fugitive             | Aboveground              | 0.56                                  | 0.56             | 0.56              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-PPM2M              | 18610-DC-20002 Paste Plant Module 2 Mixer 6                                                          | Yes             | Non-fugitive             | Aboveground              | 0.56                                  | 0.56             | 0.56              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-7                  | Coarse Ore Dust Collection System, 23100-FAN-0001                                                    | Yes             | Non-fugitive             | Aboveground              | 0.12                                  | 0.12             | 0.12              | 2.11E-03       | --              | -- | --              | --   | 0.02       | --               | --                |
| DC-8                  | Coarse Ore Dust Collection System, 23100-FAN-0002                                                    | Yes             | Non-fugitive             | Aboveground              | 0.12                                  | 0.12             | 0.12              | 2.11E-03       | --              | -- | --              | --   | 0.02       | --               | --                |
| DC-CPPBS1             | Paste Plant Binder Silo 1 6                                                                          | Yes             | Non-fugitive             | Aboveground              | 0.14                                  | 0.14             | 0.14              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-CPPBS2             | Paste Plant Binder Silo 2 6                                                                          | Yes             | Non-fugitive             | Aboveground              | 0.14                                  | 0.14             | 0.14              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-CPPBS3             | Paste Plant Binder Silo 3 6                                                                          | Yes             | Non-fugitive             | Aboveground              | 0.28                                  | 0.28             | 0.28              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-CPPBS4             | Paste Plant Binder Silo 4 6                                                                          | Yes             | Non-fugitive             | Aboveground              | 0.28                                  | 0.28             | 0.28              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-PPM1M              | Paste Plant Module 1 Mixer 6                                                                         | Yes             | Non-fugitive             | Aboveground              | 0.56                                  | 0.56             | 0.56              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-PPM2M              | Paste Plant Module 2 Mixer 6                                                                         | Yes             | Non-fugitive             | Aboveground              | 0.56                                  | 0.56             | 0.56              | --             | --              | -- | --              | --   | --         | --               | --                |
| DC-10                 | Coarse Ore Dust Collection System, 23100-DCD-0005                                                    | Yes             | Non-fugitive             | Aboveground              | 0.12                                  | 0.12             | 0.12              | 2.11E-03       | --              | -- | --              | --   | 0.02       | --               | --                |
| WTP1LS                | Waste Water Treatment Plant #1 Lime Silo                                                             | Yes             | Non-fugitive             | Aboveground              | 0.19                                  | 0.19             | 0.19              | --             | --              | -- | --              | --   | --         | --               | --                |
| WTP2 DC               | Sodium Sulfate Indoor Dust Collector 5                                                               | Yes             | Non-fugitive             | Aboveground              | 0.01                                  | 0.01             | 0.01              | --             | --              | -- | --              | 0.29 | --         | --               | --                |
| TNK-040               | F549/MIBC                                                                                            | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | -- | --              | 0.29 | 0.26       | --               | --                |

**Mine Development  
Summary**

| Emission Point Number | Emissions Activity                       | Include? Yes/No | Source Type <sup>1</sup> | Underground/Aboveground? | Controlled Emissions Summary - Annual |                  |                   |                |                 |      |                 |          |            |      | H <sub>2</sub> S | CO <sub>2</sub> e |
|-----------------------|------------------------------------------|-----------------|--------------------------|--------------------------|---------------------------------------|------------------|-------------------|----------------|-----------------|------|-----------------|----------|------------|------|------------------|-------------------|
|                       |                                          |                 |                          |                          | PM                                    | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | NO <sub>x</sub> | CO   | SO <sub>2</sub> | VOC      | Total HAPs |      |                  |                   |
| TNK-041               | 3407-A                                   | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 1.48E-03 | 9.52E-05   | --   | --               |                   |
| TNK-044               | Solvay 5100                              | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.01     | 3.67E-05   | --   | --               |                   |
| TNK-045               | Copper Sulphate                          | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-046               | Copper Sulphate                          | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-047               | Zinc Sulphate                            | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-048               | Zinc Sulphate                            | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-051               | Zinc Cyanide                             | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-052               | Zinc Cyanide                             | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-053               | SMBS                                     | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-054               | SMBS                                     | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-057               | Tailings Flocculant(SNF AN910-VHM)       | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-058               | Tailings Flocculant(SNF AN910-VHM)       | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-059               | Tailings Flocculant(SNF AN910-VHM)       | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TNK-060               | 3418-A                                   | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 1.90E-04 | --         | --   | --               |                   |
| TNK-061               | Shaft ANE                                | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 2.38E-04 | --         | --   | --               |                   |
| TSF2                  | USFS Tailings Storage Facility           | Yes             | Fugitive                 | Aboveground              | 40.47                                 | 20.24            | 3.04              | 0.17           | --              | --   | --              | --       | 1.99       | --   | --               |                   |
| TSF_1                 | Tailing Storage Facility                 | Yes             | Fugitive                 | Aboveground              | 16.45                                 | 8.23             | 1.23              | 0.07           | --              | --   | --              | --       | 0.81       | --   | --               |                   |
| WRS                   | West Rock Stockpile                      | Yes             | Fugitive                 | Aboveground              | 0.67                                  | 0.34             | 0.05              | 2.37E-03       | --              | --   | --              | --       | 0.01       | --   | --               |                   |
| EOS                   | East Ore Stockpile                       | Yes             | Fugitive                 | Aboveground              | 0.74                                  | 0.37             | 0.06              | 0.04           | --              | --   | --              | --       | 0.07       | --   | --               |                   |
| TAGG                  | Taylor Agg Stockpile                     | Yes             | Fugitive                 | Aboveground              | 4.53E-04                              | 2.27E-04         | 3.40E-05          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| TSHOT                 | Taylor Shotcrete Stockpile               | Yes             | Fugitive                 | Aboveground              | 8.06E-04                              | 4.03E-04         | 6.04E-05          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| HRS                   | Hardshell Rock Stockpile                 | Yes             | Fugitive                 | Aboveground              | 3.95                                  | 1.98             | 0.30              | 0.02           | --              | --   | --              | --       | 0.05       | --   | --               |                   |
| ORE                   | Clark Ore Stockpile                      | Yes             | Fugitive                 | Aboveground              | 0.12                                  | 0.06             | 0.01              | 2.12E-03       | --              | --   | --              | --       | 0.02       | --   | --               |                   |
| ROM                   | Clark ROM Stockpile                      | Yes             | Fugitive                 | Aboveground              | 0.04                                  | 0.02             | 2.68E-03          | 6.29E-04       | --              | --   | --              | --       | 0.01       | --   | --               |                   |
| AGG                   | Clark Agg Stockpile                      | Yes             | Fugitive                 | Aboveground              | 4.53E-04                              | 2.27E-04         | 3.40E-05          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| SHOT                  | Clark Shotcrete Stockpile                | Yes             | Fugitive                 | Aboveground              | 8.06E-04                              | 4.03E-04         | 6.04E-05          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| CHUTE                 | Waste Chute Stockpile                    | Yes             | Fugitive                 | Aboveground              | 2.59E-03                              | 1.30E-03         | 1.94E-04          | 1.49E-05       | --              | --   | --              | --       | 3.54E-05   | --   | --               |                   |
| WTP2CT                | Cooling Towers                           | Yes             | Fugitive                 | Aboveground              | 0.02                                  | 0.02             | 4.07E-04          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| PRODREF               | Refrigeration Plant <sup>3</sup>         | Yes             | Non-fugitive             | Aboveground              | 0.05                                  | 0.03             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| BBREF                 | Refrigeration Plant <sup>3</sup>         | Yes             | Non-fugitive             | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| MILLREF               | Primary Mill Cooling Tower               | Yes             | Non-fugitive             | Aboveground              | 3.51E-03                              | 1.83E-03         | 6.37E-04          | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| SCRUBBER-1            | Tank Exhaust HCN Scrubber                | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | 5.38       | --   | --               |                   |
| Tanks Exhaust         | Process Tanks Exhaust                    | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | --       | 0.03       | --   | --               |                   |
| CBP1_11               | Taylor Concrete Batch Plant <sup>2</sup> | Yes             | Non-fugitive             | Aboveground              | 0.79                                  | 0.32             | 0.32              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| CCBP1_11              | Clark Concrete Batch Plant               | Yes             | Non-fugitive             | Aboveground              | 0.04                                  | 0.02             | 0.02              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| DOZER1-TSF2           | Dozer Emissions                          | Yes             | Fugitive                 | Aboveground              | 8.96                                  | 1.89             | 0.94              | 0.04           | --              | --   | --              | --       | 0.44       | --   | --               |                   |
| DOZER2-TSF2           | Dozer Emissions                          | Yes             | Fugitive                 | Aboveground              | 8.96                                  | 1.89             | 0.94              | 0.04           | --              | --   | --              | --       | 0.44       | --   | --               |                   |
| DOZER-WRS             | Dozer Emissions                          | Yes             | Fugitive                 | Aboveground              | 1.09                                  | 0.14             | 0.11              | 3.84E-03       | --              | --   | --              | --       | 0.01       | --   | --               |                   |
| DOZER-HRS             | Dozer Emissions                          | Yes             | Fugitive                 | Aboveground              | 1.09                                  | 0.14             | 0.11              | 0.01           | --              | --   | --              | --       | 0.01       | --   | --               |                   |
| DOZER-TSF             | Dozer Emissions                          | Yes             | Fugitive                 | Aboveground              | 8.96                                  | 1.89             | 0.94              | 0.04           | --              | --   | --              | --       | 0.44       | --   | --               |                   |
| DOZER-EOS             | Dozer Emissions                          | Yes             | Fugitive                 | Aboveground              | 1.09                                  | 0.14             | 0.11              | 0.05           | --              | --   | --              | --       | 0.10       | --   | --               |                   |
| MEVAP1                | Mechanical Evaporator                    | Yes             | Fugitive                 | Aboveground              | --                                    | 0.04             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| MEVAP2                | Mechanical Evaporator                    | Yes             | Fugitive                 | Aboveground              | --                                    | 0.04             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| MEVAP3                | Mechanical Evaporator                    | Yes             | Fugitive                 | Aboveground              | --                                    | 0.04             | 0.01              | --             | --              | --   | --              | --       | --         | --   | --               |                   |
| 22310-FC-00001        | Lead Rougher                             | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.06     | --         | --   | --               |                   |
| 22310-FC-00004        | Lead Rougher Scavenger                   | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.06     | --         | --   | --               |                   |
| 22310-FC-00008        | Lead Cleaner Scalper                     | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.19     | --         | --   | --               |                   |
| 22310-FC-00007        | Lead Cleaner                             | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.16     | --         | --   | --               |                   |
| 22310-FC-00009        | Lead Cleaner Scavenger                   | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.15     | --         | --   | --               |                   |
| 22310-FC-00005        | Zinc Rougher                             | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.12     | --         | --   | --               |                   |
| 22310-FC-00006        | Zinc Rougher Scavenger                   | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.11     | --         | --   | --               |                   |
| 22310-FC-00011        | Zinc Cleaner Scalper                     | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.12     | --         | --   | --               |                   |
| 22310-FC-00010        | Zinc Cleaner                             | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.10     | --         | --   | --               |                   |
| 22310-FC-00012        | Zinc Cleaner Scavenger                   | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.09     | --         | --   | --               |                   |
| 22430-TN-00001        | Lead Concentrate Tank                    | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 6.02     | --         | --   | --               |                   |
| 22430-TN-00002        | Zinc Concentrate Tank                    | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 7.60     | --         | --   | --               |                   |
| 22310-TN-00003        | Lead Conditioning Tank                   | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.50     | --         | --   | --               |                   |
| 22310-TN-00001        | Zinc Conditioning Tank No. 1             | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.28     | --         | --   | --               |                   |
| 22310-TN-00002        | Zinc Conditioning Tank No. 2             | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --   | --              | 0.28     | --         | --   | --               |                   |
| DRILL-2               | Drilling                                 | Yes             | Non-fugitive             | Underground              | 0.02                                  | 0.01             | 0.01              | 3.39E-04       | --              | --   | --              | --       | 3.74E-03   | --   | --               |                   |
| BLAST-2               | Blasting                                 | Yes             | Non-fugitive             | Underground              | 0.31                                  | 0.16             | 0.04              | 0.01           | 0.14            | 7.59 | 0.28            | --       | 0.06       | 1.12 | 130.15           |                   |
| DP-103                | Dump into Primary Crusher Feed Hopper    | Yes             | Fugitive                 | Aboveground              | 0.29                                  | 0.14             | 0.02              | 0.01           | --              | --   | --              | --       | 0.06       | --   | --               |                   |

**Mine Development  
Summary**

| Emission Point Number                     | Emissions Activity                                            | Include? Yes/No | Source Type <sup>1</sup> | Underground/Aboveground? | Controlled Emissions Summary - Annual |                  |                   |                |                 |        |                 |          |            |       | H <sub>2</sub> S | CO <sub>2</sub> e |
|-------------------------------------------|---------------------------------------------------------------|-----------------|--------------------------|--------------------------|---------------------------------------|------------------|-------------------|----------------|-----------------|--------|-----------------|----------|------------|-------|------------------|-------------------|
|                                           |                                                               |                 |                          |                          | PM                                    | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | NO <sub>x</sub> | CO     | SO <sub>2</sub> | VOC      | Total HAPs |       |                  |                   |
| DP-104                                    | Drop from silo to trucks                                      | Yes             | Fugitive                 | Aboveground              | 0.96                                  | 0.46             | 0.07              | 0.02           | --              | --     | --              | --       | 0.19       | --    | --               |                   |
| DP-105                                    | Transfer of Ore from Ore Stockpile to Loader                  | Yes             | Fugitive                 | Aboveground              | 0.58                                  | 0.27             | 0.04              | 0.01           | --              | --     | --              | --       | 0.11       | --    | --               |                   |
| DP-106                                    | Transfer of Ore Mined from Loader to Haul Truck               | Yes             | Fugitive                 | Aboveground              | 0.58                                  | 0.27             | 0.04              | 0.01           | --              | --     | --              | --       | 0.11       | --    | --               |                   |
| DP-107                                    | Transfer from ROM Stockpile to Loader                         | Yes             | Fugitive                 | Aboveground              | 0.16                                  | 0.08             | 0.01              | 2.79E-03       | --              | --     | --              | --       | 0.03       | --    | --               |                   |
| DP-109                                    | Transfer from Agg Stockpile to Loader                         | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | --     | --              | --       | --         | --    | --               |                   |
| DP-110                                    | Transfer of Agg Material from Loader to Haul Truck            | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | --     | --              | --       | --         | --    | --               |                   |
| DP-111                                    | Transfer of Shotcrete Aggregate from Stockpile to Loader      | Yes             | Fugitive                 | Aboveground              | 0.08                                  | 0.04             | 0.01              | --             | --              | --     | --              | --       | --         | --    | --               |                   |
| DP-113                                    | Hardshell Rock Storage                                        | Yes             | Fugitive                 | Aboveground              | 2.60                                  | 1.23             | 0.19              | 0.01           | --              | --     | --              | --       | 0.06       | --    | --               |                   |
| DP-114                                    | Ore Stockpile                                                 | Yes             | Fugitive                 | Aboveground              | 0.58                                  | 0.27             | 0.04              | 0.01           | --              | --     | --              | --       | 0.11       | --    | --               |                   |
| DP-115                                    | ROM Stockpile                                                 | Yes             | Fugitive                 | Aboveground              | 0.16                                  | 0.08             | 0.01              | 2.79E-03       | --              | --     | --              | --       | 0.03       | --    | --               |                   |
| DP-124                                    | Transfer of Development Ore from Face to Loader               | Yes             | Non-fugitive             | Underground              | 9.01E-04                              | 4.26E-04         | 2.67E-04          | 1.16E-05       | --              | --     | --              | --       | 9.79E-05   | --    | --               |                   |
| DP-125                                    | Transfer of Development Ore from Loader to Stockpile          | Yes             | Non-fugitive             | Underground              | 9.01E-04                              | 4.26E-04         | 2.67E-04          | 1.16E-05       | --              | --     | --              | --       | 9.79E-05   | --    | --               |                   |
| DP-126                                    | Transfer of Development Ore from Stockpile to Loader          | Yes             | Non-fugitive             | Underground              | 9.01E-04                              | 4.26E-04         | 2.67E-04          | 1.16E-05       | --              | --     | --              | --       | 9.79E-05   | --    | --               |                   |
| DP-127                                    | Transfer of Development Ore Mined from Loader to Haul Truck   | Yes             | Non-fugitive             | Underground              | 9.01E-04                              | 4.26E-04         | 2.67E-04          | 1.16E-05       | --              | --     | --              | --       | 9.79E-05   | --    | --               |                   |
| DP-129                                    | Transfer of Development Waste Mined from Face to Loader       | Yes             | Non-fugitive             | Underground              | 4.67E-03                              | 2.21E-03         | 1.38E-03          | 2.65E-05       | --              | --     | --              | --       | 1.08E-04   | --    | --               |                   |
| DP-130                                    | Transfer of Development Waste Mined from Loader to Stockpile  | Yes             | Non-fugitive             | Underground              | 4.67E-03                              | 2.21E-03         | 1.38E-03          | 2.65E-05       | --              | --     | --              | --       | 1.08E-04   | --    | --               |                   |
| DP-131                                    | Transfer of Development Waste Mined from Stockpile to Loader  | Yes             | Non-fugitive             | Underground              | 4.67E-03                              | 2.21E-03         | 1.38E-03          | 2.65E-05       | --              | --     | --              | --       | 1.08E-04   | --    | --               |                   |
| DP-132                                    | Transfer of Development Waste Mined from Loader to Haul Truck | Yes             | Non-fugitive             | Underground              | 4.67E-03                              | 2.21E-03         | 1.38E-03          | 2.65E-05       | --              | --     | --              | --       | 1.08E-04   | --    | --               |                   |
| DP-134                                    | Transfer of Slope Ore from Slope to Loader                    | Yes             | Non-fugitive             | Underground              | 2.57E-03                              | 1.21E-03         | 7.62E-04          | 4.52E-05       | --              | --     | --              | --       | 4.99E-04   | --    | --               |                   |
| DP-135                                    | Transfer of Slope Ore from Loader to Stockpile                | Yes             | Non-fugitive             | Underground              | 2.57E-03                              | 1.21E-03         | 7.62E-04          | 4.52E-05       | --              | --     | --              | --       | 4.99E-04   | --    | --               |                   |
| DP-136                                    | Transfer of Slope Ore from Stockpile to Loader                | Yes             | Non-fugitive             | Underground              | 2.57E-03                              | 1.21E-03         | 7.62E-04          | 4.52E-05       | --              | --     | --              | --       | 4.99E-04   | --    | --               |                   |
| DP-137                                    | Transfer of Slope Ore from Loader to Haul Truck               | Yes             | Non-fugitive             | Underground              | 2.57E-03                              | 1.21E-03         | 7.62E-04          | 4.52E-05       | --              | --     | --              | --       | 4.99E-04   | --    | --               |                   |
| PP-1                                      | Truck Pneumatic Loadout to Silo 1                             | Yes             | Non-fugitive             | Aboveground              | 4.24E-02                              | 1.46E-02         | 3.04E-03          | 0.00E+00       | --              | --     | --              | --       | --         | --    | --               |                   |
| PP-2                                      | Truck Pneumatic Loadout to Silo 2                             | Yes             | Non-fugitive             | Aboveground              | 4.24E-02                              | 1.46E-02         | 3.04E-03          | 0.00E+00       | --              | --     | --              | --       | --         | --    | --               |                   |
| PP-3                                      | Truck Pneumatic Loadout to Silo 1                             | Yes             | Non-fugitive             | Aboveground              | 2.12E-02                              | 7.29E-03         | 1.52E-03          | 0.00E+00       | --              | --     | --              | --       | --         | --    | --               |                   |
| PP-4                                      | Truck Pneumatic Loadout to Silo 2                             | Yes             | Non-fugitive             | Aboveground              | 2.12E-02                              | 7.29E-03         | 1.52E-03          | 0.00E+00       | --              | --     | --              | --       | --         | --    | --               |                   |
| ROADS                                     | Road Emissions                                                | Yes             | Fugitive                 | Aboveground              | 311.25                                | 80.29            | 8.03              | 0.03           | --              | --     | --              | --       | 0.29       | --    | --               |                   |
| UGTROADS                                  | Underground Taylor Roads                                      | Yes             | Non-fugitive             | Underground              | 77.04                                 | 19.88            | 1.99              | 0.273          | --              | --     | --              | --       | 0.73       | --    | --               |                   |
| UGCROADS                                  | Underground Clark Roads                                       | Yes             | Non-fugitive             | Underground              | 81.39                                 | 21.00            | 2.10              | 0.461          | --              | --     | --              | --       | 1.88       | --    | --               |                   |
| ENGINE 0013 - 0056                        | CAT 3520 DSL 2600 kW                                          | Yes             | Non-fugitive             | Aboveground              | 52.42                                 | 52.42            | 52.42             | --             | 113.02          | 23.19  | 2.76            | 58.16    | 40.98      | --    | 781,926.73       |                   |
| ENGINE 0007 - 0012                        | CAT C18, 589 bkw                                              | Yes             | Non-fugitive             | Aboveground              | 0.68                                  | 0.68             | 0.68              | --             | 7.80            | 40.00  | 8.28E-04        | 15.00    | 0.47       | --    | 47,547.05        |                   |
| ENGINE 0002 - 0006                        | CAT C175 3000 kW                                              | Yes             | Non-fugitive             | Aboveground              | 0.36                                  | 0.36             | 0.36              | --             | 31.83           | 31.83  | 0.07            | 1.73     | 0.01       | --    | 1,267.09         |                   |
| ENGINE 0001                               | C200D2RE                                                      | Yes             | Non-fugitive             | Aboveground              | 0.04                                  | 0.04             | 0.04              | --             | 0.82            | 7.20   | 2.56            | 0.39     | 0.03       | --    | 1,432.87         |                   |
| AGGDF-T                                   | Aboveground Gasoline Dispensing Facility - Taylor             | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.85     | 0.15       | --    | --               |                   |
| AGGDF-C                                   | Aboveground Gasoline Dispensing Facility - Clark              | Yes             | Fugitive                 | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.41     | 0.08       | --    | --               |                   |
| T-01                                      | Unleaded Gasoline (S32)                                       | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.38     | 0.01       | --    | --               |                   |
| T-02                                      | Diesel (Red Dyed S32)                                         | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 1.64E-03 | 1.51E-04   | --    | --               |                   |
| T-03                                      | Diesel (Red Dyed S32)                                         | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 1.64E-03 | 1.51E-04   | --    | --               |                   |
| T-04                                      | Diesel (Red Dyed Rummel)                                      | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 2.04E-03 | 1.88E-04   | --    | --               |                   |
| T-05                                      | Unleaded Gasoline (Rummel)                                    | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.33     | 0.01       | --    | --               |                   |
| T-06                                      | Diesel (Rummel)                                               | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 4.74E-04 | 4.36E-05   | --    | --               |                   |
| T-07                                      | Unleaded Gasoline                                             | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 1.92     | 0.04       | --    | --               |                   |
| T-08                                      | Unleaded Gasoline                                             | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 1.92     | 0.04       | --    | --               |                   |
| T-09                                      | Unleaded Gasoline                                             | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 1.92     | 0.04       | --    | --               |                   |
| T-10                                      | Diesel                                                        | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.04     | 3.60E-03   | --    | --               |                   |
| T-11                                      | Diesel                                                        | Yes             | Non-fugitive             | Aboveground              | --                                    | --               | --                | --             | --              | --     | --              | 0.04     | 3.30E-03   | --    | --               |                   |
| Total - Non-Fugitive & Fugitive Emissions |                                                               |                 |                          |                          | 649.75                                | 234.02           | 86.97             | 1.85           | 154.74          | 170.56 | 7.92            | 99.23    | 56.80      | 10.12 | 833346.03        |                   |
| Total - Non-Fugitive Emissions            |                                                               |                 |                          |                          | 228.47                                | 108.02           | 69.82             | 1.15           | 154.74          | 170.56 | 7.92            | 82.11    | 50.81      | 10.12 | 833346.03        |                   |

1. Underground emissions conservatively taken as non-fugitive. South32 reserves the right to update this conservative assumption.

2. The concrete batch plant is conservatively assumed to be a non-fugitive source of emissions. South32 reserves the right to update this representation once we have more clarity on the concrete batch plant design per correspondence with ADEQ on Jan 13th 2023.

3. The surface refrigeration plant is considered a non-fugitive source of emissions based on correspondence with ADEQ on Jan 13th 2023.

**Table A-2a. Facility HAPs Summary**

| <b>Pollutant</b>               | <b>Emissions<br/>(tpy)</b> |
|--------------------------------|----------------------------|
| Benzene                        | 0.51                       |
| Toluene                        | 0.41                       |
| Xylene                         | 0.25                       |
| 1,3-Butadiene                  | 0.14                       |
| Formaldehyde                   | 6.78                       |
| Acetaldehyde                   | 27.48                      |
| Acrolein                       | 2.47                       |
| Naphthalene                    | 0.07                       |
| 1,1,2,2-Tetrachloroethane      | 0.19                       |
| 1,1,2-Trichloroethane          | 0.15                       |
| 1,3-Dichloropropene            | 0.01                       |
| 2-Methylnaphthalene            | 0.02                       |
| 2,2,4-Trimethylpentane         | 0.12                       |
| Biphenyl                       | 0.10                       |
| Carbon Tetrachloride           | 0.17                       |
| Chlorobenzene                  | 0.14                       |
| Chloroform                     | 0.13                       |
| Ethylbenzene                   | 0.04                       |
| Ethylene Dibromide             | 0.21                       |
| Methanol                       | 1.20                       |
| Methylene Chloride             | 0.09                       |
| Hexane                         | 0.55                       |
| PAH                            | 0.39                       |
| Phenol                         | 0.11                       |
| Tetrachloroethane              | 0.01                       |
| Vinyl Chloride                 | 0.07                       |
| Cresol                         | 9.52E-05                   |
| Ethylene Glycol Dimethyl Ether | 0.26                       |
| Urethane                       | 3.67E-05                   |
| Cumene                         | 4.46E-04                   |
| Isooctane                      | 0.04                       |
| PAC's                          | 5.84E-05                   |
| Hydrogen Cyanide               | 5.41E+00                   |
| Antimony Compounds             | 3.18E-02                   |
| Arsenic Compounds              | 3.54E-02                   |
| Beryllium Compounds            | 9.66E-04                   |
| Cadmium Compounds              | 1.99E-02                   |
| Chromium Compounds             | 1.86E-02                   |
| Cobalt Compounds               | 8.26E-03                   |
| Manganese Compounds            | 7.27                       |
| Nickel Compounds               | 1.28E-02                   |
| Selenium Compounds             | 3.95E-03                   |
| Lead Compounds                 | 1.85                       |



### Mine Development HAP Summary

**Table A-2b. Metal HAP in PM - Constituents Summary**

| Emission Point Number | Emissions Activity                                                                                                    | Include? Yes/No | PM       | Antimony Compounds | Arsenic Compounds | Beryllium Compounds | Cadmium Compounds | Chromium Compounds | Cobalt Compounds | Manganese Compounds | Nickel Compounds | Selenium Compounds | Lead Compounds | Mercury Compounds | Total    |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------|----------|--------------------|-------------------|---------------------|-------------------|--------------------|------------------|---------------------|------------------|--------------------|----------------|-------------------|----------|
| DRILL-1               | Drilling                                                                                                              | Yes             | 0.06     | 1.29E-05           | 9.46E-06          | 7.20E-08            | 1.18E-05          | 2.01E-06           | 1.58E-06         | 2.72E-03            | 6.08E-07         | 1.58E-06           | 3.92E-03       | --                | 5.78E-03 |
| BLAST-1               | Blasting                                                                                                              | Yes             | 0.55     | 1.16E-04           | 8.88E-05          | 6.53E-07            | 1.06E-04          | 1.80E-05           | 1.42E-07         | 2.44E-02            | 5.43E-06         | 1.42E-05           | 2.71E-02       | --                | 5.13E-02 |
| CRUSH-1               | Primary Crushing                                                                                                      | Yes             | 0.35     | 7.42E-05           | 5.44E-05          | 4.20E-07            | 6.79E-05          | 1.15E-05           | 9.10E-06         | 1.56E-02            | 3.50E-06         | 9.10E-06           | 1.74E-02       | --                | 3.32E-02 |
| BREAK-1               | Clark Rock Breaker                                                                                                    | Yes             | 0.00     | 1.80E-06           | 2.16E-06          | 6.70E-09            | 4.88E-07          | 1.71E-07           | 2.39E-08         | 7.00E-04            | 3.11E-08         | 1.99E-08           | 7.01E-05       | --                | 7.74E-04 |
| BREAK-2               | Underground Waste Rock Breaker                                                                                        | Yes             | 0.01     | 9.00E-08           | 2.62E-07          | 7.24E-09            | 1.86E-08          | 1.42E-07           | 1.96E-08         | 3.03E-05            | 4.03E-08         | 1.71E-08           | 1.83E-05       | --                | 4.92E-05 |
| BR-3 - BREAK-7        | Various Underground Ore Rock Breakers                                                                                 | Yes             | 0.05     | 1.03E-05           | 7.78E-06          | 6.05E-08            | 1.69E-06          | 1.27E-06           | 2.25E-03         | 5.07E-07            | 1.27E-06         | 2.40E-03           | 4.00E-02       | --                | 4.00E-02 |
| BREAK-8               | Underground Crusher Rock Breaker                                                                                      | Yes             | 0.14     | 2.79E-05           | 2.10E-05          | 1.64E-07            | 2.51E-05          | 4.57E-06           | 3.43E-06         | 6.10E-03            | 1.37E-06         | 3.43E-06           | 6.50E-03       | --                | 1.27E-02 |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                       | Yes             | 2.47     | 4.11E-04           | 3.28E-04          | 3.04E-06            | 3.65E-04          | 7.92E-05           | 5.13E-05         | 9.09E-02            | 2.36E-05         | 5.12E-05           | 9.56E-02       | --                | 1.88E-01 |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                        | Yes             | 0.96     | 2.57E-05           | 3.57E-05          | 1.34E-06            | 1.21E-05          | 2.67E-05           | 4.68E-06         | 7.49E-03            | 7.62E-06         | 4.22E-06           | 5.52E-03       | --                | 1.31E-02 |
| DP-21                 | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                              | Yes             | 0.36     | 7.37E-05           | 5.57E-05          | 4.33E-07            | 6.65E-05          | 1.21E-05           | 9.06E-06         | 1.61E-02            | 3.62E-06         | 9.08E-06           | 1.72E-02       | --                | 3.35E-02 |
| DP-22                 | Transfer from face to loader                                                                                          | Yes             | 0.02     | 3.04E-06           | 2.43E-06          | 2.25E-08            | 2.70E-06          | 5.86E-07           | 3.80E-07         | 6.73E-04            | 1.74E-07         | 3.79E-07           | 7.08E-04       | --                | 1.39E-03 |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                         | Yes             | 0.02     | 3.04E-06           | 2.43E-06          | 2.25E-08            | 2.70E-06          | 5.86E-07           | 3.80E-07         | 6.73E-04            | 1.74E-07         | 3.79E-07           | 7.08E-04       | --                | 1.39E-03 |
| DP-24                 | Drop from loader or haul truck through grizzly to ore pass                                                            | Yes             | 0.01     | 2.74E-06           | 2.07E-06          | 1.61E-08            | 2.47E-06          | 4.48E-07           | 3.36E-07         | 5.98E-04            | 1.35E-07         | 3.37E-07           | 6.69E-04       | --                | 1.28E-03 |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                       | Yes             | 0.01     | 2.74E-06           | 2.07E-06          | 1.61E-08            | 2.47E-06          | 4.48E-07           | 3.36E-07         | 5.98E-04            | 1.35E-07         | 3.37E-07           | 6.69E-04       | --                | 1.28E-03 |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                   | Yes             | 0.01     | 2.98E-06           | 2.25E-06          | 1.75E-08            | 2.69E-06          | 4.88E-07           | 3.67E-07         | 6.52E-04            | 1.47E-07         | 3.67E-07           | 6.95E-04       | --                | 1.36E-03 |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor | Yes             | 0.01     | 2.98E-06           | 2.25E-06          | 1.75E-08            | 2.69E-06          | 4.88E-07           | 3.67E-07         | 6.52E-04            | 1.47E-07         | 3.67E-07           | 6.95E-04       | --                | 1.36E-03 |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor/Haul Truck           | Yes             | 0.01     | 2.98E-06           | 2.25E-06          | 1.75E-08            | 2.69E-06          | 4.88E-07           | 3.67E-07         | 6.52E-04            | 1.47E-07         | 3.67E-07           | 6.95E-04       | --                | 1.36E-03 |
| DP-29                 | Drop from 12820-CV-0002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3             | Yes             | 0.10     | 2.09E-05           | 1.58E-05          | 1.23E-07            | 1.89E-05          | 3.42E-06           | 2.57E-06         | 4.57E-03            | 1.03E-06         | 2.57E-06           | 4.88E-03       | --                | 9.51E-03 |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                     | Yes             | 0.03     | 4.36E-07           | 1.27E-06          | 3.51E-08            | 9.02E-08          | 6.86E-07           | 9.52E-08         | 1.47E-04            | 1.95E-07         | 8.26E-08           | 4.88E-05       | --                | 2.38E-04 |
| DP-31                 | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor                           | Yes             | 0.02     | 4.52E-06           | 3.41E-06          | 2.65E-08            | 4.07E-06          | 7.40E-07           | 5.55E-07         | 9.88E-04            | 2.22E-07         | 5.56E-07           | 1.05E-03       | --                | 2.06E-03 |
| DP-32                 | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                                 | Yes             | 0.01     | 9.41E-08           | 2.74E-07          | 7.57E-09            | 1.95E-08          | 1.48E-07           | 2.06E-08         | 3.17E-05            | 4.22E-08         | 1.79E-08           | 1.92E-05       | --                | 5.14E-05 |
| DP-33                 | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chute                            | Yes             | 0.03     | 4.61E-06           | 3.68E-06          | 3.41E-08            | 4.09E-06          | 8.88E-07           | 5.76E-07         | 1.02E-03            | 2.64E-07         | 5.74E-07           | 1.07E-03       | --                | 2.11E-03 |
| DP-34                 | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                                   | Yes             | 0.03     | 4.61E-06           | 3.68E-06          | 3.41E-08            | 4.09E-06          | 8.88E-07           | 5.76E-07         | 1.02E-03            | 2.64E-07         | 5.74E-07           | 1.07E-03       | --                | 2.11E-03 |
| DP-82                 | Drop on West Rock Stockpile                                                                                           | Yes             | 0.32     | 5.54E-06           | 1.61E-05          | 4.46E-07            | 1.15E-06          | 8.73E-06           | 1.21E-06         | 1.86E-03            | 2.48E-06         | 1.05E-06           | 1.13E-03       | --                | 3.03E-03 |
| DP-83                 | Drop on East Ore Stockpile                                                                                            | Yes             | 0.36     | 7.37E-05           | 5.57E-05          | 4.33E-07            | 6.65E-05          | 1.21E-05           | 9.06E-06         | 1.61E-02            | 3.62E-06         | 9.08E-06           | 1.72E-02       | --                | 3.35E-02 |
| DP-84                 | Drop on TSF                                                                                                           | Yes             | 0.60     | 1.21E-04           | 9.14E-05          | 7.11E-07            | 1.09E-04          | 1.98E-05           | 1.49E-05         | 2.65E-02            | 5.95E-06         | 1.49E-05           | 2.54E-03       | --                | 9.94E-02 |
| DP-85                 | Drops on TSF2                                                                                                         | Yes             | 1.25     | 2.54E-04           | 1.92E-04          | 1.49E-06            | 2.29E-04          | 4.16E-05           | 3.12E-05         | 5.55E-02            | 1.25E-05         | 3.13E-05           | 5.32E-03       | --                | 6.16E-02 |
| DP-94                 | Transfer from Aqg Stockpile to Loader                                                                                 | Yes             | 0.08     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DP-95                 | Transfer of Aqg Material from Loader to Haul Truck                                                                    | Yes             | 0.08     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DP-96                 | Transfer of Shottcrete Aggregate from Stockpile to Loader                                                             | Yes             | 0.08     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DP-97                 | Transfer from East Ore Stockpile to Loader                                                                            | Yes             | 0.36     | 7.37E-05           | 5.57E-05          | 4.33E-07            | 6.65E-05          | 1.21E-05           | 9.06E-06         | 1.61E-02            | 3.62E-06         | 9.08E-06           | 1.72E-02       | --                | 3.35E-02 |
| DP-98                 | Transfer of Ore from Loader to Haul Truck                                                                             | Yes             | 0.36     | 7.37E-05           | 5.57E-05          | 4.33E-07            | 6.65E-05          | 1.21E-05           | 9.06E-06         | 1.61E-02            | 3.62E-06         | 9.08E-06           | 1.72E-02       | --                | 3.35E-02 |
| DP-99                 | Transfer from Waste Chute Stockpile to Loader                                                                         | Yes             | 3.21     | 8.56E-05           | 1.79E-04          | 4.46E-06            | 4.03E-05          | 8.89E-05           | 1.56E-05         | 2.50E-02            | 2.54E-05         | 1.41E-05           | 1.84E-02       | --                | 4.38E-02 |
| DP-100                | Transfer of Waste Chute Material from Loader to Haul Truck                                                            | Yes             | 3.21     | 8.56E-05           | 1.79E-04          | 4.46E-06            | 4.03E-05          | 8.89E-05           | 1.56E-05         | 2.50E-02            | 2.54E-05         | 1.41E-05           | 1.84E-02       | --                | 4.38E-02 |
| DP-108                | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                                                | Yes             | 7.92E-05 |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DP-139                | Drop of Dry Cationic Flocculant via Manual Addition                                                                   | Yes             | 3.57E-08 |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DP-143                | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module                  | Yes             | 9.97E-04 |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DP-144                | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                                  | Yes             | 2.26E-03 |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DP-145                | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module                  | Yes             | 1.09E-03 |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DP-148                | Drop of Anionic Flocculant (Hydrex 5161)                                                                              | Yes             | 1.18E-05 |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DP-149                | Drop of Sodium Bicarbonate                                                                                            | Yes             | 1.18E-05 |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-1                  | 21210-CX-00002 Main Shaft Ore Discharge Dust Collector 7                                                              | Yes             | 0.24     | 4.07E-05           | 3.25E-05          | 3.01E-07            | 3.61E-05          | 7.83E-06           | 5.08E-06         | 8.99E-03            | 2.33E-06         | 5.06E-06           | 9.46E-03       | --                | 1.86E-02 |
| DC-2                  | 21210-CX-00001 Coarse Ore Overland Dust Collector 7                                                                   | Yes             | 0.28     | 7.62E-05           | 5.75E-05          | 4.47E-07            | 6.87E-05          | 1.25E-05           | 9.36E-06         | 1.67E-02            | 3.75E-06         | 9.38E-06           | 1.78E-02       | --                | 3.47E-02 |
| DC-3                  | 21210-CX-00003 Transfer Tower Silo Dust Collector 4                                                                   | Yes             | 0.35     | 3.75E-04           | 3.00E-04          | 2.79E-06            | 3.33E-04          | 7.23E-05           | 4.69E-05         | 8.30E-02            | 2.15E-05         | 4.67E-05           | 8.73E-02       | --                | 1.71E-01 |
| DC-4                  | 21510-CX-00001 Coarse Ore Silo Dust Collector 4                                                                       | Yes             | 0.83     | 1.66E-04           | 1.27E-04          | 9.84E-07            | 1.51E-04          | 2.74E-05           | 2.06E-05         | 3.61E-02            | 8.24E-06         | 2.06E-06           | 3.91E-02       | --                | 7.66E-02 |
| DC-5                  | 21710-CX-00002 Silo Discharge Dust Collector 5                                                                        | Yes             | 0.81     | 1.65E-04           | 1.25E-04          | 9.71E-07            | 1.49E-04          | 2.71E-05           | 2.03E-05         | 3.61E-02            | 8.13E-06         | 2.03E-05           | 3.85E-02       | --                | 7.52E-02 |
| DC-12                 | 22620-CX-00001 Cooper Sulphate Mix Tank Dust Collector                                                                | Yes             | 0.30     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-13                 | 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector                                                              | Yes             | 0.30     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-14                 | 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector                                                              | Yes             | 0.30     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-15                 | 22620-CX-00004 Caustic Mix Tank Dust Collector                                                                        | Yes             | 0.30     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-16                 | 22210-CX-00001 Pebble Crusher Dust Collector 4                                                                        | Yes             | 0.93     | 1.88E-04           | 1.42E-04          | 1.11E-06            | 1.70E-04          | 3.08E-05           | 2.31E-05         | 4.11E-02            | 9.25E-06         | 2.32E-05           | 4.39E-02       | --                | 8.56E-02 |
| DC-PPBS51             | 18610-SI-00001 Paste Plant Binder Storage Silo 1 6                                                                    | Yes             | 0.14     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-PPBS52             | 18610-SI-00002 Paste Plant Binder Storage Silo 2 6                                                                    | Yes             | 0.14     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-PPBS53             | 18610-SI-00003 Paste Plant Binder Storage Silo 3 6                                                                    | Yes             | 0.28     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-PPBS54             | 18610-SI-00004 Paste Plant Binder Storage Silo 4 6                                                                    | Yes             | 0.28     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-PPM1M              | 18610-DC-20002 Paste Plant Module 1 Mixer 6                                                                           | Yes             | 0.56     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-PPM2M              | 18610-DC-20002 Paste Plant Module 2 Mixer 6                                                                           | Yes             | 0.56     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-7                  | Coarse Ore Dust Collection System 23100-FAN-0001                                                                      | Yes             | 0.12     | 5.42E-05           | 6.52E-05          | 2.02E-07            | 1.47E-05          | 5.17E-06           | 7.21E-07         | 2.11E-02            | 9.37E-07         | 6.01E-07           | 2.11E-03       | --                | 2.33E-02 |
| DC-8                  | Coarse Ore Dust Collection System 23100-FAN-0002                                                                      | Yes             | 0.12     | 5.42E-05           | 6.52E-05          | 2.02E-07            | 1.47E-05          | 5.17E-06           | 7.21E-07         | 2.11E-02            | 9.37E-07         | 6.01E-07           | 2.11E-03       | --                | 2.33E-02 |
| DC-CPBS51             | Paste Plant Binder Silo 1 6                                                                                           | Yes             | 0.14     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-CPBS52             | Paste Plant Binder Silo 2 6                                                                                           | Yes             | 0.14     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-CPBS53             | Paste Plant Binder Silo 3 6                                                                                           | Yes             | 0.28     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-CPBS54             | Paste Plant Binder Silo 4 6                                                                                           | Yes             | 0.28     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-CPM1M              | Paste Plant Module 1 Mixer 6                                                                                          | Yes             | 0.56     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-CPM2M              | Paste Plant Module 2 Mixer 6                                                                                          | Yes             | 0.56     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| DC-10                 | Coarse Ore Dust Collection System 23100-DCD-0005                                                                      | Yes             | 0.12     | 5.42E-05           | 6.52E-05          | 2.02E-07            | 1.47E-05          | 5.17E-06           | 7.21E-07         | 2.11E-02            | 9.37E-07         | 6.01E-07           | 2.11E-03       | --                | 2.33E-02 |
| WTP1LS                | Waste Water Treatment Plant #1 Lime Silo                                                                              | Yes             | 0.19     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| WTP2 DC               | Sodium Sulfate Indoor Dust Collector 5                                                                                | Yes             | 0.01     |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-040               | F449/MB3                                                                                                              | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-041               | 3407-A                                                                                                                | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-044               | Solvay 5100                                                                                                           | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-045               | Cooper Sulphate                                                                                                       | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-046               | Copper Sulphate                                                                                                       | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-047               | Zinc Sulphate                                                                                                         | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-048               | Zinc Sulphate                                                                                                         | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-051               | Zinc Cyanide                                                                                                          | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-052               | Zinc Cyanide                                                                                                          | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-053               | SMBS                                                                                                                  | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-054               | SMBS                                                                                                                  | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-057               | Tailings Flocculant (SNF AN910-VHM)                                                                                   | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                | --                | 0.00E+00 |
| TKN-058               | Tailings Flocculant (SNF AN910-VHM)                                                                                   | Yes             | --       |                    |                   |                     |                   |                    |                  |                     |                  |                    |                |                   |          |

See Table A.2f for HAP emissions not included in this table

### Mine Development HAP Summary

|                |                                                               |     |          |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  |    |          |
|----------------|---------------------------------------------------------------|-----|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--|--|--|--|----|----------|
| TKN-059        | Tailings Flocculant (SNF AN910-VHM)                           | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| TKN-060        | Shaft ANE                                                     | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| TKN-061        | TSF2 Tailings Storage Facility                                | Yes | 40.47    | 8.21E-03 | 6.20E-03 | 4.82E-05 | 7.40E-03 | 1.34E-03 | 1.01E-03 | 1.80     | 4.04E-04 | 1.01E-03 | 1.72E-01 |          |  |  |  |  | -- | 0.00E+00 |
| TSF 1          | Tailing Storage Facility                                      | Yes | 16.45    | 3.34E-03 | 2.52E-03 | 1.96E-05 | 3.01E-03 | 5.47E-04 | 4.10E-04 | 0.73     | 1.64E-04 | 4.11E-04 | 7.01E-02 |          |  |  |  |  | -- | 8.10E-01 |
| WRS            | West Rock Stockpile                                           | Yes | 0.67     | 1.17E-05 | 3.39E-05 | 9.38E-07 | 2.41E-06 | 1.84E-05 | 2.55E-06 | 3.92E-03 | 5.23E-06 | 2.21E-06 | 2.37E-03 |          |  |  |  |  | -- | 6.37E-03 |
| EOS            | East Ore Stockpile                                            | Yes | 0.74     | 1.51E-04 | 1.14E-04 | 8.84E-07 | 1.36E-04 | 2.47E-05 | 1.85E-05 | 3.29E-02 | 7.40E-06 | 1.85E-05 | 3.51E-02 |          |  |  |  |  | -- | 6.85E-02 |
| TAGG           | Taylor Aqa Stockpile                                          | Yes | 4.53E-04 |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| TSHOT          | Taylor Shotcrete Stockpile                                    | Yes | 8.06E-04 |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| HRS            | Hardshell Rock Stockpile                                      | Yes | 3.95     | 6.88E-05 | 2.00E-04 | 5.53E-06 | 1.42E-05 | 1.08E-04 | 1.50E-05 | 2.31E-02 | 3.08E-05 | 1.30E-05 | 2.25E-02 |          |  |  |  |  | -- | 4.61E-02 |
| ORE            | Clark Ore Stockpile                                           | Yes | 0.12     | 5.43E-05 | 2.02E-07 | 2.02E-07 | 1.48E-05 | 1.58E-06 | 7.23E-07 | 2.11E-02 | 9.39E-07 | 6.02E-07 | 2.12E-03 |          |  |  |  |  | -- | 2.34E-02 |
| ROM            | Clark ROM Stockpile                                           | Yes | 0.04     | 1.61E-05 | 1.94E-05 | 6.00E-08 | 4.38E-06 | 1.54E-06 | 2.14E-07 | 6.27E-03 | 2.79E-07 | 1.79E-07 | 6.29E-04 |          |  |  |  |  | -- | 6.94E-03 |
| AGG            | Clark Aqa Stockpile                                           | Yes | 0.00     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| SHOT           | Clark Shotcrete Stockpile                                     | Yes | 0.00     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| CHUTE          | Waste Chute Stockpile                                         | Yes | 0.00     | 6.92E-08 |          | 1.44E-07 | 3.60E-09 | 3.26E-08 | 7.18E-08 | 1.26E-08 | 2.02E-05 | 2.05E-08 | 1.14E-08 | 1.49E-05 |  |  |  |  | -- | 3.54E-05 |
| WTP2CT         | Cooling Towers                                                | Yes | 0.02     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| PRODREF        | Refrigeration Plant3                                          | Yes | 0.05     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| BREF           | Refrigeration Plant3                                          | Yes | 0.08     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| MILLREF        | Primary Mill Cooling Tower                                    | Yes | 0.00     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| SCRUBBER-1     | Tank Exhaust HCN Scrubber                                     | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| Tanks Exhaust  | Process Tanks Exhaust                                         | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| CBP1_11        | Taylor Concrete Batch Plant2                                  | Yes | 0.79     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| CBP1_11        | Clark Concrete Batch Plant                                    | Yes | 0.04     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| DOZER1-TSF2    | Dozer Emissions                                               | Yes | 8.96     | 1.82E-03 | 1.37E-03 | 1.07E-05 | 1.64E-03 | 2.98E-04 | 2.24E-04 | 3.98E-01 | 8.94E-05 | 2.24E-04 | 3.82E-02 |          |  |  |  |  | -- | 4.42E-01 |
| DOZER2-TSF2    | Dozer Emissions                                               | Yes | 8.96     | 1.82E-03 | 1.37E-03 | 1.07E-05 | 1.64E-03 | 2.98E-04 | 2.24E-04 | 3.98E-01 | 8.94E-05 | 2.24E-04 | 3.82E-02 |          |  |  |  |  | -- | 4.42E-01 |
| DOZER-WRS      | Dozer Emissions                                               | Yes | 1.09     | 1.89E-05 | 5.49E-05 | 1.52E-06 | 3.91E-06 | 2.97E-05 | 4.13E-06 | 6.35E-03 | 8.47E-06 | 3.58E-06 | 3.84E-03 |          |  |  |  |  | -- | 1.03E-02 |
| DOZER-HRS      | Dozer Emissions                                               | Yes | 1.09     | 1.89E-05 | 5.49E-05 | 1.52E-06 | 3.91E-06 | 2.97E-05 | 4.13E-06 | 6.35E-03 | 8.47E-06 | 3.58E-06 | 6.19E-03 |          |  |  |  |  | -- | 1.27E-02 |
| DOZER-TSF      | Dozer Emissions                                               | Yes | 1.09     | 1.82E-03 | 1.37E-03 | 1.07E-05 | 1.64E-03 | 2.98E-04 | 2.24E-04 | 3.98E-01 | 8.94E-05 | 2.24E-04 | 3.82E-02 |          |  |  |  |  | -- | 1.11E-01 |
| DOZER-EOS      | Dozer Emissions                                               | Yes | 1.09     | 2.20E-04 | 1.66E-04 | 1.29E-06 | 1.99E-04 | 3.61E-05 | 2.71E-05 | 4.82E-02 | 1.08E-05 | 2.71E-05 | 5.14E-02 |          |  |  |  |  | -- | 1.00E-01 |
| MEVAP1         | Mechanical Evaporator                                         | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| MEVAP2         | Mechanical Evaporator                                         | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| MEVAP3         | Mechanical Evaporator                                         | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-FC-00001 | Lead Rougher                                                  | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-FC-00004 | Lead Rougher Scavenger                                        | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-FC-00008 | Lead Cleaner Scalper                                          | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-FC-00007 | Lead Cleaner                                                  | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-FC-00009 | Lead Cleaner Scavenger                                        | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-FC-00005 | Zinc Rougher                                                  | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-FC-00006 | Zinc Rougher Scavenger                                        | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-FC-00011 | Zinc Cleaner Scalper                                          | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-FC-00010 | Zinc Cleaner                                                  | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-FC-00012 | Zinc Cleaner Scavenger                                        | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22430-TN-00001 | Lead Concentrate Tank                                         | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22430-TN-00002 | Zinc Concentrate Tank                                         | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-TN-00003 | Lead Conditioning Tank                                        | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-TN-00001 | Zinc Conditioning Tank No. 1                                  | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| 22310-TN-00002 | Zinc Conditioning Tank No. 2                                  | Yes | --       |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| DRILL-2        | Drilling                                                      | Yes | 0.02     | 8.68E-06 | 1.05E-05 | 3.23E-08 | 2.36E-06 | 8.28E-07 | 1.15E-07 | 3.38E-03 | 1.50E-07 | 9.62E-08 | 3.39E-04 |          |  |  |  |  | -- | 3.74E-03 |
| BLAST-2        | Blasting                                                      | Yes | 0.31     | 1.38E-04 | 1.67E-04 | 5.16E-07 | 3.76E-05 | 1.32E-05 | 1.84E-06 | 5.39E-02 | 2.39E-06 | 1.53E-06 | 5.40E-03 |          |  |  |  |  | -- | 5.96E-02 |
| DP-103         | Dump into Primary Crusher Feed Hopper                         | Yes | 0.29     | 1.31E-04 | 1.57E-04 | 4.86E-07 | 3.55E-05 | 1.24E-05 | 1.74E-06 | 5.08E-02 | 2.26E-06 | 1.45E-06 | 5.09E-03 |          |  |  |  |  | -- | 5.62E-02 |
| DP-104         | Drop from silo to trucks                                      | Yes | 0.96     | 4.35E-04 | 5.24E-04 | 1.62E-06 | 1.18E-04 | 4.15E-05 | 5.75E-06 | 1.69E-01 | 7.53E-06 | 4.82E-06 | 1.70E-02 |          |  |  |  |  | -- | 1.87E-01 |
| DP-105         | Transfer of Ore from Ore Stockpile to loader                  | Yes | 0.26     | 2.61E-04 | 3.14E-04 | 9.73E-07 | 7.09E-05 | 3.47E-06 | 1.03E-01 | 4.52E-06 | 2.89E-06 | 1.02E-02 |          |          |  |  |  |  | -- | 1.31E-01 |
| DP-106         | Transfer of Ore Mined from Loader to Haul Truck               | Yes | 0.58     | 2.61E-04 | 3.14E-04 | 9.73E-07 | 7.09E-05 | 2.49E-05 | 3.47E-06 | 1.02E-01 | 4.52E-06 | 2.89E-06 | 1.02E-02 |          |  |  |  |  | -- | 1.12E-01 |
| DP-107         | Transfer from ROM Stockpile to Loader                         | Yes | 0.16     | 7.16E-05 | 8.62E-05 | 2.67E-07 | 1.94E-05 | 6.82E-06 | 9.52E-07 | 2.79E-02 | 1.24E-06 | 7.94E-07 | 2.79E-03 |          |  |  |  |  | -- | 3.08E-02 |
| DP-109         | Transfer from Aqa Stockpile to Loader                         | Yes | 0.08     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| DP-110         | Transfer of Aqa Material from Loader to Haul Truck            | Yes | 0.08     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| DP-111         | Transfer of Shotcrete Aggregate from Stockpile to Loader      | Yes | 0.08     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| DP-113         | Hardshell Rock Storage                                        | Yes | 2.60     | 1.22E-04 | 2.20E-04 | 2.82E-06 | 3.29E-05 | 8.02E-05 | 5.79E-06 | 4.48E-02 | 1.68E-05 | 7.67E-06 | 1.47E-02 |          |  |  |  |  | -- | 6.00E-02 |
| DP-114         | Ore Stockpile                                                 | Yes | 0.58     | 2.61E-04 | 3.14E-04 | 9.73E-07 | 7.09E-05 | 2.49E-05 | 3.47E-06 | 1.02E-01 | 4.52E-06 | 2.89E-06 | 1.02E-02 |          |  |  |  |  | -- | 1.12E-01 |
| DP-115         | ROM Stockpile                                                 | Yes | 0.16     | 7.16E-05 | 8.62E-05 | 2.67E-07 | 1.94E-05 | 6.82E-06 | 9.52E-07 | 2.79E-02 | 1.24E-06 | 7.94E-07 | 2.79E-03 |          |  |  |  |  | -- | 3.08E-02 |
| DP-124         | Transfer of Development Ore from Face to Loader               | Yes | 0.00     | 2.20E-07 | 2.98E-07 | 1.08E-09 | 6.02E-08 | 4.61E-08 | 4.14E-09 | 8.56E-05 | 7.77E-09 | 3.91E-09 | 1.16E-05 |          |  |  |  |  | -- | 9.79E-05 |
| DP-125         | Transfer of Development Ore from Loader to Stockpile          | Yes | 0.00     | 2.20E-07 | 2.98E-07 | 1.08E-09 | 6.02E-08 | 4.61E-08 | 4.14E-09 | 8.56E-05 | 7.77E-09 | 3.91E-09 | 1.16E-05 |          |  |  |  |  | -- | 9.79E-05 |
| DP-126         | Transfer of Development Ore from Stockpile to Loader          | Yes | 0.00     | 2.20E-07 | 2.98E-07 | 1.08E-09 | 6.02E-08 | 4.61E-08 | 4.14E-09 | 8.56E-05 | 7.77E-09 | 3.91E-09 | 1.16E-05 |          |  |  |  |  | -- | 9.79E-05 |
| DP-127         | Transfer of Development Ore Mined from Loader to Haul Truck   | Yes | 0.00     | 2.20E-07 | 2.98E-07 | 1.08E-09 | 6.02E-08 | 4.61E-08 | 4.14E-09 | 8.56E-05 | 7.77E-09 | 3.91E-09 | 1.16E-05 |          |  |  |  |  | -- | 9.79E-05 |
| DP-129         | Transfer of Development Waste Mined from Face to Loader       | Yes | 0.00     | 2.19E-07 | 3.96E-07 | 5.07E-09 | 5.91E-08 | 1.44E-07 | 1.04E-08 | 8.06E-05 | 3.02E-08 | 1.38E-08 | 2.65E-05 |          |  |  |  |  | -- | 1.08E-04 |
| DP-130         | Transfer of Development Waste Mined from Loader to Stockpile  | Yes | 0.00     | 2.19E-07 | 3.96E-07 | 5.07E-09 | 5.91E-08 | 1.44E-07 | 1.04E-08 | 8.06E-05 | 3.02E-08 | 1.38E-08 | 2.65E-05 |          |  |  |  |  | -- | 1.08E-04 |
| DP-131         | Transfer of Development Waste Mined from Stockpile to Loader  | Yes | 0.00     | 2.19E-07 | 3.96E-07 | 5.07E-09 | 5.91E-08 | 1.44E-07 | 1.04E-08 | 8.06E-05 | 3.02E-08 | 1.38E-08 | 2.65E-05 |          |  |  |  |  | -- | 1.08E-04 |
| DP-132         | Transfer of Development Waste Mined from Loader to Haul Truck | Yes | 0.00     | 2.19E-07 | 3.96E-07 | 5.07E-09 | 5.91E-08 | 1.44E-07 | 1.04E-08 | 8.06E-05 | 3.02E-08 | 1.38E-08 | 2.65E-05 |          |  |  |  |  | -- | 1.08E-04 |
| DP-134         | Transfer of Slope Ore from Slope to Loader                    | Yes | 0.00     | 1.16E-06 | 1.39E-06 | 4.31E-09 | 3.14E-07 | 1.10E-07 | 1.54E-08 | 4.50E-04 | 2.00E-08 | 1.28E-08 | 4.52E-05 |          |  |  |  |  | -- | 4.99E-04 |
| DP-135         | Transfer of Slope Ore from Loader to Stockpile                | Yes | 0.00     | 1.16E-06 | 1.39E-06 | 4.31E-09 | 3.14E-07 | 1.10E-07 | 1.54E-08 | 4.50E-04 | 2.00E-08 | 1.28E-08 | 4.52E-05 |          |  |  |  |  | -- | 4.99E-04 |
| DP-136         | Transfer of Slope Ore from Stockpile to Loader                | Yes | 0.00     | 1.16E-06 | 1.39E-06 | 4.31E-09 | 3.14E-07 | 1.10E-07 | 1.54E-08 | 4.50E-04 | 2.00E-08 | 1.28E-08 | 4.52E-05 |          |  |  |  |  | -- | 4.99E-04 |
| DP-137         | Transfer of Slope Ore from Loader to Haul Truck               | Yes | 0.00     | 1.16E-06 | 1.39E-06 | 4.31E-09 | 3.14E-07 | 1.10E-07 | 1.54E-08 | 4.50E-04 | 2.00E-08 | 1.28E-08 | 4.52E-05 |          |  |  |  |  | -- | 4.99E-04 |
| PP-1           | Truck Pneumatic Loadout to Silo 1                             | Yes | 0.04     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| PP-2           | Truck Pneumatic Loadout to Silo 2                             | Yes | 0.04     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| PP-3           | Truck Pneumatic Loadout to Silo 1                             | Yes | 0.02     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| PP-4           | Truck Pneumatic Loadout to Silo 2                             | Yes | 0.02     |          |          |          |          |          |          |          |          |          |          |          |  |  |  |  | -- | 0.00E+00 |
| ROADS          | Road Emissions                                                | Yes | 311.25   | 4.51E-03 | 6.41E-03 | 6.23E-04 | 1.44E-04 | 1.00E-02 | 5.26E-03 | 2.19E-01 | 1.05E-02 | 9.34E-04 | 3.17E-02 |          |  |  |  |  | -- | 2.89E-01 |
| UGTROADS       | Underground Taylor Roads                                      | Yes | 77.04    | 1.34E-03 | 3.90E-03 | 1.08E-04 | 2.77E-04 | 2.11E-03 | 2.93E    |          |          |          |          |          |  |  |  |  |    |          |

1. Table of HAP Constituents received from South32 in "Copy of Air Permitting Final 0 HAPs"

**Mine Development  
HAP Summary**

**Table A-2c. Constituent Mass Fraction in LOM**

| HAP                 | Taylor          |           |         |                         |  | Clark           |           |         |  | Taylor Weighted Average |                         |                      |
|---------------------|-----------------|-----------|---------|-------------------------|--|-----------------|-----------|---------|--|-------------------------|-------------------------|----------------------|
|                     | Development Ore | Stope Ore | Rock    | Tailings <sup>1,2</sup> |  | Development Ore | Stope Ore | Rock    |  | All Material            | Stope + Development Ore | Waste Chute Material |
| Antimony Compounds  | 0.0101%         | 0.0212%   | 0.0017% | 0.0203%                 |  | 0.024%          | 0.045%    | 0.005%  |  | 0.017%                  | 0.020%                  | 0.003%               |
| Arsenic Compounds   | 0.0127%         | 0.0156%   | 0.0051% | 0.0153%                 |  | 0.033%          | 0.054%    | 0.008%  |  | 0.013%                  | 0.015%                  | 0.006%               |
| Beryllium Compounds | 0.0001%         | 0.0001%   | 0.0001% | 0.0001%                 |  | 0.0001%         | 0.0002%   | 0.0001% |  | 0.000%                  | 0.000%                  | 0.000%               |
| Cadmium Compounds   | 0.0060%         | 0.0194%   | 0.0004% | 0.0183%                 |  | 0.007%          | 0.012%    | 0.001%  |  | 0.015%                  | 0.018%                  | 0.001%               |
| Chromium Compounds  | 0.0036%         | 0.0033%   | 0.0027% | 0.0033%                 |  | 0.005%          | 0.004%    | 0.003%  |  | 0.003%                  | 0.003%                  | 0.003%               |
| Cobalt Compounds    | 0.0013%         | 0.0026%   | 0.0004% | 0.0025%                 |  | 0.0005%         | 0.001%    | 0.0002% |  | 0.002%                  | 0.002%                  | 0.000%               |
| Cyanide Compounds   | N/A             | N/A       | N/A     | N/A                     |  | N/A             | N/A       | N/A     |  | N/A                     | N/A                     | N/A                  |
| Manganese Compounds | 4.0637%         | 4.4700%   | 0.5852% | 4.4366%                 |  | 9.497%          | 17.550%   | 1.726%  |  | 3.684%                  | 4.437%                  | 0.778%               |
| Mercury Compounds   | N/A             | N/A       | N/A     | N/A                     |  | N/A             | N/A       | N/A     |  | N/A                     | N/A                     | N/A                  |
| Nickel Compounds    | 0.0010%         | 0.0010%   | 0.0008% | 0.0010%                 |  | 0.001%          | 0.001%    | 0.001%  |  | 0.001%                  | 0.001%                  | 0.001%               |
| Radionuclides       | N/A             | N/A       | N/A     | N/A                     |  | N/A             | N/A       | N/A     |  | N/A                     | N/A                     | N/A                  |
| Selenium Compounds  | 0.0014%         | 0.0026%   | 0.0003% | 0.0025%                 |  | 0.000%          | 0.001%    | 0.000%  |  | 0.002%                  | 0.002%                  | 0.000%               |
| Lead Compounds      | 2.1756%         | 4.9606%   | 0.3541% | 0.4259%                 |  | 1.2896%         | 1.759%    | 0.5669% |  | 3.876%                  | 4.732%                  | 0.573%               |

1. For constituents other than lead, tailings based on the weighted average of the development and stope ore throughput and mass fraction.

2. Estimated 91% recovery for lead ore. Since the recovery fractions for other metals are not known yet, it is conservatively assumed that all of those metals pass through to the tailings.

Notes on Lead

| Material        | Notes                                                  |
|-----------------|--------------------------------------------------------|
| Development Ore | Based on average inside domains                        |
| Stope Ore       | Based on assays within stope design                    |
| Rock            | Based on average lithology grades minus inside domains |

Stope numbers based on evaluation of drillhole data through stope designs

Rock is the evaluation of assays within lithological units.

**Table A-2d. Metal Content in Road Surface**

| Metal     | Content (kg/kg) |
|-----------|-----------------|
| Antimony  | 1.45E-05        |
| Arsenic   | 2.06E-05        |
| Beryllium | 2.00E-06        |
| Cadmium   | 4.64E-07        |
| Chromium  | 3.22E-05        |
| Cobalt    | 1.69E-05        |
| Nickel    | 3.38E-05        |
| Selenium  | 3.00E-06        |
| Mercury   | 0.00E+00        |

Mean of 61 rock samples collected on Trachyandesite of Meadow Valley geologic base (Ka) reported in "Geochemical and Mineralogical Study of the Red Mountain Porphyry Copper-Molybdenum Deposit and Vicinity, Santa Cruz County, Arizona" 2020 prepared by USGS.

Table A-2a. Generator HAPs Summary

| Emission ID        | Description | HAP Annual Emissions (lb/yr) |          |          |               |              |              |          |             |                           |                       |                     |                     |                        |          |                      |               |            |              |                     |          |                    |          |          |          |                   |                |       |
|--------------------|-------------|------------------------------|----------|----------|---------------|--------------|--------------|----------|-------------|---------------------------|-----------------------|---------------------|---------------------|------------------------|----------|----------------------|---------------|------------|--------------|---------------------|----------|--------------------|----------|----------|----------|-------------------|----------------|-------|
|                    |             | Benzene                      | Toluene  | Xylene   | 1,3-Butadiene | Formaldehyde | Acetaldehyde | Acrolein | Naphthalene | 1,1,2,2-Tetrachloroethane | 1,1,2-Trichloroethane | 1,2-Dichloropropane | 2-Methylnaphthalene | 2,2,4-Trimethylpentane | Biphenyl | Carbon Tetrachloride | Chlorobenzene | Chloroform | Ethylbenzene | Ethylene Dichloride | Methanol | Methylene Chloride | Hexane   | PAH      | Phenol   | Tetrachloroethane | Vinyl Chloride | Total |
| ENGINE 0003 - 0006 | Trench      | 2.11E-01                     | 1.95E-01 | 0.69     | 0.13          | 6.75         | 27.46        | 2.46     | 0.04        | 0.19                      | 0.15                  | 0.01                | 0.02                | 0.12                   | 0.10     | 0.17                 | 0.14          | 0.13       | 0.02         | 0.21                | 1.20     | 0.09               | 0.53     | 0.36     | 0.11     | 0.01              | 0.07           | 40.98 |
| ENGINE 0007 - 0013 | Headshot    | 2.70E-01                     | 2.17E-01 | 4.41E-01 | 1.14E-01      | 2.70E-01     | 2.70E-01     | 1.70E-01 | ...         | ...                       | ...                   | ...                 | ...                 | ...                    | ...      | ...                  | ...           | ...        | ...          | ...                 | ...      | ...                | ...      | ...      | ...      | ...               | ...            |       |
| ENGINE 0004 - 0006 | Tank        | 6.01E-01                     | 2.18E-01 | 1.40E-01 | 1.03E-01      | 6.11E-01     | 1.00E-01     | 6.10E-01 | 1.01E-01    | ...                       | ...                   | ...                 | ...                 | ...                    | ...      | ...                  | ...           | ...        | ...          | ...                 | ...      | ...                | ...      | ...      | ...      | ...               | ...            |       |
| ENGINE 0001        | VWV         | 2.17E-01                     | 2.18E-01 | 2.90E-01 | 1.40E-01      | 1.03E-01     | 6.75E-01     | 3.10E-01 | ...         | ...                       | ...                   | ...                 | ...                 | ...                    | ...      | ...                  | ...           | ...        | ...          | ...                 | ...      | ...                | ...      | ...      | ...      | ...               | ...            |       |
|                    | Total       | 4.50E-01                     | 2.63E-01 | 4.40E-01 | 1.40E-01      | 6.70E+00     | 2.70E+01     | 2.77E+00 | 7.44E-02    | 1.88E-01                  | 1.49E-01              | 1.26E-02            | 1.59E-02            | 1.20E-01               | 1.02E-01 | 1.72E-01             | 1.43E-01      | 1.34E-01   | 1.90E-02     | 2.08E-01            | 1.20E+00 | 0.39E-02           | 5.53E-01 | 3.89E-01 | 1.13E-01 | 1.16E-02          | 7.00E-02       | 41.47 |

Table A-2f. Emission Source - Other HAPs and Lead Compounds Summary

| Emission ID | Description                     | HAP Annual Emissions (lb/yr) |        |                                |          |          |                        |          |              |          |          |             |          |          |          |          |
|-------------|---------------------------------|------------------------------|--------|--------------------------------|----------|----------|------------------------|----------|--------------|----------|----------|-------------|----------|----------|----------|----------|
|             |                                 | 1,1,1-Trichloroethane        |        |                                |          |          |                        |          |              |          |          |             |          |          |          |          |
|             |                                 | Hydrogen Cyanide             | Cresol | Ethylene Glycol Dimethyl Ether | Urethane | Benzene  | Benzene(g/L)peryl hour | Cumene   | Ethylbenzene | Hexane   | Isocane  | Naphthalene | PAC's    | Toluene  | Xylene   | Total    |
| Y-01        | Unleaded Gasoline (CYO)         | ...                          | ...    | ...                            | ...      | 2.03E-01 | 1.49E-19               | 2.03E-06 | 1.53E-04     | 1.53E-04 | 2.13E-01 | 1.18E-04    | 1.18E-04 | 2.13E-01 | 6.66E-04 | 2.76E-03 |
| Y-02        | Diesel (Blat Diesel SLP)        | ...                          | ...    | ...                            | ...      | 1.20E-06 | 1.00E-18               | 0.00E+00 | 5.03E-06     | 5.03E-06 | 6.00E+00 | 2.69E-07    | 2.69E-07 | 1.77E-01 | 9.81E-01 | 1.58E-04 |
| Y-03        | Diesel (Blat Diesel SLP)        | ...                          | ...    | ...                            | ...      | 1.30E-06 | 1.00E-18               | 0.00E+00 | 5.03E-06     | 5.03E-06 | 6.00E+00 | 2.69E-07    | 2.69E-07 | 1.77E-01 | 9.81E-01 | 1.58E-04 |
| Y-04        | Diesel (Blat Diesel SLP)        | ...                          | ...    | ...                            | ...      | 1.40E-06 | 1.00E-18               | 0.00E+00 | 5.03E-06     | 5.03E-06 | 6.00E+00 | 2.69E-07    | 2.69E-07 | 1.77E-01 | 9.81E-01 | 1.58E-04 |
| Y-05        | Unleaded Gasoline (Blat Diesel) | ...                          | ...    | ...                            | ...      | 1.70E-01 | 1.20E-19               | 2.23E-06 | 1.43E-01     | 1.43E-01 | 2.01E-01 | 1.03E-06    | 1.03E-06 | 2.01E-01 | 5.70E-01 | 6.66E-03 |
| Y-06        | Diesel (Blat Diesel)            | ...                          | ...    | ...                            | ...      | 1.30E-07 | 1.00E-18               | 0.00E+00 | 1.40E-06     | 1.40E-06 | 2.13E-01 | 1.18E-04    | 1.18E-04 | 2.13E-01 | 6.66E-04 | 3.96E-02 |
| Y-07        | Unleaded Gasoline               | ...                          | ...    | ...                            | ...      | 1.03E-07 | 7.62E-19               | 1.13E-04 | 2.70E-04     | 2.70E-04 | 1.18E-07 | 6.03E-06    | 6.03E-06 | 1.18E-07 | 1.40E-01 | 1.98E-02 |
| Y-08        | Unleaded Gasoline               | ...                          | ...    | ...                            | ...      | 1.03E-07 | 7.62E-19               | 1.13E-04 | 2.70E-04     | 2.70E-04 | 1.18E-07 | 6.03E-06    | 6.03E-06 | 1.18E-07 | 1.40E-01 | 1.98E-02 |
| Y-09        | Unleaded Gasoline               | ...                          | ...    | ...                            | ...      | 1.03E-07 | 7.62E-19               | 1.13E-04 | 2.70E-04     | 2.70E-04 | 1.18E-07 | 6.03E-06    | 6.03E-06 | 1.18E-07 | 1.40E-01 | 1.98E-02 |
| Y-10        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.60E-01 | 1.80E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-11        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-12        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-13        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-14        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-15        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-16        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-17        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-18        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-19        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-20        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-21        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-22        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-23        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-24        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-25        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-26        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-27        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-28        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-29        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-30        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-31        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-32        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-33        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-34        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-35        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-36        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-37        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-38        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-39        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-40        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-41        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-42        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-43        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-44        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-45        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-46        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-47        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-48        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-49        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-50        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-51        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-52        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-53        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-54        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-55        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-56        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-57        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-58        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-59        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-60        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-61        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-62        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-63        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-64        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-65        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-66        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    | 1.00E-01 | 0.00E+00 | 2.13E-01 | 3.46E-03 |
| Y-67        | Diesel                          | ...                          | ...    | ...                            | ...      | 2.00E-05 | 1.50E-17               | 0.00E+00 | 1.10E-04     | 1.10E-04 | 0.00E+00 | 1.00E-01    |          |          |          |          |

**Mine Development  
Pb Content**

**Table A-2g. Taylor Lead Content**

| <b>Material</b>                            | <b>Lead Content (%)</b> |
|--------------------------------------------|-------------------------|
| Stope Ore                                  | 4.96%                   |
| Waste Rock                                 | 0.35%                   |
| Developmental Ore                          | 2.18%                   |
| Tailings                                   | 0.43%                   |
| Stope Ore & Developmental Ore              | 4.73%                   |
| Stope Ore & Developmental Ore & Waste Rock | 3.88%                   |
| Waste Chute Material                       | 0.57%                   |

**Mine Development  
Drilling - Taylor**

**Table A-3a. Taylor Drilling - Parameters and Emission Factors**

| Emission Point Number | Activity | Throughput <sup>1</sup> |            | Controlled Emission Factor <sup>3</sup> |                                           |                               |                                         | Control <sup>4</sup>                                            |                                        |                                  |
|-----------------------|----------|-------------------------|------------|-----------------------------------------|-------------------------------------------|-------------------------------|-----------------------------------------|-----------------------------------------------------------------|----------------------------------------|----------------------------------|
|                       |          | (tons/hr)               | (ton/year) | PM<br>(lb/ton)                          | PM <sub>10</sub> <sup>2</sup><br>(lb/ton) | PM <sub>2.5</sub><br>(lb/ton) | Lead Compounds <sup>5</sup><br>(lb/ton) | Type                                                            | PM/PM <sub>10</sub> /Pb Efficiency (%) | PM <sub>2.5</sub> Efficiency (%) |
| DRILL-1               | Drilling | 657                     | 5,755,000  | 1.69E-04                                | 8.00E-05                                  | 1.21E-05                      | 8.39E-06                                | Gravity Settling due to underground drilling (underground only) | 87%                                    | 17%                              |

1. Per Total tonnes w/ backfill used from "Mined tonnes and Pb grade.xlsx" recd. on 7/12/2021

2. Per AP-42 Section 11.19.2, Table 11.19.2-2 (08/2004) for "Wet Drilling - Unfragmented Stone".

3. Per U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, the particle size multiplier used for calculating emission factors for PM<sub>10</sub> and PM<sub>2.5</sub> is as follows:

PM: 0.74

PM<sub>10</sub>: 0.35

PM<sub>2.5</sub>: 0.053

4. Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32. Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

5. Lead percentage in stope ore used conservatively for drilling 4.96 %

**Table A-3b. Taylor Drilling - Emissions**

| Emission Point Number | Activity | Controlled Emissions <sup>1</sup> |                  |                   |                |                          |                  |                   |                |                          |                  |                   |                |
|-----------------------|----------|-----------------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |          | Annual Emissions (tpy)            |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                | Hourly Emissions (lb/hr) |                  |                   |                |
|                       |          | PM                                | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DRILL-1               | Drilling | 0.06                              | 0.03             | 2.88E-02          | 3.02E-03       | 0.33                     | 0.16             | 0.16              | 0.02           | 1.39E-02                 | 6.57E-03         | 6.57E-03          | 6.89E-04       |

1. Controlled Emissions have been calculated for drilling since gravity settling is a part of an inherent process for underground mines.

Pursuant to 40 CFR §64.1, "control device" means "equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere." Furthermore, "inherent process equipment" means "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations." The gravity settling is an inherent part of the process.

**Mine Development  
Drilling - Clark**

**Table A-4a. Clark Drilling - Parameters and Emission Factors**

| Emission Point Number | Activity | Throughput <sup>1</sup> |            | Controlled Emission Factor <sup>3</sup> |                               |                   |                             | Control <sup>4</sup>                                            |                                        |                                  |
|-----------------------|----------|-------------------------|------------|-----------------------------------------|-------------------------------|-------------------|-----------------------------|-----------------------------------------------------------------|----------------------------------------|----------------------------------|
|                       |          |                         |            | PM                                      | PM <sub>10</sub> <sup>2</sup> | PM <sub>2.5</sub> | Lead Compounds <sup>5</sup> | Type                                                            | PM/PM <sub>10</sub> /Pb Efficiency (%) | PM <sub>2.5</sub> Efficiency (%) |
|                       |          | (tons/hr)               | (ton/year) | (lb/ton)                                | (lb/ton)                      | (lb/ton)          | (lb/ton)                    |                                                                 |                                        |                                  |
| DRILL-2               | Drilling | 128                     | 1,125,000  | 1.69E-04                                | 8.00E-05                      | 1.21E-05          | 2.98E-06                    | Gravity Settling due to underground drilling (underground only) | 80%                                    | 16%                              |

1. Per email "Clark Updated Inputs for Air Permit" from Cayley Hoffman received on 9/8/2022

2. Per AP-42 Section 11.19.2, Table 11.19.2-2 (08/2004) for "Wet Drilling - Unfragmented Stone".

3. Per U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, the particle size multiplier used for calculating emission factors for PM10 and PM2.5 is as follows:

PM: 0.74

PM<sub>10</sub>: 0.35

PM<sub>2.5</sub>: 0.053

4. Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32. Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

5. Lead percentage in stope ore used conservatively for drilling 1.76 %

**Table A-4b. Clark Drilling - Emissions**

| Emission Point Number | Activity | Controlled Emissions <sup>1</sup> |                  |                   |                |                          |                  |                   |                |                          |                  |                   |                |
|-----------------------|----------|-----------------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |          | Annual Emissions (tpy)            |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                | Hourly Emissions (lb/hr) |                  |                   |                |
|                       |          | PM                                | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DRILL-2               | Drilling | 0.02                              | 0.009            | 0.0057            | 0.0003         | 0.11                     | 0.05             | 0.031             | 0.002          | 0.004                    | 0.002            | 1.30E-03          | 7.73E-05       |

1. Controlled Emissions have been calculated for drilling since gravity settling is a part of an inherent process for underground mines.

Pursuant to 40 CFR §64.1, "control device" means "equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere." Furthermore, "inherent process equipment" means "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations." The gravity settling is an inherent part of the process.

**Mine Development  
Blasting - Taylor**

**Table A-5a. Taylor Blasting - Parameters**

| Emission Point No. | Location | Blast Area<br>(ft <sup>2</sup> /blast) <sup>1</sup> | Throughput <sup>1</sup> |          | Blasting Rates <sup>1</sup> |
|--------------------|----------|-----------------------------------------------------|-------------------------|----------|-----------------------------|
|                    |          | Maximum                                             | (ton/hr)                | (ton/yr) | (blasts/yr)                 |
| BLAST-1            | Blasting | 9,000                                               | 17.42                   | 4,500    | 730                         |

1. Per meetings with Kevin McCoy on 9/9/2022, 10/14/2022, and 10/17/2022

Maximum Hourly emulsion usage = 17.42 ton/hr

**Table A-5b. Taylor Blasting Emissions**

| Emission Point No. | Location | Pollutant         | Emission Factor <sup>1,2,3,4,5</sup> | Unit              | Controlled Emissions <sup>6,7</sup> |          |          |
|--------------------|----------|-------------------|--------------------------------------|-------------------|-------------------------------------|----------|----------|
|                    |          |                   |                                      |                   | (tpy)                               | (lb/day) | (lb/hr)  |
| BLAST-1            | Blasting | NO <sub>x</sub>   | 0.50                                 | (lb/ton Emulsion) | 1.13                                | --       | 8.71     |
|                    |          | CO                | 27.00                                | (lb/ton Emulsion) | 60.75                               | --       | 470.25   |
|                    |          | H <sub>2</sub> S  | 4.00                                 | (lb/ton Emulsion) | 9.00                                | --       | 69.67    |
|                    |          | SO <sub>2</sub>   | 1.00                                 | (lb/ton Emulsion) | 2.25                                | --       | 17.42    |
|                    |          | PM                | 1.49                                 | (Max lb/Blast)    | 0.55                                | 2.99     | 1.49     |
|                    |          | PM <sub>10</sub>  | 0.78                                 | (Max lb/Blast)    | 0.28                                | 1.55     | 0.78     |
|                    |          | PM <sub>2.5</sub> | 0.30                                 | (Max lb/Blast)    | 0.11                                | 0.59     | 0.30     |
|                    |          | Lead (from ore)   | 0.07                                 | (Max lb/Blast)    | 0.03                                | 0.15     | 0.074    |
|                    |          | CO <sub>2</sub>   | 463.18                               | (lb/ton)          | 1,042.15                            | --       | 8,066.92 |

1. NO<sub>x</sub> and CO emission factors based on "Fume Memo WESCO Aug 2021" pdf dated 19 August 2021 provided by Seth Fredrick Dyno Nobel Inc.

2. H<sub>2</sub>S and SO<sub>2</sub> emission factors per AP-42 Section 13.3, Table 13.3-1 for dynamite, gelatin (January 1995).

This emission factor was used by FMI Climax Mine, Colorado (underground mine) per permit application in October 2013 for CDPHE Air Permit No. 95CC899.

3. PM emission factor calculated per AP-42 Section 11.9, Table 11.9-1 for blasting (July 1998)

$0.000014(A)^{1.5}$  where, A = horizontal area (ft<sup>2</sup>), with blasting depth ≤ 70 ft

The following scaling factors are applied to PM emission factor to calculate PM<sub>10</sub> and PM<sub>2.5</sub> emission factors per AP-42 Table 11.9-1:

PM<sub>10</sub>: 0.52

PM<sub>2.5</sub>: 0.03

4. CO<sub>2</sub> emission factor is based on "Testing of mining explosives with regard to the content of carbon oxides and nitrogen oxides in their detonation products" - Iwona Zawadzka-Malota, January 7, 2016.

5. Lead content in ore 4.96 %

6. Hourly emissions are based on 1 1.00 blast/hr per meeting with Kevin McCoy on 9/9/2022

blast/hr (7 Developmental and 1 Stope 2.00 blasts/day per meeting with Kevin McCoy on 9/9/2022

sub-blasts per Blast).



**Mine Development  
Blasting - Clark**

**Table A-6a. Clark Blasting - Parameters**

| Emission Point No. | Location | Blast Area<br>(ft <sup>2</sup> /blast) <sup>1</sup> | Throughput <sup>1</sup> |          | Blasting Rates <sup>1</sup> |
|--------------------|----------|-----------------------------------------------------|-------------------------|----------|-----------------------------|
|                    |          | Maximum                                             | (ton/hr)                | (ton/yr) | (blasts/yr)                 |
| BLAST-2            | Blasting | 4,450                                               | 4.60                    | 562      | 730                         |

1. Per email "Clark Updated Inputs for Air Permit" from Cayley Hoffman received on 9/8/2022 and meetings on 10/2022  
Maximum total emulsion usage = 4.60 tonnes/hr

**Table A-6b. Clark Blasting Emissions**

| Emission Point No. | Location | Pollutant         | Emission Factor <sup>1,2,3,4,5</sup> | Unit              | Controlled Emissions <sup>6,7</sup> |          |          |
|--------------------|----------|-------------------|--------------------------------------|-------------------|-------------------------------------|----------|----------|
|                    |          |                   |                                      |                   | (tpy)                               | (lb/day) | (lb/hr)  |
| BLAST-2            | Blasting | NO <sub>x</sub>   | 0.50                                 | (lb/ton Emulsion) | 0.14                                | --       | 2.30     |
|                    |          | CO                | 27.00                                | (lb/ton Emulsion) | 7.59                                | --       | 124.11   |
|                    |          | H <sub>2</sub> S  | 4.00                                 | (lb/ton Emulsion) | 1.12                                | --       | 18.39    |
|                    |          | SO <sub>2</sub>   | 1.00                                 | (lb/ton Emulsion) | 0.28                                | --       | 4.60     |
|                    |          | PM                | 0.84                                 | (Max lb/Blast)    | 0.31                                | 1.68     | 0.84     |
|                    |          | PM <sub>10</sub>  | 0.44                                 | (Max lb/Blast)    | 0.16                                | 0.87     | 0.437    |
|                    |          | PM <sub>2.5</sub> | 0.10                                 | (Max lb/Blast)    | 0.038                               | 0.21     | 0.1045   |
|                    |          | Lead (from ore)   | 0.01                                 | (Max lb/Blast)    | 0.0054                              | 0.03     | 0.0148   |
|                    |          | CO <sub>2</sub>   | 463.18                               | (lb/ton)          | 130.15                              | --       | 2,129.05 |

1. NO<sub>x</sub> and CO emission factors based on "Fume Memo WESCO Aug 2021" pdf dated 19 August 2021 provided by Seth Fredrick Dyno Nobel Inc.

2. H<sub>2</sub>S and SO<sub>2</sub> emission factors per AP-42 Section 13.3, Table 13.3-1 for dynamite, gelatin (January 1995).

This emission factor was used by FMI Climax Mine, Colorado (underground mine) per permit application in October 2013 for CDPHE Air Permit No. 95CC899.

3. PM emission factor calculated per AP-42 Section 11.9, Table 11.9-1 for blasting (July 1998)

$0.000014(A)^{1.5}$  where, A = horizontal area (ft<sup>2</sup>), with blasting depth ≤ 70 ft

The following scaling factors are applied to PM emission factor to calculate PM<sub>10</sub> and PM<sub>2.5</sub> emission factors per AP-42 Table 11.9-1:

PM<sub>10</sub>: 0.52

PM<sub>2.5</sub>: 0.03

4. CO<sub>2</sub> emission factor is based on "Testing of mining explosives with regard to the content of carbon oxides and nitrogen oxides in their detonation products" - Iwona Zawadzka-Malota, January 7, 2016.

5. Lead content in ore

1.76 %

6. Hourly emissions are based on 1 blast/hr (4

1.00 blast/hr

per meeting with Cayley Hoffman on 9/9/2022

Developmental and 1 Stope sub-blasts per Blast).

2.00 blasts/day

per meeting with Cayley Hoffman on 9/9/2022

**Mine Development  
Crushing**

**Table A-7a. Crushing - Emission Factors**

| Emission Point Number | Description                           | Activity         | Throughput <sup>1,2</sup> |              | Material                      | Lead Grade | Controlled Emission Factor <sup>3,4,5</sup> |                  |                   |                | Control <sup>6</sup>                                     |                                |                              |
|-----------------------|---------------------------------------|------------------|---------------------------|--------------|-------------------------------|------------|---------------------------------------------|------------------|-------------------|----------------|----------------------------------------------------------|--------------------------------|------------------------------|
|                       |                                       |                  | (ton ore/hr)              | (ton ore/yr) |                               |            | PM                                          | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | Type                                                     | PM/PM <sub>10</sub> Efficiency | PM <sub>2.5</sub> Efficiency |
|                       |                                       |                  |                           |              |                               |            | (lb/ton ore)                                | (lb/ton ore)     | (lb/ton ore)      | (lb/ton ore)   |                                                          | (%)                            | (%)                          |
| CRUSH-1               | Underground Crushing                  | Primary Crushing | 1,543                     | 4,665,131    | Stope Ore                     | 4.96%      | 0.0012                                      | 0.00054          | 0.0001            | 5.95E-05       | Gravity Settling                                         | 87%                            | 17%                          |
| BREAK-1               | Clark Rock Breaker                    | Rock Breaker     | 12                        | 47,131       | Clark Ore                     | 1.76%      | 1.69E-04                                    | 8.00E-05         | 1.21E-05          | 2.98E-06       | No Control as a Controlled Emission Factor is being used | 0%                             | 0%                           |
| BREAK-2               | Underground Waste Rock Breaker        | Rock Breaker     | 29                        | 61,138       | Waste Rock                    | 0.35%      | 1.69E-04                                    | 8.00E-05         | 1.21E-05          | 5.99E-07       | No Control as a Controlled Emission Factor is being used | 0%                             | 0%                           |
| BREAK-3 - BREAK-7     | Various Underground Ore Rock Breakers | Rock Breaker     | 69                        | 600,453      | Stope Ore & Developmental Ore | 4.73%      | 1.69E-04                                    | 8.00E-05         | 1.21E-05          | 8.00E-06       | No Control as a Controlled Emission Factor is being used | 0%                             | 0%                           |
| BREAK-8               | Underground Crusher Rock Breaker      | Rock Breaker     | 538                       | 1,624,871    | Stope Ore & Developmental Ore | 4.73%      | 1.69E-04                                    | 8.00E-05         | 1.21E-05          | 8.00E-06       | No Control as a Controlled Emission Factor is being used | 0%                             | 0%                           |

1. Annual Taylor rock breaker throughputs per meeting with Kevin McCoy on 5/3/2024

Hourly taylor rock breakers throughputs based on hourly drop throughput

Hourly crusher throughputs based on "thyssenkrupp ERC Product Range Sizes.pdf" recd. on 7/12/2021.

2. Rock breakers are hydraulic-type hammers that break down rock pieces that are too large for the Clark Grizzly Screen. As such, the throughput will correspond to a percent (%) of the total grizzly screen throughput. Emission factor is similar to drilling.

3. Crushing emission factors obtained from AP-42 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing for tertiary crushing

4. For rock breakers, per U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, the particle size multiplier used for calculating emission factors for PM<sub>10</sub> and PM<sub>2.5</sub> is as follows:

PM: 0.74

PM<sub>10</sub>: 0.35

PM<sub>2.5</sub>: 0.053

5. Emission factors per AP-42 Section 11.19.2, Table 11.19.2-2 (08/2004) for "Wet Drilling - Unfragmented Stone".

6. Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32.

For Watering

70%

Gravity Settling (underground only) (PM/PM<sub>10</sub>/Pb)

87%

Gravity Settling (underground only) (PM<sub>2.5</sub>)

17%

**Table A-7b. Crushing - Emissions**

| Emission Point Number | Activity                              | Controlled Emissions   |                  |                   |                |                          |                  |                   |                |                          |                  |                   |                |
|-----------------------|---------------------------------------|------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |                                       | Annual Emissions (tpy) |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                | Hourly Emissions (lb/hr) |                  |                   |                |
|                       |                                       | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| CRUSH-1               | Underground Crushing <sup>1</sup>     | 0.35                   | 0.16             | 0.19              | 0.02           | 5.56                     | 2.50             | 3.06              | 0.28           | 0.23                     | 0.10             | 0.13              | 0.01           |
| BREAK-1               | Clark Rock Breaker                    | 3.99E-03               | 1.89E-03         | 2.85E-04          | 7.01E-05       | 0.05                     | 0.02             | 3.50E-03          | 8.61E-04       | 2.04E-03                 | 9.64E-04         | 1.46E-04          | 3.59E-05       |
| BREAK-2               | Underground Waste Rock Breaker        | 5.17E-03               | 2.45E-03         | 3.70E-04          | 1.83E-05       | 0.12                     | 0.06             | 0.01              | 4.13E-04       | 4.86E-03                 | 2.30E-03         | 3.48E-04          | 1.72E-05       |
| BREAK-3 - BREAK-7     | Various Underground Ore Rock Breakers | 5.08E-02               | 2.40E-02         | 3.64E-03          | 2.40E-03       | 0.28                     | 0.13             | 0.02              | 0.01           | 0.01                     | 0.01             | 8.30E-04          | 5.49E-04       |
| BREAK-8               | Underground Crusher Rock Breaker      | 1.37E-01               | 6.50E-02         | 9.84E-03          | 6.50E-03       | 2.18                     | 1.03             | 0.16              | 0.10           | 0.09                     | 0.04             | 0.01              | 4.30E-03       |
| Total                 |                                       | 0.55                   | 0.25             | 0.21              | 0.03           | 8.18                     | 3.74             | 3.25              | 0.39           | 0.34                     | 0.16             | 0.14              | 0.02           |

1. Controlled Emissions have been calculated for underground crushing since gravity settling is a part of an inherent process for underground mines.

Pursuant to 40 CFR §64.1, "control device" means "equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere." Furthermore, "inherent process equipment" means "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations." The gravity settling is an inherent part of the process.

**Mine Development  
Crushing Monthly**

**Table A-8a. Crushing Monthly - Emission Factors**

| Emission Point Number | Description                           | Activity         | Throughput <sup>1,2</sup><br>(ton ore/month) | Material                      | Lead Grade | Controlled Emission Factor <sup>3,4,5</sup> |                                  |                                   |                                | Control <sup>6</sup>                                     |                                       |                                     |
|-----------------------|---------------------------------------|------------------|----------------------------------------------|-------------------------------|------------|---------------------------------------------|----------------------------------|-----------------------------------|--------------------------------|----------------------------------------------------------|---------------------------------------|-------------------------------------|
|                       |                                       |                  |                                              |                               |            | PM<br>(lb/ton ore)                          | PM <sub>10</sub><br>(lb/ton ore) | PM <sub>2.5</sub><br>(lb/ton ore) | Lead Compounds<br>(lb/ton ore) | Type                                                     | PM/PM <sub>10</sub><br>Efficiency (%) | PM <sub>2.5</sub><br>Efficiency (%) |
| CRUSH-1               | Underground Crushing                  | Primary Crushing | 388,761                                      | Stope Ore                     | 4.96%      | 0.0012                                      | 0.00054                          | 0.0001                            | 5.95E-05                       | Gravity Settling                                         | 87%                                   | 17%                                 |
| BREAK-1               | Clark Rock Breaker                    | Rock Breaker     | 3,927.6                                      | Clark Ore                     | 1.76%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 2.98E-06                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |
| BREAK-2               | Underground Waste Rock Breaker        | Rock Breaker     | 5,095                                        | Waste Rock                    | 0.35%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 5.99E-07                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |
| BREAK-3 -<br>BREAK-7  | Various Underground Ore Rock Breakers | Rock Breaker     | 50,038                                       | Stope Ore & Developmental Ore | 4.73%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 8.00E-06                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |
| BREAK-8               | Underground Crusher Rock Breaker      | Rock Breaker     | 135,406                                      | Stope Ore & Developmental Ore | 4.73%      | 1.69E-04                                    | 8.00E-05                         | 1.21E-05                          | 8.00E-06                       | No Control as a Controlled Emission Factor is being used | 0%                                    | 0%                                  |

1. Monthly throughput per email from Sarah Richman (South32) dated 5/18/2023

Monthly rock breaker throughput per Kevin McCoy (South32) on 4/31/2024

2. Rock breakers are hydraulic-type hammers that break down rock pieces that are too large for the Clark Grizzly Screen. As such, the throughput will correspond to a percent (%) of the total grizzly screen throughput. Emission factor is similar to drilling.

3. Crushing emission factors obtained from AP-42 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing for tertiary crushing

4. Assumed that PM<sub>2.5</sub> is approximately 30% of PM<sub>10</sub> per AP-42, as calculated below and described in AP-42 Appendix B.2, Category 3, September 1990.

|                                           |      |
|-------------------------------------------|------|
| % cumulative size                         |      |
| PM <sub>2.5</sub>                         | 15 % |
| PM <sub>10</sub>                          | 51 % |
| Ratio PM <sub>2.5</sub> /PM <sub>10</sub> | 0.29 |

5. Emission factors per AP-42 Section 11.19.2, Table 11.19.2-2 (08/2004) for "Wet Drilling - Unfragmented Stone".

6. Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32.

|                                                               |     |
|---------------------------------------------------------------|-----|
| For Watering                                                  | 70% |
| Gravity Settling (underground only) (PM/PM <sub>10</sub> /Pb) | 87% |
| Gravity Settling (underground only) (PM <sub>2.5</sub> )      | 17% |

**Table A-8b. Crushing Monthly - Emissions**

| Emission Point Number | Activity                              | Controlled Emissions            |                  |                   |                |
|-----------------------|---------------------------------------|---------------------------------|------------------|-------------------|----------------|
|                       |                                       | Monthly Emissions<br>(lb/month) |                  |                   |                |
|                       |                                       | PM                              | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| CRUSH-1               | Underground Crushing <sup>1</sup>     | 58.32                           | 26.25            | 32.11             | 2.89E+00       |
| BREAK-1               | Clark Rock Breaker                    | 6.64E-01                        | 3.14E-01         | 4.76E-02          | 1.17E-02       |
| BREAK-2               | Underground Waste Rock Breaker        | 8.62E-01                        | 4.08E-01         | 6.17E-02          | 3.05E-03       |
| BREAK-3 -<br>BREAK-7  | Various Underground Ore Rock Breakers | 8.46E+00                        | 4.00E+00         | 6.06E-01          | 4.00E-01       |
| BREAK-8               | Underground Crusher Rock Breaker      | 2.29E+01                        | 1.08E+01         | 1.64E+00          | 1.08E+00       |
|                       | <b>Total</b>                          | <b>91.22</b>                    | <b>41.80</b>     | <b>34.47</b>      | <b>4.39</b>    |

1. Controlled Emissions have been calculated for underground crushing since gravity settling is a part of an inherent process for underground mines.

Pursuant to 40 CFR §64.1, "control device" means "equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere." Furthermore, "inherent process equipment" means "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations." The gravity settling is an inherent part of the process.

**Mine Development  
Drops (Hourly) - Taylor**

**Table A-9a. Taylor Drops - Emissions - Inputs - Hourly/Daily**

| Emission Point Number           | Description                                                                                                                                                | Throughput <sup>1</sup><br>(tph) | Material                                   | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                                                                  | Control Factor <sup>2</sup>        |                                  | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                           |                            |                         |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------|-------------------------|--------------------------------|---------------------------------------------------------------------------------|------------------------------------|----------------------------------|---------------------------------|-------------------------------------------|---------------------------|----------------------------|-------------------------|
|                                 |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 | PM/PM <sub>10</sub> Efficiency (%) | PM <sub>2.5</sub> Efficiency (%) |                                 | PM (lb/ton)                               | PM <sub>10</sub> (lb/ton) | PM <sub>2.5</sub> (lb/ton) | Lead Compounds (lb/ton) |
|                                 |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 |                                    |                                  |                                 |                                           |                           |                            |                         |
| Coarse Ore Delivery and Storage |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 |                                    |                                  |                                 |                                           |                           |                            |                         |
| DP-1                            | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                                                            | 714.04                           | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Full Enclosure, Watering                                                        | 85%                                | 85%                              | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.04E-04                |
| DP-2                            | Drop from 21210-FE-00001 Main Shaft Ore Discharge Feeder to 21210-CV-00003 Main Shaft Outfeed Conveyor                                                     | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00002 Main Shaft Ore Discharge Dust Collector (DC-1)     |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-3                            | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-CV-00001 Coarse Ore Overland Conveyor                                                        | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21210-CX-00001 Coarse Ore Overland Conveyor Dust Collector (DC-2) |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-4                            | Drop from Shaft to Waste Chute                                                                                                                             | 126.67                           | Waste Chute Material                       | 0.57%                   | 4.00                           | Watering                                                                        | 70%                                | 70%                              | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 3.01E-05                |
| DP-5                            | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-BN-00002 Transfer Tower Storage Bin                                                          | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00003 Transfer Tower Dust Collector (DC-3)               |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-6                            | Drop from 21210-BN-00002 Transfer Tower Storage Bin to Haul Truck                                                                                          | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00003 Transfer Tower Dust Collector                      |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-7                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00001 Coarse Ore Silo No. 1                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-8                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00002 Coarse Ore Silo No. 2                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-9                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00003 Coarse Ore Silo No. 3                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-10                           | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00004 Coarse Ore Silo No. 4                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-11                           | Drop from 21710-FE-00001/00002 Coarse Ore Silo No.1 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-12                           | Drop from 21710-FE-00003/00005 Coarse Ore Silo No.2 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-13                           | Drop from 21710-FE-00006/00007 Coarse Ore Silo No. 3 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                  | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-14                           | Drop from 21710-FE-00008/00009 Coarse Ore Silo No.4 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-15                           | Drop from 21710-CV-00001 Primary Mill Feed Conveyor to 22110-CH-00001 Primary Mill Feed Chute                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                          | Wet Stream, no emissions expected                                               |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-16                           | Drop from 22110-ML-00001 Primary Mill to 22110-SN-00002 Primary Mill Discharge Screen                                                                      | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                          | Wet Stream, no emissions expected                                               |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-17                           | Drop from 22110-SN-00002 Primary Mill Discharge Screen to 22210-CV-00002 Primary Screen Discharge Conveyor                                                 | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-18                           | Drop from 22210-CV-00002 Primary Screen Discharge Conveyor to 22210-CV-00001 Pebble Crusher Feed Conveyor                                                  | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-19                           | Drop from 22210-CV-00001 Pebble Crusher Feed Conveyor to 22210-BN-00001 Pebble Crusher Feed Bin/Bunker/22210-FE-00002 Pebble Crusher Product Return Feeder | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-20                           | Drop from 22210-FE-00002 Pebble Crusher Product Return Feeder to 21710-CV-00001 Primary Mill Feed Conveyor                                                 | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                    |                                  | 19.49                           | --                                        | --                        | --                         | --                      |
| DP-21                           | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                                                                   | 459.12                           | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | No Control                                                                      | 0%                                 | 0%                               | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.49E-04                |
| Underground Drops               |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 |                                    |                                  |                                 |                                           |                           |                            |                         |
| DP-22                           | Transfer from face to loader                                                                                                                               | 714.04                           | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 6.04E-06                |
| DP-23                           | Transfer from loader to haul truck, as needed                                                                                                              | 714.04                           | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 6.04E-06                |
| DP-24                           | Drop from loader or haul truck through grizzly to ore pass                                                                                                 | 527.27                           | Stope Ore                                  | 4.96%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.73E-06                |
| DP-25                           | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                                                            | 527.27                           | Stope Ore                                  | 4.96%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.73E-06                |
| DP-26                           | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                                                        | 574.46                           | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-27                           | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor                                      | 574.46                           | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-28                           | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                                                           | 574.46                           | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-29                           | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3                                                   | 574.46                           | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 5.82                            | 1.09E-03                                  | 5.17E-04                  | 7.82E-05                   | 5.17E-05                |
| DP-30                           | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                                                          | 139.58                           | Waste Rock                                 | 0.35%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                                | 75%                              | 5.82                            | 1.09E-03                                  | 5.17E-04                  | 7.82E-05                   | 3.87E-06                |

Mine Development  
Drops (Hourly) - Taylor

|                 |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
|-----------------|------------------------------------------------------------------------------------------------------|----------|--------------------------------------------|-------|-------|------------------------------------------------------------------------------|-----|-----|-------|----------|----------|----------|----------|
| DP-31           | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor          | 574.46   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 1.12E-05 |
| DP-32           | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                | 139.58   | Waste Rock                                 | 0.35% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 8.36E-07 |
| DP-33           | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes          | 714.04   | Slope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| DP-34           | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                  | 714.04   | Slope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| WTP2            |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-138          | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                               | 1.19E-02 | Dry Anionic Flocculant                     | 0.00% | 0.25  | Enclosure by building                                                        | 80% | 80% | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-139          | Drop of Dry Cationic Flocculant via Manual Addition                                                  | 5.39E-06 | Dry Cationic Flocculant                    | 0.00% | 0.25  | Enclosure by building                                                        | 80% | 80% | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-140          | Drop of Sodium Sulfate to Bulk Handling System                                                       | 3.72E-02 | Sodium Sulfate                             | 0.00% | 0.25  | Controlled by WTP2 DC                                                        |     |     | 19.49 | --       | --       | --       | --       |
| Reagents        |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-141          | Drop of Copper Sulphate into 22620-TN-00005 Copper Sulphate Mix Tank                                 | --       | Copper Sulphate                            | 0%    | 0.25  | Controlled by DC-12 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector   |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-142          | Drop of 50% Zinc Sulphate into 22620-TN-00025 50% Zinc Sulphate Mix/Holding Tank                     | --       | 50% Zinc Sulphate                          | 0%    | 0.25  | Controlled by DC-14 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-143          | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module | 0.08     | Lead Concentrate Flocculant                | 0%    | 0.25  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-144          | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                 | 3.31     | Tailings Flocculant                        | 0%    | 0.25  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-145          | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module | 0.05     | Zinc Concentrate Flocculant                | 0%    | 0.25  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-146          | Drop of 10% Zinc Sulphate to 22620-TN-00007 10% Zinc Sulphate Mix Tank                               | --       | 10% Zinc Sulphate                          | 0%    | 0.25  | Controlled by DC-13 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-147          | Drop of Caustic to 22620-TN-00023 Caustic Mix/Holding Tank                                           | --       | Caustic                                    | 0%    | 0.25  | Controlled by DC-15 22620-CX-00004 Caustic Mix Tank                          |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| Stockpile Drops |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-82           | Drop on West Rock Stockpile                                                                          | 13.82    | Waste Rock                                 | 0.35% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 1.86E-05 |
| DP-83           | Drop on East Ore Stockpile                                                                           | 643.01   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-84           | TSF                                                                                                  | 117.77   | Tailings                                   | 0.43% | 11.80 | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0012   | 0.0005   | 0.0001   | 4.93E-06 |
| DP-85           | Drops on TSF2                                                                                        | 247.02   | Tailings                                   | 0.43% | 11.80 | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0012   | 0.0005   | 0.0001   | 4.93E-06 |
| From Stockpiles |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-94           | Transfer from Agg Stockpile to Loader                                                                | 9.19     | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-95           | Transfer of Agg Material from Loader to Haul Truck                                                   | 9.19     | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-96           | Transfer of Shotcrete Aggregate from Stockpile to Loader                                             | 6.43     | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-97           | Transfer from East Ore Stockpile to Loader                                                           | 643.01   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-98           | Transfer of Ore from Loader to Haul Truck                                                            | 643.01   | Slope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-99           | Transfer from Waste Chute Stockpile to Loader                                                        | 126.67   | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| DP-100          | Transfer of Waste Chute Material from Loader to Haul Truck                                           | 126.67   | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| WTP1            |                                                                                                      |          |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-148          | Drop of Anionic Flocculant (Hydrex 6161)                                                             | 8.92E-04 | Anionic Flocculant                         | 0.00% | 0.25  | No Control                                                                   | 0%  | 0%  | 1.3   | 7.55E-03 | 3.57E-03 | 5.41E-04 | --       |
| DP-149          | Drop of Sodium Bicarbonate                                                                           | 8.92E-04 | Sodium Bicarbonate                         | 0.00% | 0.25  | No Control                                                                   | 0%  | 0%  | 1.3   | 7.55E-03 | 3.57E-03 | 5.41E-04 | --       |

1. Per February 2021 dated Process Flow Diagram, provided by South32 in May 2021.

Confirmed by RFI provided by South32, Sarah Richman, on 7/12/2021.

Per August 2023 date Process Flow Diagrams, provided by South32 in April 2024.

Reassent throughout per RFI responses from Matt Novak on 4/26/2024 and 6/19/2024

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

For Watering  
Moisture Content (Moisture Content taken into account in AP-42 Drop Equation)

70%

0%

Gravity Settling (underground only) (PM<sub>10</sub>/Pb)

87%

Gravity Settling (underground only) (PM<sub>2.5</sub>)

17%

For Full Enclosure/Enclosure by building

80%

For Partial Enclosure

50%

No control

0%

Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023.

Horizontal settling is based on Stoke's Equation and inputs from South32.

Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCoy (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \left( \frac{U}{5} \right)^{1.3} \left( \frac{M}{2} \right)^{1.4}$$

Where E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)

U = Mean wind speed (miles per hour [mph]), which is equal to:

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1  
0.25 %

PM

0.74

19.49

1.3

PM<sub>10</sub>

0.35

PM<sub>2.5</sub>

0.053

Based on 2019-2021 On-Site Met Data

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

Mine Development  
Drops (Hourly) - Taylor

Table A-9b. Taylor Drops - Hourly/Daily Emissions - Controlled

| Emission Point Number | Description                                                                                                           | Controlled Emissions     |                  |                   |                |                          |                  |                   |                |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |                                                                                                                       | Hourly Emissions (lb/hr) |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                |
|                       |                                                                                                                       | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                       | 0.56                     | 0.27             | 0.04              | 2.18E-02       | 13.52                    | 6.39             | 0.97              | 5.24E-01       |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                        | 0.20                     | 0.09             | 0.01              | 1.15E-03       | 4.80                     | 2.27             | 0.34              | 2.75E-02       |
| DP-21                 | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                              | 2.41                     | 1.14             | 0.173             | 1.14E-01       | 57.95                    | 27.41            | 4.15              | 2.74E+00       |
| DP-22                 | Transfer from face to loader                                                                                          | 0.004                    | 0.002            | 0.002             | 1.62E-04       | 0.10                     | 0.05             | 0.05              | 3.88E-03       |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                         | 0.004                    | 0.002            | 0.002             | 1.62E-04       | 0.10                     | 0.05             | 0.05              | 3.88E-03       |
| DP-24                 | Drop from loader or haul truck through grizzly to ore pass                                                            | 0.003                    | 0.001            | 0.001             | 1.53E-04       | 0.07                     | 0.03             | 0.03              | 3.67E-03       |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                       | 0.003                    | 0.001            | 0.001             | 1.53E-04       | 0.07                     | 0.03             | 0.03              | 3.67E-03       |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                   | 0.003                    | 0.002            | 0.002             | 1.59E-04       | 0.08                     | 0.04             | 0.04              | 3.81E-03       |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor | 0.003                    | 0.002            | 0.002             | 1.59E-04       | 0.08                     | 0.04             | 0.04              | 3.81E-03       |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                      | 0.003                    | 0.002            | 0.002             | 1.59E-04       | 0.08                     | 0.04             | 0.04              | 3.81E-03       |
| DP-29                 | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3              | 0.024                    | 0.011            | 0.011             | 1.11E-03       | 0.56                     | 0.27             | 0.27              | 2.67E-02       |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                     | 0.006                    | 0.003            | 0.003             | 2.02E-05       | 0.14                     | 0.06             | 0.06              | 4.86E-04       |
| DP-31                 | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor                           | 0.005                    | 0.002            | 0.002             | 2.41E-04       | 0.12                     | 0.06             | 0.06              | 5.77E-03       |
| DP-32                 | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                                 | 0.001                    | 0.001            | 0.001             | 4.37E-06       | 0.03                     | 0.01             | 0.01              | 1.05E-04       |
| DP-33                 | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes                           | 0.006                    | 0.003            | 0.003             | 2.45E-04       | 0.15                     | 0.07             | 0.07              | 5.88E-03       |
| DP-34                 | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                                   | 0.006                    | 0.003            | 0.003             | 2.45E-04       | 0.15                     | 0.07             | 0.07              | 5.88E-03       |
| DP-82                 | Drop on West Rock Stockpile                                                                                           | 0.07                     | 0.03             | 0.01              | 2.57E-04       | 1.74                     | 0.83             | 0.12              | 6.18E-03       |
| DP-83                 | Drop on East Ore Stockpile                                                                                            | 3.38                     | 1.60             | 0.24              | 1.60E-01       | 81.16                    | 38.39            | 5.81              | 3.84E+00       |
| DP-84                 | TSF                                                                                                                   | 0.14                     | 0.06             | 0.01              | 5.80E-04       | 3.27                     | 1.55             | 0.23              | 1.39E-02       |
| DP-85                 | Drops on TSF2                                                                                                         | 0.29                     | 0.14             | 0.02              | 1.22E-03       | 6.86                     | 3.24             | 0.49              | 2.92E-02       |
| DP-94                 | Transfer from Agg Stockpile to Loader                                                                                 | 0.15                     | 0.07             | 0.01              | --             | 3.63                     | 1.72             | 0.26              | --             |
| DP-95                 | Transfer of Agg Material from Loader to Haul Truck                                                                    | 0.15                     | 0.07             | 0.01              | --             | 3.63                     | 1.72             | 0.26              | --             |
| DP-96                 | Transfer of Shotcrete Aggregate from Stockpile to Loader                                                              | 0.11                     | 0.05             | 0.01              | --             | 2.54                     | 1.20             | 0.18              | --             |
| DP-97                 | Transfer from East Ore Stockpile to Loader                                                                            | 3.38                     | 1.60             | 0.24              | 0.16           | 81.16                    | 38.39            | 5.81              | 3.84E+00       |
| DP-98                 | Transfer of Ore from Loader to Haul Truck                                                                             | 3.38                     | 1.60             | 0.24              | 0.16           | 81.16                    | 38.39            | 5.81              | 3.84E+00       |
| DP-99                 | Transfer from Waste Chute Stockpile to Loader                                                                         | 0.67                     | 0.32             | 0.05              | 0.00           | 15.99                    | 7.56             | 1.15              | 9.16E-02       |
| DP-100                | Transfer of Waste Chute Material from Loader to Haul Truck                                                            | 0.67                     | 0.32             | 0.05              | 0.00           | 15.99                    | 7.56             | 1.15              | 9.16E-02       |
| DP-138                | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                                                | 1.80E-05                 | 8.50E-06         | 1.29E-06          | --             | 4.31E-04                 | 2.04E-04         | 3.09E-05          | --             |
| DP-139                | Drop of Dry Cationic Flocculant via Manual Addition                                                                   | 8.14E-09                 | 3.85E-09         | 5.84E-10          | --             | 1.95E-07                 | 9.24E-08         | 1.40E-08          | --             |
| DP-143                | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module                  | 0.02                     | 0.01             | 0.00              | --             | 0.46                     | 0.22             | 0.03              | --             |
| DP-144                | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                                  | 0.84                     | 0.40             | 0.06              | --             | 20.25                    | 9.58             | 1.45              | --             |
| DP-145                | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module                  | 0.01                     | 0.01             | 0.00              | --             | 0.31                     | 0.14             | 0.02              | --             |
| DP-148                | Drop of Anionic Flocculant (Hydrex 6161)                                                                              | 6.74E-06                 | 3.19E-06         | 4.83E-07          | --             | 1.62E-04                 | 7.65E-05         | 1.16E-05          | --             |
| DP-149                | Drop of Sodium Bicarbonate                                                                                            | 6.74E-06                 | 3.19E-06         | 4.83E-07          | --             | 1.62E-04                 | 7.65E-05         | 1.16E-05          | --             |
|                       | <b>Total</b>                                                                                                          | <b>16.51</b>             | <b>7.81</b>      | <b>1.21</b>       | <b>0.63</b>    | <b>396.17</b>            | <b>187.38</b>    | <b>29.08</b>      | <b>15.12</b>   |

**Mine Development  
Drops (Monthly) - Taylor**

**Table A-10a. Taylor Drops - Emissions - Inputs - Hourly/Daily**

| Emission Point Number           | Description                                                                                                                                                | Throughput <sup>1</sup><br>(tons/month) | Material                                   | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                                                           | Control Factor <sup>2</sup>        |                                  | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                           |                            |                         |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------|-------------------------|--------------------------------|--------------------------------------------------------------------------|------------------------------------|----------------------------------|---------------------------------|-------------------------------------------|---------------------------|----------------------------|-------------------------|
|                                 |                                                                                                                                                            |                                         |                                            |                         |                                |                                                                          | PM/PM <sub>10</sub> Efficiency (%) | PM <sub>2.5</sub> Efficiency (%) |                                 | PM (lb/ton)                               | PM <sub>10</sub> (lb/ton) | PM <sub>2.5</sub> (lb/ton) | Lead Compounds (lb/ton) |
| Coarse Ore Delivery and Storage |                                                                                                                                                            |                                         |                                            |                         |                                |                                                                          |                                    |                                  |                                 |                                           |                           |                            |                         |
| DP-1                            | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                                                            | 521,251                                 | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Full Enclosure, Watering                                                 | 85%                                | 85%                              | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.04E-04                |
| DP-2                            | Drop from 21210-FE-00001 Main Shaft Ore Discharge Feeder to 21210-CV-00003 Main Shaft Outfeed Conveyor                                                     | --                                      | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00002 Main Shaft Ore Discharge Dust Collector     |                                    |                                  | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.04E-04                |
| DP-3                            | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-CV-00001 Coarse Ore Overland Conveyor                                                        | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21210-CX-00001 Coarse Ore Overland Conveyor Dust Collector |                                    |                                  | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.49E-04                |
| DP-4                            | Drop from Shaft to Waste Chute                                                                                                                             | 101,710                                 | Waste Chute Material                       | 0.57%                   | 4.00                           | Watering                                                                 | 70%                                | 70%                              | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 3.01E-05                |
| DP-5                            | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-BN-00002 Transfer Tower Storage Bin                                                          | --                                      | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00003 Transfer Tower Dust Collector (DC-3)        |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-6                            | Drop from 21210-BN-00002 Transfer Tower Storage Bin to Haul Truck                                                                                          | --                                      | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00003 Transfer Tower Dust Collector (DC-3)        |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-7                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00001 Coarse Ore Silo No. 1                                                              | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-8                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00002 Coarse Ore Silo No. 2                                                              | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-9                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00003 Coarse Ore Silo No. 3                                                              | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-10                           | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00004 Coarse Ore Silo No. 4                                                              | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-11                           | Drop from 21710-FE-00001/00002 Coarse Ore Silo No.1 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)              |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-12                           | Drop from 21710-FE-00003/00005 Coarse Ore Silo No.2 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)              |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-13                           | Drop from 21710-FE-00006/00007 Coarse Ore Silo No. 3 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                  | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)              |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-14                           | Drop from 21710-FE-00008/00009 Coarse Ore Silo No.4 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)              |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-15                           | Drop from 21710-CV-00001 Primary Mill Feed Conveyor to 22110-CH-00001 Primary Mill Feed Chute                                                              | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                          | Wet Stream, no emissions expected                                        |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-16                           | Drop from 22110-ML-00001 Primary Mill to 22110-SN-00002 Primary Mill Discharge Screen                                                                      | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                          | Wet Stream, no emissions expected                                        |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-17                           | Drop from 22110-SN-00002 Primary Mill Discharge Screen to 22210-CV-00002 Primary Screen Discharge Conveyor                                                 | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-18                           | Drop from 22210-CV-00002 Primary Screen Discharge Conveyor to 22210-CV-00001 Pebble Crusher Feed Conveyor                                                  | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-19                           | Drop from 22210-CV-00001 Pebble Crusher Feed Conveyor to 22210-BN-00001 Pebble Crusher Feed Bin/Bunker/22210-FE-00002 Pebble Crusher Product Return Feeder | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-20                           | Drop from 22210-FE-00002 Pebble Crusher Product Return Feeder to 21710-CV-00001 Primary Mill Feed Conveyor                                                 | --                                      | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)       |                                    |                                  | --                              | --                                        | --                        | --                         | --                      |
| DP-21                           | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                                                                   | 11,516                                  | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | No Control                                                               | 0%                                 | 0%                               | 19.49                           | 5.26E-03                                  | 2.49E-03                  | 3.77E-04                   | 2.49E-04                |
| Underground Drops               |                                                                                                                                                            |                                         |                                            |                         |                                |                                                                          |                                    |                                  |                                 |                                           |                           |                            |                         |
| DP-22                           | Transfer from face to loader                                                                                                                               | 521,251                                 | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 6.04E-06                |
| DP-23                           | Transfer from loader to haul truck, as needed                                                                                                              | 521,251                                 | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 6.04E-06                |
| DP-24                           | Drop from loader or haul truck through grizzly to ore pass                                                                                                 | 384,906                                 | Stope Ore                                  | 4.96%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.73E-06                |
| DP-25                           | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                                                            | 384,906                                 | Stope Ore                                  | 4.96%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.73E-06                |
| DP-26                           | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                                                        | 419,355                                 | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-27                           | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor                                      | 419,355                                 | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-28                           | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                                                           | 419,355                                 | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 1.30                            | 1.56E-04                                  | 7.37E-05                  | 1.12E-05                   | 7.37E-06                |
| DP-29                           | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3                                                   | 419,355                                 | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 5.82                            | 1.09E-03                                  | 5.17E-04                  | 7.82E-05                   | 5.17E-05                |
| DP-30                           | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                                                          | 101,897                                 | Waste Rock                                 | 0.35%                   | 4.00                           | Gravity Settling, Watering                                               | 96.25%                             | 75.22%                           | 5.82                            | 1.09E-03                                  | 5.17E-04                  | 7.82E-05                   | 3.87E-06                |

Mine Development  
Drops (Monthly) - Taylor

|                 |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
|-----------------|------------------------------------------------------------------------------------------------------|----------|--------------------------------------------|-------|-------|------------------------------------------------------------------------------|--------|--------|-------|----------|----------|----------|----------|
| DP-31           | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor          | 419,355  | Stope Ore & Developmental Ore              | 4.73% | 4.00  | Gravity Settling, Watering                                                   | 96.25% | 75.22% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 1.12E-05 |
| DP-32           | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                | 101,897  | Waste Rock                                 | 0.35% | 4.00  | Gravity Settling, Watering                                                   | 96.25% | 75.22% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 8.36E-07 |
| DP-33           | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes          | 521,251  | Stope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96.25% | 75.22% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| DP-34           | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                  | 521,251  | Stope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96%    | 75%    | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| Stockpile Drops |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
| DP-82           | Drop on West Rock Stockpile                                                                          | 10,091   | Waste Rock                                 | 0.35% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 1.86E-05 |
| DP-83           | Drop on East Ore Stockpile                                                                           | 11,516   | Stope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-84           | TSF                                                                                                  | 85,969   | Tailings                                   | 0.43% | 11.80 | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0012   | 0.0005   | 0.0001   | 4.93E-06 |
| DP-85           | Drops on TSF2                                                                                        | 180,323  | Tailings                                   | 0.43% | 11.80 | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0012   | 0.0005   | 0.0001   | 4.93E-06 |
| From Stockpiles |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
| DP-94           | Transfer from Aqg Stockpile to Loader                                                                | 6,834    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-95           | Transfer of Aqg Material from Loader to Haul Truck                                                   | 6,834    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-96           | Transfer of Shotcrete Aggregate from Stockpile to Loader                                             | 4,784    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-97           | Transfer of Ore from East Ore Stockpile to Loader                                                    | 11,516   | Stope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-98           | Transfer of Ore from Loader to Haul Truck                                                            | 11,516   | Stope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-99           | Transfer from Waste Chute to Loader                                                                  | 101,710  | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| DP-100          | Transfer from Loader to Haul Truck                                                                   | 101,710  | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| WTP2            |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
| DP-138          | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                               | 1.08E-03 | Dry Anionic Flocculant                     | 0.00% | 0.25  | Enclosure by building                                                        | 80%    | 80%    | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-139          | Drop of Dry Cationic Flocculant via Manual Addition                                                  | 5.39E-06 | Dry Cationic Flocculant                    | 0.00% | 0.25  | Enclosure by building                                                        | 80%    | 80%    | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-140          | Drop of Sodium Sulfate to Bulk Handling System                                                       | 3.72E-02 | Sodium Sulfate                             | 0.00% | 0.25  | Controlled by WTP2 DC                                                        |        |        | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| Reagents        |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
| DP-141          | Drop of Copper Sulphate into 22620-TN-00005 Copper Sulphate Mix Tank                                 | --       | Copper Sulphate                            | 0%    | 0.25  | Controlled by DC-12 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector   |        |        | 19.49 | 0.26     | 0.12     | 0.02     | 0        |
| DP-142          | Drop of 50% Zinc Sulphate into 22620-TN-00025 50% Zinc Sulphate Mix/Holding Tank                     | --       | 50% Zinc Sulphate                          | 0%    | 0.25  | Controlled by DC-14 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector |        |        | 19.49 | 0.26     | 0.12     | 0.02     | 0        |
| DP-143          | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module | 0.72     | Lead Concentrate Flocculant                | 0%    | 25%   | No Control                                                                   | 0%     | 0%     | 19.49 | 0.26     | 0.12     | 0.02     | 0        |
| DP-144          | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                 | 0.72     | Tailings Flocculant                        | 0%    | 0.25  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.26     | 0.12     | 0.02     | 0        |
| DP-145          | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module | 1.51     | Zinc Concentrate Flocculant                | 0%    | 0.25  | No Control                                                                   | 0%     | 0%     | 19.49 | 0.26     | 0.12     | 0.02     | 0        |
| DP-146          | Drop of 10% Zinc Sulphate to 22620-TN-00007 10% Zinc Sulphate Mix Tank                               | --       | 10% Zinc Sulphate                          | 0%    | 0.25  | Controlled by DC-13 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector |        |        | 19.49 | 0.26     | 0.12     | 0.02     | 0.00E+00 |
| DP-147          | Drop of Caustic to 22620-TN-00023 Caustic Mix/Holding Tank                                           | --       | Caustic                                    | 0%    | 0.25  | Controlled by DC-15 22620-CX-00004 Caustic Mix Tank                          |        |        | 19.49 | 0.26     | 0.12     | 0.02     | 0.00E+00 |
| WTP1            |                                                                                                      |          |                                            |       |       |                                                                              |        |        |       |          |          |          |          |
| DP-148          | Drop of Anionic Flocculant (Hydrex 6161)                                                             | 0.65     | Anionic Flocculant                         | 0%    | 0.25  | No Control                                                                   | 0%     | 0%     | 1.30  | 7.55E-03 | 3.57E-03 | 5.41E-04 | 0        |
| DP-149          | Drop of Sodium Bicarbonate                                                                           | 0.65     | Sodium Bicarbonate                         | 0%    | 0.25  | No Control                                                                   | 0%     | 0%     | 1.30  | 7.55E-03 | 3.57E-03 | 5.41E-04 | 0        |

1. Per February 2021 dated Process Flow Diagram, provided by South32 in May 2021.  
Confirmed by RFI provided by South32, Sarah Richman, on 7/12/2021.

Per August 2023 date Process Flow Diagrams, provided by South32 in April 2024.

Recent throughputs per RFI responses from Matt Novak on 4/26/2024 and 6/19/2024

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

For Watering

Moisture Content (Moisture Content taken into account in AP-42 Drop Equation)

For Watering

Moisture Content (Moisture Content taken into account in AP-42 Drop Equation)

Gravity Settling (underground only) (PM<sub>10</sub>/PM<sub>2.5</sub>/Pb)

Gravity Settling (underground only) (PM<sub>10</sub>/PM<sub>2.5</sub>/Pb)

For Full Enclosure/Enclosure by building

For Partial Enclosure

No control

Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023.

Horizontal settling is based on Stoke's Equation and inputs from South32.

Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

4. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCov (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

5. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \left( \frac{U}{5} \right)^{1.3} \left( \frac{M}{2} \right)^{1.4}$$

Where: E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)

U = Mean wind speed (miles per hour [mph]), which is equal to:

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1

0.25 %

PM

0.74

19.49

1.3

PM<sub>10</sub>

0.35

Based on 2019-2021 On-Site Met Data

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

PM<sub>2.5</sub>

0.053



Mine Development  
Drops (Monthly) - Taylor

Table A-10b. Taylor Drops - Monthly Emissions - Controlled

| Emission Point Number | Description                                                                                                           | Controlled Emissions         |                  |                   |                |                          |                  |                   |                |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |                                                                                                                       | Monthly Emissions (lb/month) |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                |
|                       |                                                                                                                       | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                       | 411.22                       | 194.50           | 29.45             | 1.59E+01       | 13.48                    | 6.38             | 0.97              | 5.23E-01       |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                        | 160.48                       | 75.90            | 11.49             | 9.20E-01       | 5.26                     | 2.49             | 0.38              | 3.01E-02       |
| DP-21                 | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                              | 60.57                        | 28.65            | 4.34              | 2.87E+00       | 1.99                     | 0.94             | 0.14              | 9.40E-02       |
| DP-22                 | Transfer from face to loader                                                                                          | 3.04                         | 1.44             | 1.44              | 1.18E-01       | 0.10                     | 0.05             | 0.05              | 3.87E-03       |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                         | 3.04                         | 1.44             | 1.44              | 1.18E-01       | 0.10                     | 0.05             | 0.05              | 3.87E-03       |
| DP-24                 | Drop from loader or haul truck through grizzly to ore pass                                                            | 2.25                         | 1.06             | 1.06              | 1.12E-01       | 0.07                     | 0.03             | 0.03              | 3.66E-03       |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                       | 2.25                         | 1.06             | 1.06              | 1.12E-01       | 0.07                     | 0.03             | 0.03              | 3.66E-03       |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                   | 2.45                         | 1.16             | 1.16              | 1.16E-01       | 0.08                     | 0.04             | 0.04              | 3.80E-03       |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor | 2.45                         | 1.16             | 1.16              | 1.16E-01       | 0.08                     | 0.04             | 0.04              | 3.80E-03       |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                      | 2.45                         | 1.16             | 1.16              | 1.16E-01       | 0.08                     | 0.04             | 0.04              | 3.80E-03       |
| DP-29                 | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3              | 17.18                        | 8.12             | 8.13              | 8.13E-01       | 0.56                     | 0.27             | 0.27              | 2.66E-02       |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                     | 4.17                         | 1.97             | 1.98              | 1.48E-02       | 0.14                     | 0.06             | 0.06              | 4.85E-04       |
| DP-31                 | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor                           | 3.71                         | 1.76             | 1.76              | 1.76E-01       | 0.12                     | 0.06             | 0.06              | 5.76E-03       |
| DP-32                 | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                                 | 0.90                         | 0.43             | 0.43              | 3.19E-03       | 0.03                     | 0.01             | 0.01              | 1.05E-04       |
| DP-33                 | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes                           | 4.61                         | 2.18             | 2.18              | 1.79E-01       | 0.15                     | 0.07             | 0.07              | 5.86E-03       |
| DP-34                 | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                                   | 4.61                         | 2.18             | 2.18              | 1.79E-01       | 0.15                     | 0.07             | 0.07              | 5.86E-03       |
| DP-82                 | Drop on West Rock Stockpile                                                                                           | 53.07                        | 25.10            | 3.80              | 1.88E-01       | 1.74                     | 0.82             | 0.12              | 6.16E-03       |
| DP-83                 | Drop on East Ore Stockpile                                                                                            | 60.57                        | 28.65            | 4.34              | 2.87E+00       | 1.99                     | 0.94             | 0.14              | 9.40E-02       |
| DP-84                 | TSF                                                                                                                   | 99.43                        | 47.03            | 7.12              | 4.23E-01       | 3.26                     | 1.54             | 0.23              | 1.39E-02       |
| DP-85                 | Drops on TSF2                                                                                                         | 208.56                       | 98.64            | 14.94             | 8.88E-01       | 6.84                     | 3.23             | 0.49              | 2.91E-02       |
| DP-94                 | Transfer from Agg Stockpile to Loader                                                                                 | 112.55                       | 53.23            | 8.06              | --             | 3.690                    | 1.745            | 0.2643            | --             |
| DP-95                 | Transfer of Agg Material from Loader to Haul Truck                                                                    | 112.55                       | 53.23            | 8.06              | --             | 3.690                    | 1.745            | 0.2643            | --             |
| DP-96                 | Transfer of Shotcrete Aggregate from Stockpile to Loader                                                              | 78.79                        | 37.26            | 5.64              | --             | 2.583                    | 1.222            | 0.1850            | --             |
| DP-97                 | Transfer of Ore from East Ore Stockpile to Loader                                                                     | 60.57                        | 28.65            | 4.34              | 2.87           | 1.99                     | 0.94             | 0.14              | 9.40E-02       |
| DP-98                 | Transfer of Ore from Loader to Haul Truck                                                                             | 60.57                        | 28.65            | 4.34              | 2.87           | 1.99                     | 0.94             | 0.14              | 9.40E-02       |
| DP-99                 | Transfer from Waste Chute to Loader                                                                                   | 534.93                       | 253.01           | 38.31             | 3.07           | 17.54                    | 8.30             | 1.26              | 1.00E-01       |
| DP-100                | Transfer from Loader to Haul Truck                                                                                    | 534.93                       | 253.01           | 38.31             | 3.07           | 17.54                    | 8.30             | 1.26              | 1.00E-01       |
| DP-138                | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                                                | 1.63E-06                     | 7.72E-07         | 1.17E-07          | --             | 5.35E-08                 | 2.53E-08         | 3.83E-09          | --             |
| DP-139                | Drop of Dry Cationic Flocculant via Manual Addition                                                                   | 8.15E-09                     | 3.85E-09         | 5.84E-10          | --             | 2.67E-10                 | 1.26E-10         | 1.91E-11          | --             |
| DP-143                | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module                  | 1.84E-01                     | 8.72E-02         | 1.32E-02          | --             | 0.01                     | 0.00             | 0.00              | --             |
| DP-144                | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                                  | 1.84E-01                     | 8.72E-02         | 1.32E-02          | --             | 0.01                     | 0.00             | 0.00              | --             |
| DP-145                | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module                  | 3.84E-01                     | 1.82E-01         | 2.75E-02          | --             | 0.01                     | 0.01             | 0.00              | --             |
| DP-148                | Drop of Anionic Flocculant (Hydrex 6161)                                                                              | 4.92E-03                     | 2.33E-03         | 3.52E-04          | --             | 1.61E-04                 | 7.63E-05         | 1.15E-05          | --             |
| DP-149                | Drop of Sodium Bicarbonate                                                                                            | 4.92E-03                     | 2.33E-03         | 3.52E-04          | --             | 1.61E-04                 | 7.63E-05         | 1.15E-05          | --             |
|                       | <b>Total</b>                                                                                                          | <b>2,603</b>                 | <b>1,231</b>     | <b>208</b>        | <b>38</b>      | <b>85</b>                | <b>40</b>        | <b>7</b>          | <b>1</b>       |

**Mine Development  
Drops (Annual) - Taylor**

**Table A-11a. Taylor Drops - Emissions - Inputs - Annual**

| Emission Point Number           | Description                                                                                                                                                | Throughput <sup>1</sup><br>(tpy) | Material                                   | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                                                                  | Control Factor <sup>2</sup>    |                              | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                              |                               |                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------|-------------------------|--------------------------------|---------------------------------------------------------------------------------|--------------------------------|------------------------------|---------------------------------|-------------------------------------------|------------------------------|-------------------------------|----------------------------|
|                                 |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 | PM/PM <sub>10</sub> Efficiency | PM <sub>2.5</sub> Efficiency |                                 | PM<br>(lb/ton)                            | PM <sub>10</sub><br>(lb/ton) | PM <sub>2.5</sub><br>(lb/ton) | Lead Compounds<br>(lb/ton) |
|                                 |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 | (%)                            | (%)                          |                                 |                                           |                              |                               |                            |
| Coarse Ore Delivery and Storage |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 |                                |                              |                                 |                                           |                              |                               |                            |
| DP-1                            | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                                                            | 6,255,015                        | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Full Enclosure, Watering                                                        | 85%                            | 85%                          | 19.49                           | 0.0053                                    | 0.0025                       | 0.0004                        | 0.0002                     |
| DP-2                            | Drop from 21210-FE-00001 Main Shaft Ore Discharge Feeder to 21210-CV-00003 Main Shaft Outfeed Conveyor                                                     | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00002 Main Shaft Ore Discharge Dust Collector (DC-1)     |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-3                            | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-CV-00001 Coarse Ore Overland Conveyor                                                        | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21210-CX-00001 Coarse Ore Overland Conveyor Dust Collector (DC-2) |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-4                            | Drop from Shaft to Waste Chute                                                                                                                             | 1,220,522                        | Waste Chute Material                       | 0.57%                   | 4.00                           | Watering                                                                        | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025                       | 0.0004                        | 0.00003                    |
| DP-5                            | Drop from 21210-CV-00003 Main Shaft Outfeed Conveyor to 21210-BN-00002 Transfer Tower Storage Bin                                                          | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00003 Transfer Tower Dust Collector (DC-3)               |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-6                            | Drop from 21210-BN-00002 Transfer Tower Storage Bin to Haul Truck                                                                                          | --                               | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Controlled by 21210-CX-00003 Transfer Tower Dust Collector (DC-3)               |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-7                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00001 Coarse Ore Silo No. 1                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-8                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00002 Coarse Ore Silo No. 2                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-9                            | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00003 Coarse Ore Silo No. 3                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-10                           | Drop from 21210-CV-00001 Coarse Ore Overland Conveyor to 21510-SI-00004 Coarse Ore Silo No. 4                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by 21510-CX-00001 Coarse Ore Silo Dust Collector (DC-4)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-11                           | Drop from 21710-FE-00001/00002 Coarse Ore Silo No.1 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-12                           | Drop from 21710-FE-00003/00005 Coarse Ore Silo No.2 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-13                           | Drop from 21710-FE-00006/00007 Coarse Ore Silo No. 3 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                  | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-14                           | Drop from 21710-FE-00008/00009 Coarse Ore Silo No.4 Discharge Feeder No.1/2 to 27210-CV-00001 Primary Mill Feed Conveyor                                   | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Controlled by Coarse Ore Silo Loadout Dust Collector (DC-5)                     |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-15                           | Drop from 21710-CV-00001 Primary Mill Feed Conveyor to 22110-CH-00001 Primary Mill Feed Chute                                                              | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                          | Wet Stream, no emissions expected                                               |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-16                           | Drop from 22110-ML-00001 Primary Mill to 22110-SN-00002 Primary Mill Discharge Screen                                                                      | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 25.00                          | Wet Stream, no emissions expected                                               |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-17                           | Drop from 22110-SN-00002 Primary Mill Discharge Screen to 22210-CV-00002 Primary Screen Discharge Conveyor                                                 | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-18                           | Drop from 22210-CV-00002 Primary Screen Discharge Conveyor to 22210-CV-00001 Pebble Crusher Feed Conveyor                                                  | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-19                           | Drop from 22210-CV-00001 Pebble Crusher Feed Conveyor to 22210-BN-00001 Pebble Crusher Feed Bin/Bunker/22210-FE-00002 Pebble Crusher Product Return Feeder | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-20                           | Drop from 22210-FE-00002 Pebble Crusher Product Return Feeder to 21710-CV-00001 Primary Mill Feed Conveyor                                                 | --                               | Stope Ore & Developmental Ore              | 4.73%                   | 5.00                           | Controlled by 22210-CX-00001 Pebble Crusher Dust Collector (DC-16)              |                                |                              | 19.49                           | --                                        | --                           | --                            | --                         |
| DP-21                           | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                                                                   | 138,188                          | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | No Control                                                                      | 0%                             | 0%                           | 19.49                           | 0.0053                                    | 0.0025                       | 0.0004                        | 0.00025                    |
| Underground Drops               |                                                                                                                                                            |                                  |                                            |                         |                                |                                                                                 |                                |                              |                                 |                                           |                              |                               |                            |
| DP-22                           | Transfer from face to loader                                                                                                                               | 6,255,015                        | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 6.04E-06                   |
| DP-23                           | Transfer from loader to haul truck, as needed                                                                                                              | 6,255,015                        | Stope Ore & Developmental Ore & Waste Rock | 3.88%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 6.04E-06                   |
| DP-24                           | Drop from loader or haul truck through grizzly to ore pass                                                                                                 | 4,618,867                        | Stope Ore                                  | 4.96%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 7.73E-06                   |
| DP-25                           | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                                                            | 4,618,867                        | Stope Ore                                  | 4.96%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 7.73E-06                   |
| DP-26                           | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                                                        | 5,032,256                        | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 7.37E-06                   |
| DP-27                           | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor                                      | 5,032,256                        | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 7.37E-06                   |
| DP-28                           | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                                                           | 5,032,256                        | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 1.30                            | 1.56E-04                                  | 7.37E-05                     | 1.12E-05                      | 7.37E-06                   |
| DP-29                           | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3                                                   | 5,032,256                        | Stope Ore & Developmental Ore              | 4.73%                   | 4.00                           | Gravity Settling, Watering                                                      | 96%                            | 75%                          | 5.82                            | 1.09E-03                                  | 5.17E-04                     | 7.82E-05                      | 5.17E-05                   |

**Mine Development  
Drops (Annual) - Taylor**

|                 |                                                                                                      |           |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
|-----------------|------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------|-------|-------|------------------------------------------------------------------------------|-----|-----|-------|----------|----------|----------|----------|
| DP-30           | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill    | 1,222,759 | Waste Rock                                 | 0.35% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 5.82  | 1.09E-03 | 5.17E-04 | 7.82E-05 | 3.87E-06 |
| DP-31           | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor          | 5,032,256 | Stope Ore & Developmental Ore              | 4.73% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 1.12E-05 |
| DP-32           | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                | 1,222,759 | Waste Rock                                 | 0.35% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 8.36E-07 |
| DP-33           | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes          | 6,255,015 | Stope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| DP-34           | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                  | 6,255,015 | Stope Ore & Developmental Ore & Waste Rock | 3.88% | 4.00  | Gravity Settling, Watering                                                   | 96% | 75% | 1.79  | 2.36E-04 | 1.12E-04 | 1.69E-05 | 9.15E-06 |
| Stockpile Drops |                                                                                                      |           |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-82           | Drop on West Rock Stockpile                                                                          | 121,097   | Waste Rock                                 | 0.35% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 1.86E-05 |
| DP-83           | Drop on East Ore Stockpile                                                                           | 138,188   | Stope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-84           | Drop on TSF                                                                                          | 1,031,627 | Tailings                                   | 0.43% | 11.80 | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0012   | 0.0005   | 0.0001   | 4.93E-06 |
| DP-85           | Drops on TSF2                                                                                        | 2,163,873 | Tailings                                   | 0.43% | 11.80 | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0012   | 0.0005   | 0.0001   | 4.93E-06 |
| From Stockpiles |                                                                                                      |           |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-94           | Transfer from Agg Stockpile to Loader                                                                | 10,000    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-95           | Transfer of Agg Material from Loader to Haul Truck                                                   | 10,000    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-96           | Transfer of Shotcrete Aggregate from Stockpile to Loader                                             | 10,000    | Aggregate                                  | 0.00% | 1.77  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0165   | 0.0078   | 0.0012   | --       |
| DP-97           | Transfer from East Ore Stockpile to Loader                                                           | 138,188   | Stope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-98           | Transfer of Ore from Loader to Haul Truck                                                            | 138,188   | Stope Ore & Developmental Ore              | 4.73% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 2.49E-04 |
| DP-99           | Transfer from Waste Chute Stockpile to Loader                                                        | 1,220,522 | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| DP-100          | Transfer of Waste Chute Material from Loader to Haul Truck                                           | 1,220,522 | Waste Chute Material                       | 0.57% | 4.00  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.0053   | 0.0025   | 0.0004   | 3.01E-05 |
| Reagents        |                                                                                                      |           |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-141          | Drop of Copper Sulphate into 22620-TN-00005 Copper Sulphate Mix Tank                                 | --        | Copper Sulphate                            | 0.00% | 0.25  | Controlled by DC-12 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector   |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-142          | Drop of 50% Zinc Sulphate into 22620-TN-00025 50% Zinc Sulphate Mix/Holding Tank                     | --        | 50% Zinc Sulphate                          | 0.00% | 0.25  | Controlled by DC-14 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-143          | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module | 7.81      | Lead Concentrate Flocculant                | 0.00% | 0.25  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-144          | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                 | 17.73     | Tailings Flocculant                        | 0.00% | 0.25  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-145          | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module | 8.51      | Zinc Concentrate Flocculant                | 0.00% | 0.25  | No Control                                                                   | 0%  | 0%  | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-146          | Drop of 10% Zinc Sulphate to 22620-TN-00007 10% Zinc Sulphate Mix Tank                               | --        | 10% Zinc Sulphate                          | 0.00% | 0.25  | Controlled by DC-13 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| DP-147          | Drop of Caustic to 22620-TN-00023 Caustic Mix/Holding Tank                                           | --        | Caustic                                    | 0.00% | 0.25  | Controlled by DC-15 22620-CX-00004 Caustic Mix Tank                          |     |     | 19.49 | 0.2551   | 0.1207   | 0.0183   | --       |
| WTP2            |                                                                                                      |           |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-138          | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                               | 104.90    | Dry Anionic Flocculant                     | 0.00% | 0.25  | Enclosure by building                                                        | 80% | 80% | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-139          | Drop of Dry Cationic Flocculant via Manual Addition                                                  | 0.05      | Dry Cationic Flocculant                    | 0.00% | 0.25  | Enclosure by building                                                        | 80% | 80% | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-140          | Drop of Sodium Sulfate to Bulk Handling System                                                       | 325.50    | Sodium Sulfate                             | 0.00% | 0.25  | Controlled by WTP2 DC                                                        |     |     | 1.30  | 0.0076   | 0.0036   | 0.0005   | --       |
| WTP1            |                                                                                                      |           |                                            |       |       |                                                                              |     |     |       |          |          |          |          |
| DP-148          | Drop of Anionic Flocculant (Hydrex 6161)                                                             | 3.13      | Anionic Flocculant                         | 0.00% | 0.25  | No Control                                                                   | 0%  | 0%  | 1.3   | 0.0076   | 0.0036   | 0.0005   | --       |
| DP-149          | Drop of Sodium Bicarbonate                                                                           | 3.13      | Sodium Bicarbonate                         | 0.00% | 0.25  | No Control                                                                   | 0%  | 0%  | 1.3   | 0.0076   | 0.0036   | 0.0005   | --       |

1. Per February 2021 dated Process Flow Diagram, provided by South32 in May 2021.

Confirmed by RF1 provided by South32, Sarah Richman, on 7/12/2021.

Per August 2023 date Process Flow Diagrams, provided by South32 in April 2024.

Reagent throughputs per RF1 responses from Matt Novak on 4/26/2024 and 6/19/2024

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

For Waterline  
Moisture Content (Moisture Content taken into account in AP-42 Drop Equation)

70%  
0%

Gravity Settling (underground only) (PM<sub>10</sub>/Pb)

87%

Gravity Settling (underground only) (PM<sub>2.5</sub>)

17%

For Full Enclosure/Enclosure by building

80%

For Partial Enclosure

50%

No control

0%

Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May

18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32.

Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCoy (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "droo equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \left( \frac{U}{5} \right)^{1.3} \left( \frac{M}{2} \right)^{1.4}$$

Where E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)

U = Mean wind speed (miles per hour [mph]), which is equal to:

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1

PM

0.74

19.49

1.3

PM<sub>10</sub>

0.35

PM<sub>2.5</sub>

0.053

Based on 2019-2021 On-Site Met Data

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

**Mine Development  
Drops (Annual) - Taylor**

**Table A-11b. Taylor Drops - Annual Emissions - Controlled**

| Emission Point Number | Description                                                                                                           | Fugitive (Y/N) | Controlled Emissions   |                  |                   |                | Uncontrolled Emissions |                  |                   |                |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|----------------|------------------------|------------------|-------------------|----------------|------------------------|------------------|-------------------|----------------|
|                       |                                                                                                                       |                | Annual Emissions (tpy) |                  |                   |                | Annual Emissions (tpy) |                  |                   |                |
|                       |                                                                                                                       |                | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-1                  | Drop of crushed ore from underground to 21210-BN-00001 Main Shaft Ore Surge Bin                                       | Y              | 2.47                   | 1.17             | 0.18              | 9.56E-02       | 16.45                  | 7.78             | 1.18              | 0.638          |
| DP-4                  | Drop from Shaft to Waste Chute                                                                                        | N              | 0.96                   | 0.46             | 0.07              | 5.52E-03       | 3.21                   | 1.52             | 0.23              | 0.018          |
| DP-21                 | Drop from Haul Truck to 21710-CV-00001 Primary Mill Feed Conveyor Hopper                                              | Y              | 0.36                   | 0.17             | 0.03              | 1.72E-02       | 0.36                   | 0.17             | 0.03              | 0.017          |
| DP-22                 | Transfer from face to loader                                                                                          | N              | 0.02                   | 0.01             | 0.01              | 7.08E-04       | 0.49                   | 0.23             | 0.03              | 0.019          |
| DP-23                 | Transfer from loader to haul truck, as needed                                                                         | N              | 0.02                   | 0.01             | 0.01              | 7.08E-04       | 0.49                   | 0.23             | 0.03              | 0.019          |
| DP-24                 | Drop from loader or haul truck through grizzly to ore pass                                                            | N              | 0.01                   | 0.01             | 0.01              | 6.69E-04       | 0.36                   | 0.17             | 0.03              | 0.018          |
| DP-25                 | Drop from 12820-FD-0001 Ore Pass Vibrating Feeder to Haul Truck                                                       | N              | 0.01                   | 0.01             | 0.01              | 6.69E-04       | 0.36                   | 0.17             | 0.03              | 0.018          |
| DP-26                 | Drop from loader or haul truck through grizzly to 12820-BN-0005 Primary Crusher Bin                                   | N              | 0.01                   | 0.01             | 0.01              | 6.95E-04       | 0.39                   | 0.19             | 0.03              | 0.019          |
| DP-27                 | Drop from 12820-CH-0006 Primary Crusher Apron Feeder Dribble Chute to 12820-CV-0001 Primary Crusher Transfer Conveyor | N              | 0.01                   | 0.01             | 0.01              | 6.95E-04       | 0.39                   | 0.19             | 0.03              | 0.019          |
| DP-28                 | Drop from 12820-CV-0001 Primary Crusher Transfer Conveyor to 12820-CV-0002 Side Tipping Conveyor                      | N              | 0.01                   | 0.01             | 0.01              | 6.95E-04       | 0.39                   | 0.19             | 0.03              | 0.019          |
| DP-29                 | Drop from 12820-CV-002 Side Tipping Conveyor/Haul Truck to 12820-BN-0008/0009/0010 Ore Storage Bin 1/2/3              | N              | 0.10                   | 0.05             | 0.05              | 4.88E-03       | 2.75                   | 1.30             | 0.20              | 0.130          |
| DP-30                 | Drop from loader or haul truck through grizzly to 12820-BN-0011 Waste Storage Bin or as rock fill                     | N              | 0.03                   | 0.01             | 0.01              | 8.87E-05       | 0.67                   | 0.32             | 0.05              | 0.002          |
| DP-31                 | Drop 12820-FD-0003/0004/0005 Vibrating Feeders to 12820-CV-0003 Ore/Waste Transfer Conveyor                           | N              | 0.02                   | 0.01             | 0.01              | 1.05E-03       | 0.59                   | 0.28             | 0.04              | 0.028          |
| DP-32                 | Drop from 12820-FD-0006 Vibrating Feeder to 12820-CV-0003 Ore/Waste Transfer Conveyor                                 | N              | 0.01                   | 0.00             | 0.00              | 1.92E-05       | 0.14                   | 0.07             | 0.01              | 0.001          |
| DP-33                 | Drop from 12820-CV-0003 Ore/Waste Transfer Conveyor to 12820-CH-0016/0017 Flask Feed Chutes                           | N              | 0.03                   | 0.01             | 0.01              | 1.07E-03       | 0.74                   | 0.35             | 0.05              | 0.029          |
| DP-34                 | Drop from 12820-CH-0016/0017 Flask Feed Chute to 12820-CH-0018/0019 Skip Feed Chute                                   | N              | 0.03                   | 0.01             | 0.01              | 1.07E-03       | 0.74                   | 0.19             | 0.05              | 0.029          |
| DP-82                 | Drop on West Rock Stockpile                                                                                           | Y              | 0.32                   | 0.15             | 0.02              | 1.13E-03       | 0.32                   | 0.15             | 0.02              | 0.00           |
| DP-83                 | Drop on East Ore Stockpile                                                                                            | Y              | 0.36                   | 0.17             | 0.03              | 1.72E-02       | 0.36                   | 0.17             | 0.03              | 0.02           |
| DP-84                 | Drop on TSF                                                                                                           | Y              | 0.60                   | 0.28             | 0.04              | 2.54E-03       | 0.60                   | 0.28             | 0.04              | 0.00           |
| DP-85                 | Drops on TSF2                                                                                                         | Y              | 1.25                   | 0.59             | 0.09              | 5.33E-03       | 1.25                   | 0.59             | 0.09              | 0.01           |
| DP-94                 | Transfer from Agg Stockpile to Loader                                                                                 | Y              | 0.08                   | 0.04             | 0.01              | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-95                 | Transfer of Agg Material from Loader to Haul Truck                                                                    | Y              | 0.08                   | 0.04             | 0.01              | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-96                 | Transfer of Shotcrete Aggregate from Stockpile to Loader                                                              | Y              | 0.08                   | 0.04             | 0.01              | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-97                 | Transfer from East Ore Stockpile to Loader                                                                            | Y              | 0.36                   | 0.17             | 0.03              | 1.72E-02       | 0.36                   | 0.17             | 0.03              | 0.02           |
| DP-98                 | Transfer of Ore from Loader to Haul Truck                                                                             | Y              | 0.36                   | 0.17             | 0.03              | 1.72E-02       | 0.36                   | 0.17             | 0.03              | 0.02           |
| DP-99                 | Transfer from Waste Chute Stockpile to Loader                                                                         | Y              | 3.21                   | 1.52             | 0.23              | 1.84E-02       | 3.21                   | 1.52             | 0.23              | 0.02           |
| DP-100                | Transfer of Waste Chute Material from Loader to Haul Truck                                                            | Y              | 3.21                   | 1.52             | 0.23              | 1.84E-02       | 3.21                   | 1.52             | 0.23              | 0.02           |
| DP-138                | Drop of Dry Anionic Flocculant to Open Top Dump Hopper                                                                | Y              | 7.92E-05               | 3.75E-05         | 5.68E-06          | --             | 0.00                   | 0.00             | 0.00              | --             |
| DP-139                | Drop of Dry Cationic Flocculant via Manual Addition                                                                   | Y              | 3.57E-08               | 1.69E-08         | 2.56E-09          | --             | 0.00                   | 0.00             | 0.00              | --             |
| DP-143                | Drop of Lead Concentrate Flocculant to 22620-EP-00002 Lead Concentrate Flocculant Preparation Module                  | Y              | 9.97E-04               | 4.71E-04         | 7.14E-05          | --             | 9.97E-04               | 4.71E-04         | 7.14E-05          | --             |
| DP-144                | Drop of Tailings Flocculant to 22620-EP-00001 Tailings Flocculant Preparation Module                                  | Y              | 2.26E-03               | 1.07E-03         | 1.62E-04          | --             | 2.26E-03               | 1.07E-03         | 1.62E-04          | --             |
| DP-145                | Drop of Zinc Concentrate Flocculant to 22620-EP-00003 Zinc Concentrate Flocculant Preparation Module                  | Y              | 1.09E-03               | 5.13E-04         | 7.77E-05          | --             | 1.09E-03               | 5.13E-04         | 7.77E-05          | --             |
| DP-148                | Drop of Anionic Flocculant (Hydrex 6161)                                                                              | Y              | 1.18E-05               | 5.58E-06         | 8.45E-07          | --             | 1.18E-05               | 5.58E-06         | 8.45E-07          | --             |
| DP-149                | Drop of Sodium Bicarbonate                                                                                            | Y              | 1.18E-05               | 5.58E-06         | 8.45E-07          | --             | 1.18E-05               | 5.58E-06         | 8.45E-07          | --             |
| <b>Total</b>          |                                                                                                                       |                | <b>14.04</b>           | <b>6.63</b>      | <b>1.13</b>       | <b>0.23</b>    | <b>38.45</b>           | <b>18.02</b>     | <b>2.75</b>       | <b>1.12</b>    |

**Mine Development  
Drops (Hourly) - Clark**

**Table A-12a. Clark Drops - Emissions - Inputs**

| Emission Point Number           | Description                                                   | Throughput <sup>1</sup><br>(tph) | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                    | Control Factor <sup>2</sup>    |                              | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                  |                   |                |  |
|---------------------------------|---------------------------------------------------------------|----------------------------------|-------------------------|--------------------------------|-----------------------------------|--------------------------------|------------------------------|---------------------------------|-------------------------------------------|------------------|-------------------|----------------|--|
|                                 |                                                               |                                  |                         |                                |                                   | PM/PM <sub>10</sub> Efficiency | PM <sub>2.5</sub> Efficiency |                                 | PM                                        | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |  |
|                                 |                                                               |                                  |                         |                                |                                   | %                              | %                            |                                 | (lb/ton)                                  | (lb/ton)         | (lb/ton)          | (lb/ton)       |  |
| Surface Activities              |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |  |
| Coarse Ore Delivery and Storage |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |  |
| DP-103                          | Dump into Primary Crusher Feed Hopper                         | 129                              | 1.76%                   | 4.00                           | Spray Bar, Partial Enclosure      | 85%                            | 85%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |  |
| DP-104                          | Drop from silo to trucks                                      | 90                               | 1.76%                   | 4.00                           | Partial Enclosure, Dust Extractor | 50%                            | 50%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |  |
| From Stockpiles                 |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |  |
| DP-105                          | Transfer of Ore from Ore Stockpile to Loader                  | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25274E-05    |  |
| DP-106                          | Transfer of Ore Mined from Loader to Haul Truck               | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 0.0001         |  |
| DP-107                          | Transfer from ROM Stockpile to Loader                         | 22.96                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 0.0001         |  |
| DP-109                          | Transfer from Agg Stockpile to Loader                         | 9.19                             | 0.00%                   | 1.77                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |  |
| DP-110                          | Transfer of Agg Material from Loader to Haul Truck            | 9.19                             | 0.00%                   | 1.77                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |  |
| DP-111                          | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 6.43                             | 0.00%                   | 1.77                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |  |
| Stockpile Drops                 |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |  |
| DP-113                          | Hardshell Rock Storage Drop                                   | 112.71                           | 0.57%                   | 4.00                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 2.98E-05       |  |
| DP-114                          | Ore Stockpile Drop                                            | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |  |
| DP-115                          | ROM Stockpile Drop                                            | 22.96                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |  |
| Underground                     |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |  |
| DP-124                          | Transfer of Development Ore from Face to Loader               | 22                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.01E-06       |  |
| DP-125                          | Transfer of Development Ore from Loader to Stockpile          | 22                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.01E-06       |  |
| DP-126                          | Transfer of Development Ore from Stockpile to Loader          | 22                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.01E-06       |  |
| DP-127                          | Transfer of Development Ore Mined from Loader to Haul Truck   | 22                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.01E-06       |  |
| DP-129                          | Transfer of Development Waste Mined from Face to Loader       | 113                              | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 8.83E-07       |  |
| DP-130                          | Transfer of Development Waste Mined from Loader to Stockpile  | 113                              | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 8.83E-07       |  |
| DP-131                          | Transfer of Development Waste Mined from Stockpile to Loader  | 113                              | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 8.83E-07       |  |
| DP-132                          | Transfer of Development Waste Mined from Loader to Haul Truck | 113                              | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 8.83E-07       |  |
| DP-134                          | Transfer of Stope Ore from Stope to Loader                    | 62                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.74E-06       |  |
| DP-135                          | Transfer of Stope Ore from Loader to Stockpile                | 62                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.74E-06       |  |
| DP-136                          | Transfer of Stope Ore from Stockpile to Loader                | 62                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.74E-06       |  |
| DP-137                          | Transfer of Stope Ore from Loader to Haul Truck               | 62                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001           | 0.00001           | 2.74E-06       |  |

1. Per March 2022 dated Process Flow Diagram, provided by South32 in March 2022.

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

|                                                                     |     |                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| For Watering                                                        | 70% |                                                                                                                                                                                                                                                                                                                                          |
| Moisture Content (Moisture taken into account within drop equation) | 0%  |                                                                                                                                                                                                                                                                                                                                          |
| Gravity Settling (underground only) (PM/PM <sub>10</sub> /Pb)       | 80% | Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32. |
| Gravity Settling (underground only) (PM <sub>2.5</sub> )            | 16% | Detailed calculations are included in the Gravity Settling Tab of this spreadsheet                                                                                                                                                                                                                                                       |
| For Full Enclosure/Enclosure by building                            | 80% |                                                                                                                                                                                                                                                                                                                                          |
| For Partial Enclosure                                               | 50% |                                                                                                                                                                                                                                                                                                                                          |
| No control                                                          | 0%  |                                                                                                                                                                                                                                                                                                                                          |

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCoy (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)

|       |                                                                                       |                   |
|-------|---------------------------------------------------------------------------------------|-------------------|
| PM    | PM <sub>10</sub>                                                                      | PM <sub>2.5</sub> |
| 0.74  | 0.35                                                                                  | 0.053             |
| 19.49 | Based on 2019-2021 On-Site Met Data                                                   |                   |
| 1.3   | For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4. |                   |

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1  
0.25 %

Moisture Content of Aggregate taken to be 1.7 per AP-42 Section 11.12 Table 11.12-1 Footnote b

Mine Development  
Drops (Hourly) - Clark

Table A-12b. Clark Drops - Emissions - Controlled

| Emission Point Number | Description                                                   | Controlled Emissions     |                  |                   |                |                          |                  |                   |                |
|-----------------------|---------------------------------------------------------------|--------------------------|------------------|-------------------|----------------|--------------------------|------------------|-------------------|----------------|
|                       |                                                               | Hourly Emissions (lb/hr) |                  |                   |                | Daily Emissions (lb/day) |                  |                   |                |
|                       |                                                               | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-103                | Dump into Primary Crusher Feed Hopper                         | 0.10                     | 0.05             | 0.007             | 0.002          | 2.44                     | 1.15             | 0.17              | 0.04           |
| DP-104                | Drop from silo to trucks                                      | 0.24                     | 0.11             | 0.02              | 0.004          | 5.69                     | 2.69             | 0.41              | 0.10           |
| DP-105                | Transfer of Ore from Ore Stockpile to Loader                  | 0.13                     | 0.06             | 0.01              | 0.00           | 3.17                     | 1.50             | 0.23              | 0.06           |
| DP-106                | Transfer of Ore Mined from Loader to Haul Truck               | 0.13                     | 0.06             | 0.01              | 0.00           | 3.17                     | 1.50             | 0.23              | 0.06           |
| DP-107                | Transfer from ROM Stockpile to Loader                         | 0.04                     | 0.02             | 0.00              | 0.00           | 0.87                     | 0.41             | 0.06              | 0.02           |
| DP-109                | Transfer from Agg Stockpile to Loader                         | 0.15                     | 0.07             | 0.01              | --             | 3.63                     | 1.72             | 0.26              | --             |
| DP-110                | Transfer of Agg Material from Loader to Haul Truck            | 0.15                     | 0.07             | 0.01              | --             | 3.63                     | 1.72             | 0.26              | --             |
| DP-111                | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 0.11                     | 0.05             | 0.01              | --             | 2.54                     | 1.20             | 0.18              | --             |
| DP-113                | Hardshell Rock Storage Drop                                   | 0.59                     | 0.28             | 0.04              | 0.003          | 14.23                    | 6.73             | 1.02              | 0.08           |
| DP-114                | Ore Stockpile Drop                                            | 0.13                     | 0.06             | 0.01              | 0.00           | 3.17                     | 1.50             | 0.23              | 0.06           |
| DP-115                | ROM Stockpile Drop                                            | 0.04                     | 0.02             | 0.00              | 0.001          | 0.87                     | 0.41             | 0.06              | 0.02           |
| DP-124                | Transfer of Development Ore from Face to Loader               | 2.06E-04                 | 9.73E-05         | 6.11E-05          | 2.65E-06       | 0.00                     | 0.00             | 0.001             | 0.000          |
| DP-125                | Transfer of Development Ore from Loader to Stockpile          | 2.06E-04                 | 9.73E-05         | 6.11E-05          | 2.65E-06       | 0.00                     | 0.00             | 0.001             | 0.000          |
| DP-126                | Transfer of Development Ore from Stockpile to Loader          | 2.06E-04                 | 9.73E-05         | 6.11E-05          | 2.65E-06       | 0.00                     | 0.00             | 0.001             | 0.000          |
| DP-127                | Transfer of Development Ore Mined from Loader to Haul Truck   | 2.06E-04                 | 9.73E-05         | 6.11E-05          | 2.65E-06       | 0.00                     | 0.00             | 0.001             | 0.000          |
| DP-129                | Transfer of Development Waste Mined from Face to Loader       | 1.07E-03                 | 5.04E-04         | 3.16E-04          | 6.04E-06       | 0.03                     | 0.01             | 0.008             | 0.000          |
| DP-130                | Transfer of Development Waste Mined from Loader to Stockpile  | 1.07E-03                 | 5.04E-04         | 3.16E-04          | 6.04E-06       | 0.03                     | 0.01             | 0.008             | 0.000          |
| DP-131                | Transfer of Development Waste Mined from Stockpile to Loader  | 1.07E-03                 | 5.04E-04         | 3.16E-04          | 6.04E-06       | 0.03                     | 0.01             | 0.008             | 0.000          |
| DP-132                | Transfer of Development Waste Mined from Loader to Haul Truck | 1.07E-03                 | 5.04E-04         | 3.16E-04          | 6.04E-06       | 0.03                     | 0.01             | 0.008             | 0.000          |
| DP-134                | Transfer of Stope Ore from Stope to Loader                    | 5.86E-04                 | 2.77E-04         | 1.74E-04          | 1.03E-05       | 0.01                     | 0.01             | 0.004             | 0.000          |
| DP-135                | Transfer of Stope Ore from Loader to Stockpile                | 5.86E-04                 | 2.77E-04         | 1.74E-04          | 1.03E-05       | 0.01                     | 0.01             | 0.004             | 0.000          |
| DP-136                | Transfer of Stope Ore from Stockpile to Loader                | 5.86E-04                 | 2.77E-04         | 1.74E-04          | 1.03E-05       | 0.01                     | 0.01             | 0.004             | 0.000          |
| DP-137                | Transfer of Stope Ore from Loader to Haul Truck               | 5.86E-04                 | 2.77E-04         | 1.74E-04          | 1.03E-05       | 0.01                     | 0.01             | 0.004             | 0.000          |
|                       | <b>Total</b>                                                  | <b>1.82</b>              | <b>0.86</b>      | <b>0.13</b>       | <b>0.02</b>    | <b>43.60</b>             | <b>20.62</b>     | <b>3.16</b>       | <b>0.42</b>    |

**Mine Development  
Drops (Monthly) - Clark**

**Table A-13a. Clark Drops - Emissions - Inputs**

| Emission Point Number           | Description                                                   | Throughput <sup>1</sup><br>(tph) | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                    | Control Factor <sup>2</sup>    |                              | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                           |                            |                         |
|---------------------------------|---------------------------------------------------------------|----------------------------------|-------------------------|--------------------------------|-----------------------------------|--------------------------------|------------------------------|---------------------------------|-------------------------------------------|---------------------------|----------------------------|-------------------------|
|                                 |                                                               |                                  |                         |                                |                                   | PM/PM <sub>10</sub> Efficiency | PM <sub>2.5</sub> Efficiency |                                 | PM (lb/ton)                               | PM <sub>10</sub> (lb/ton) | PM <sub>2.5</sub> (lb/ton) | Lead Compounds (lb/ton) |
|                                 |                                                               |                                  |                         |                                |                                   | (%)                            | (%)                          |                                 |                                           |                           |                            |                         |
| Surface Activities              |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                           |                            |                         |
| Coarse Ore Delivery and Storage |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                           |                            |                         |
| DP-103                          | Dump into Primary Crusher Feed Hopper                         | 86                               | 1.76%                   | 4.00                           | Spray Bar, Partial Enclosure      | 85%                            | 85%                          | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 9.25E-05                |
| DP-104                          | Drop from silo to trucks                                      | 86                               | 1.76%                   | 4.00                           | Partial Enclosure, Dust Extractor | 50%                            | 50%                          | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 9.25E-05                |
| From Stockpiles                 |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                           |                            |                         |
| DP-105                          | Transfer of Ore from Ore Stockpile to Loader                  | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 9.25274E-05             |
| DP-106                          | Transfer of Ore Mined from Loader to Haul Truck               | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 0.0001                  |
| DP-107                          | Transfer from ROM Stockpile to Loader                         | 22.96                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 0.0001                  |
| DP-109                          | Transfer from Agg Stockpile to Loader                         | 9.19                             | 0.00%                   | 1.77                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078                    | 0.0012                     | --                      |
| DP-110                          | Transfer of Agg Material from Loader to Haul Truck            | 9.19                             | 0.00%                   | 1.77                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078                    | 0.0012                     | --                      |
| DP-111                          | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 6.43                             | 0.00%                   | 1.77                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078                    | 0.0012                     | --                      |
| Stockpile Drops                 |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                           |                            |                         |
| DP-113                          | Hardshell Rock Storage Drop                                   | 112.71                           | 0.57%                   | 4.00                           | No control                        | 0%                             | 0%                           | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 2.98E-05                |
| DP-114                          | Ore Stockpile Drop                                            | 83.77                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 9.25E-05                |
| DP-115                          | ROM Stockpile Drop                                            | 22.96                            | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025                    | 0.0004                     | 9.25E-05                |
| Underground                     |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                           |                            |                         |
| DP-124                          | Transfer of Development Ore from Face to Loader               | 53                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.01E-06                |
| DP-125                          | Transfer of Development Ore from Loader to Stockpile          | 53                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.01E-06                |
| DP-126                          | Transfer of Development Ore from Stockpile to Loader          | 53                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.01E-06                |
| DP-127                          | Transfer of Development Ore Mined from Loader to Haul Truck   | 53                               | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.01E-06                |
| DP-129                          | Transfer of Development Waste Mined from Face to Loader       | 74                               | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 8.83E-07                |
| DP-130                          | Transfer of Development Waste Mined from Loader to Stockpile  | 74                               | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 8.83E-07                |
| DP-131                          | Transfer of Development Waste Mined from Stockpile to Loader  | 74                               | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 8.83E-07                |
| DP-132                          | Transfer of Development Waste Mined from Loader to Haul Truck | 74                               | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 8.83E-07                |
| DP-134                          | Transfer of Stope Ore from Stope to Loader                    | 81                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.74E-06                |
| DP-135                          | Transfer of Stope Ore from Loader to Stockpile                | 81                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.74E-06                |
| DP-136                          | Transfer of Stope Ore from Stockpile to Loader                | 81                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.74E-06                |
| DP-137                          | Transfer of Stope Ore from Loader to Haul Truck               | 81                               | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.0001                    | 0.00001                    | 2.74E-06                |

1. Per March 2022 dated Process Flow Diagram, provided by South32 in March 2022.

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

|                                                                     |     |
|---------------------------------------------------------------------|-----|
| For Watering                                                        | 70% |
| Moisture Content (Moisture taken into account within drop equation) | 0%  |
| Gravity Settling (underground only) (PM/PM <sub>10</sub> /Pb)       | 80% |
| Gravity Settling (underground only) (PM <sub>2.5</sub> )            | 16% |
| For Full Enclosure/Enclosure by building                            | 80% |
| For Partial Enclosure                                               | 50% |
| No control                                                          | 0%  |

Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32.

Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCoy (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \left( \frac{U}{5} \right)^{1.3} \left( \frac{M}{2} \right)^{1.4}$$

Where E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)

U = Mean wind speed (miles per hour [mph]), which is equal to:

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1

0.25 %

Moisture Content of Aggregate taken to be 1.7 per AP-42 Section 11.12 Table 11.12-1 Footnote b

PM

0.74

19.49

1.3

PM<sub>10</sub>

0.35

Based on 2019-2021 On-Site Met Data

0.053

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

**Mine Development  
Drops (Monthly) - Clark**

**Table A-13b. Clark Drops - Emissions - Controlled**

| Emission Point Number | Description                                                   | Controlled Emissions        |                  |                   |                |                             |                  |                   |                |
|-----------------------|---------------------------------------------------------------|-----------------------------|------------------|-------------------|----------------|-----------------------------|------------------|-------------------|----------------|
|                       |                                                               | Hourly Emissions<br>(lb/hr) |                  |                   |                | Daily Emissions<br>(lb/day) |                  |                   |                |
|                       |                                                               | PM                          | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                          | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-103                | Dump into Primary Crusher Feed Hopper                         | 0.07                        | 0.03             | 0.005             | 0.001          | 1.63                        | 0.77             | 0.12              | 0.03           |
| DP-104                | Drop from silo to trucks                                      | 0.23                        | 0.11             | 0.02              | 0.004          | 5.43                        | 2.57             | 0.39              | 0.10           |
| DP-105                | Transfer of Ore from Ore Stockpile to Loader                  | 0.13                        | 0.06             | 0.01              | 0.00           | 3.17                        | 1.50             | 0.23              | 0.06           |
| DP-106                | Transfer of Ore Mined from Loader to Haul Truck               | 0.13                        | 0.06             | 0.01              | 0.00           | 3.17                        | 1.50             | 0.23              | 0.06           |
| DP-107                | Transfer from ROM Stockpile to Loader                         | 0.04                        | 0.02             | 0.00              | 0.00           | 0.87                        | 0.41             | 0.06              | 0.02           |
| DP-109                | Transfer from Agg Stockpile to Loader                         | 0.15                        | 0.07             | 0.01              | --             | 3.63                        | 1.72             | 0.26              | --             |
| DP-110                | Transfer of Agg Material from Loader to Haul Truck            | 0.15                        | 0.07             | 0.01              | --             | 3.63                        | 1.72             | 0.26              | --             |
| DP-111                | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 0.11                        | 0.05             | 0.01              | --             | 2.54                        | 1.20             | 0.18              | --             |
| DP-113                | Hardshell Rock Storage Drop                                   | 0.59                        | 0.28             | 0.04              | 0.003          | 14.23                       | 6.73             | 1.02              | 0.08           |
| DP-114                | Ore Stockpile Drop                                            | 0.13                        | 0.06             | 0.01              | 0.00           | 3.17                        | 1.50             | 0.23              | 0.06           |
| DP-115                | ROM Stockpile Drop                                            | 0.04                        | 0.02             | 0.00              | 0.001          | 0.87                        | 0.41             | 0.06              | 0.02           |
| DP-124                | Transfer of Development Ore from Face to Loader               | 5.00E-04                    | 2.36E-04         | 1.48E-04          | 6.45E-06       | 0.01                        | 0.01             | 0.004             | 0.000          |
| DP-125                | Transfer of Development Ore from Loader to Stockpile          | 5.00E-04                    | 2.36E-04         | 1.48E-04          | 6.45E-06       | 0.01                        | 0.01             | 0.004             | 0.000          |
| DP-126                | Transfer of Development Ore from Stockpile to Loader          | 5.00E-04                    | 2.36E-04         | 1.48E-04          | 6.45E-06       | 0.01                        | 0.01             | 0.004             | 0.000          |
| DP-127                | Transfer of Development Ore Mined from Loader to Haul Truck   | 5.00E-04                    | 2.36E-04         | 1.48E-04          | 6.45E-06       | 0.01                        | 0.01             | 0.004             | 0.000          |
| DP-129                | Transfer of Development Waste Mined from Face to Loader       | 6.99E-04                    | 3.31E-04         | 2.07E-04          | 3.96E-06       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-130                | Transfer of Development Waste Mined from Loader to Stockpile  | 6.99E-04                    | 3.31E-04         | 2.07E-04          | 3.96E-06       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-131                | Transfer of Development Waste Mined from Stockpile to Loader  | 6.99E-04                    | 3.31E-04         | 2.07E-04          | 3.96E-06       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-132                | Transfer of Development Waste Mined from Loader to Haul Truck | 6.99E-04                    | 3.31E-04         | 2.07E-04          | 3.96E-06       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-134                | Transfer of Stope Ore from Stope to Loader                    | 7.63E-04                    | 3.61E-04         | 2.26E-04          | 1.34E-05       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-135                | Transfer of Stope Ore from Loader to Stockpile                | 7.63E-04                    | 3.61E-04         | 2.26E-04          | 1.34E-05       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-136                | Transfer of Stope Ore from Stockpile to Loader                | 7.63E-04                    | 3.61E-04         | 2.26E-04          | 1.34E-05       | 0.02                        | 0.01             | 0.005             | 0.000          |
| DP-137                | Transfer of Stope Ore from Loader to Haul Truck               | 7.63E-04                    | 3.61E-04         | 2.26E-04          | 1.34E-05       | 0.02                        | 0.01             | 0.005             | 0.000          |
| <b>Total</b>          |                                                               | <b>1.77</b>                 | <b>0.84</b>      | <b>0.13</b>       | <b>0.02</b>    | <b>42.54</b>                | <b>20.12</b>     | <b>3.09</b>       | <b>0.41</b>    |



**Mine Development  
Drops (Annual) - Clark**

**Table A-14a. Clark Drops - Emissions - Inputs**

| Emission Point Number           | Description                                                   | Throughput <sup>1</sup><br>(tpy) | Lead Grade <sup>1</sup> | Water Content (%) <sup>1</sup> | Control Method                    | Control Factor <sup>2</sup>    |                              | Windspeed <sup>3</sup><br>(mph) | Uncontrolled Emission Factor <sup>4</sup> |                  |                   |                |
|---------------------------------|---------------------------------------------------------------|----------------------------------|-------------------------|--------------------------------|-----------------------------------|--------------------------------|------------------------------|---------------------------------|-------------------------------------------|------------------|-------------------|----------------|
|                                 |                                                               |                                  |                         |                                |                                   | PM/PM <sub>10</sub> Efficiency | PM <sub>2.5</sub> Efficiency |                                 | PM                                        | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
|                                 |                                                               |                                  |                         |                                |                                   | %                              | %                            |                                 | (lb/ton)                                  | (lb/ton)         | (lb/ton)          | (lb/ton)       |
| Surface Activities              |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |
| Coarse Ore Delivery and Storage |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |
| DP-103                          | Dump into Primary Crusher Feed Hopper                         | 733,798                          | 1.76%                   | 4.00                           | Spray Bar, Partial Enclosure      | 85%                            | 85%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| DP-104                          | Drop from silo to trucks                                      | 733,798                          | 1.76%                   | 4.00                           | Partial Enclosure, Dust Extractor | 50%                            | 50%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| From Stockpiles                 |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |
| DP-105                          | Transfer of Ore from Ore Stockpile to Loader                  | 733794                           | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| DP-106                          | Transfer of Ore Mined from Loader to Haul Truck               | 733794                           | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| DP-107                          | Transfer from ROM Stockpile to Loader                         | 201172                           | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| DP-109                          | Transfer from Agg Stockpile to Loader                         | 10,000                           | 0.00%                   | 1.77                           | No Control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |
| DP-110                          | Transfer of Agg Material from Loader to Haul Truck            | 10,000                           | 0.00%                   | 1.77                           | No Control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |
| DP-111                          | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 10,000                           | 0.00%                   | 1.77                           | No Control                        | 0%                             | 0%                           | 19.49                           | 0.0165                                    | 0.0078           | 0.0012            | --             |
| Stockpile Drops                 |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |
| DP-113                          | Hardshell Rock Storage                                        | 987,351                          | 0.57%                   | 4.00                           | No Control                        | 0%                             | 0%                           | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 2.98E-05       |
| DP-114                          | Ore Stockpile                                                 | 733,794                          | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| DP-115                          | ROM Stockpile                                                 | 201,172                          | 1.76%                   | 4.00                           | Watering                          | 70%                            | 70%                          | 19.49                           | 0.0053                                    | 0.0025           | 0.0004            | 9.25E-05       |
| Underground                     |                                                               |                                  |                         |                                |                                   |                                |                              |                                 |                                           |                  |                   |                |
| DP-124                          | Transfer of Development Ore from Face to Loader               | 190,691                          | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000002       |
| DP-125                          | Transfer of Development Ore from Loader to Stockpile          | 190,691                          | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000002       |
| DP-126                          | Transfer of Development Ore from Stockpile to Loader          | 190,691                          | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000002       |
| DP-127                          | Transfer of Development Ore Mined from Loader to Haul Truck   | 190,691                          | 1.29%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000002       |
| DP-129                          | Transfer of Development Waste Mined from Face to Loader       | 987,351                          | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000001       |
| DP-130                          | Transfer of Development Waste Mined from Loader to Stockpile  | 987,351                          | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000001       |
| DP-131                          | Transfer of Development Waste Mined from Stockpile to Loader  | 987,351                          | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000001       |
| DP-132                          | Transfer of Development Waste Mined from Loader to Haul Truck | 987,351                          | 0.57%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000001       |
| DP-134                          | Transfer of Stope Ore from Stope to Loader                    | 543,107                          | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000003       |
| DP-135                          | Transfer of Stope Ore from Loader to Stockpile                | 543,107                          | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000003       |
| DP-136                          | Transfer of Stope Ore from Stockpile to Loader                | 543,107                          | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000003       |
| DP-137                          | Transfer of Stope Ore from Loader to Haul Truck               | 543,107                          | 1.76%                   | 4.00                           | Gravity Settling, Watering        | 94%                            | 75%                          | 1.30                            | 0.0002                                    | 0.00007          | 0.00001           | 0.000003       |

1. Per March 2022 dated Process Flow Diagram, provided by South32 in March 2022.

2. Control Factor based on conservative assumptions using "Nevada DEP - Guidance on Emission Factors for the Mining Industry" and West Virginia DEP Nonmetallic Mineral Processing Plants Application Instructions and Forms for General Permit G40-C - Table A

For Watering  
For Moisture Content

70%  
0%

Gravity Settling (underground only) (PM/PM<sub>10</sub>/Pb)  
Gravity Settling (underground only) (PM<sub>2.5</sub>)  
For Full Enclosure/Enclosure by building  
For Partial Enclosure  
No control

80%  
16%  
80%  
50%  
0%

Control efficiencies for underground gravity settling are a combination of vertical settling and horizontal settling based on discussions with ADEQ in May 2023. Vertical settling is based on various technical papers and per ADEQ meeting on May 18th 2023. Horizontal settling is based on Stoke's Equation and inputs from South32.  
Detailed calculations are included in the Gravity Settling Tab of this spreadsheet

3. Underground wind speeds at various drop locations based on ventilation design wind speeds provided in emails from Kevin McCoy (South32) on 05/18/2023 and Cayley Hoffman (South32) on 05/22/2023. For wind speeds under 1.3 miles/hour, a minimum wind speed of 1.3 was conservatively used

4. Uncontrolled emission factors using the "drop equation" contained in U.S. EPA AP-42, Section 13.2.4 (Aggregate Handling and Storage Piles), November 2006, as follows:

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where E = Emission factor (lb/ton)

k = Particle size multiplier (dimensionless)  
U = Mean wind speed (miles per hour [mph]), which is equal to:

PM  
0.74  
19.49

PM<sub>10</sub>  
0.35

PM<sub>2.5</sub>  
0.053

Based on 2019-2021 On-Site Met Data

For indoor activities, based on minimum value of wind speed per AP-42 Section 13.2.4.

M = Moisture Content (%) (Assuming 0.25 if water content not specified per EPA AP-42, Section 13.2.4 Equation 1  
0.25 %

Moisture Content of Aggregate taken to be 1.7 per AP-42 Section 11.12 Table 11.12-1 Footnote b

Mine Development  
Drops (Annual) - Clark

Table A-14b. Clark Drops - Emissions - Controlled

| Emission Point Number | Description                                                   | Controlled Emissions   |                  |                   |                | Uncontrolled Emissions |                  |                   |                |
|-----------------------|---------------------------------------------------------------|------------------------|------------------|-------------------|----------------|------------------------|------------------|-------------------|----------------|
|                       |                                                               | Annual Emissions (tpy) |                  |                   |                | Annual Emissions (tpy) |                  |                   |                |
|                       |                                                               | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| DP-103                | Dump into Primary Crusher Feed Hopper                         | 0.29                   | 0.14             | 0.02              | 0.01           | 1.93                   | 0.91             | 0.14              | 0.03           |
| DP-104                | Drop from silo to trucks                                      | 0.96                   | 0.46             | 0.07              | 0.02           | 1.93                   | 0.91             | 0.14              | 0.03           |
| DP-105                | Transfer of Ore from Ore Stockpile to Loader                  | 0.58                   | 0.27             | 0.04              | 0.01           | 1.93                   | 0.91             | 0.14              | 0.03           |
| DP-106                | Transfer of Ore Mined from Loader to Haul Truck               | 0.58                   | 0.27             | 0.04              | 0.01           | 1.93                   | 0.91             | 0.14              | 0.03           |
| DP-107                | Transfer from ROM Stockpile to Loader                         | 0.16                   | 0.08             | 0.011             | 0.003          | 0.53                   | 0.25             | 0.04              | 0.01           |
| DP-109                | Transfer from Aqg Stockpile to Loader                         | 0.08                   | 0.04             | 0.006             | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-110                | Transfer of Aqg Material from Loader to Haul Truck            | 0.08                   | 0.04             | 0.006             | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-111                | Transfer of Shotcrete Aggregate from Stockpile to Loader      | 0.08                   | 0.04             | 0.006             | --             | 0.08                   | 0.04             | 0.01              | --             |
| DP-113                | Hardshell Rock Storage                                        | 2.60                   | 1.23             | 0.186             | 0.015          | 2.60                   | 1.23             | 0.19              | 0.01           |
| DP-114                | Ore Stockpile                                                 | 0.58                   | 0.27             | 0.041             | 0.010          | 1.93                   | 0.91             | 0.14              | 0.03           |
| DP-115                | ROM Stockpile                                                 | 0.16                   | 0.08             | 0.011             | 0.003          | 0.53                   | 0.25             | 0.04              | 0.01           |
| DP-124                | Transfer of Development Ore from Face to Loader               | 9.01E-04               | 4.26E-04         | 2.67E-04          | 1.16E-05       | 0.01                   | 0.01             | 0.00              | 0.00           |
| DP-125                | Transfer of Development Ore from Loader to Stockpile          | 9.01E-04               | 4.26E-04         | 2.67E-04          | 1.16E-05       | 0.01                   | 0.01             | 0.00              | 0.00           |
| DP-126                | Transfer of Development Ore from Stockpile to Loader          | 9.01E-04               | 4.26E-04         | 2.67E-04          | 1.16E-05       | 0.01                   | 0.01             | 0.00              | 0.00           |
| DP-127                | Transfer of Development Ore Mined from Loader to Haul Truck   | 9.01E-04               | 4.26E-04         | 2.67E-04          | 1.16E-05       | 0.01                   | 0.01             | 0.00              | 0.00           |
| DP-129                | Transfer of Development Waste Mined from Face to Loader       | 4.67E-03               | 2.21E-03         | 1.38E-03          | 2.65E-05       | 0.08                   | 0.04             | 0.01              | 0.00           |
| DP-130                | Transfer of Development Waste Mined from Loader to Stockpile  | 4.67E-03               | 2.21E-03         | 1.38E-03          | 2.65E-05       | 0.08                   | 0.04             | 0.01              | 0.00           |
| DP-131                | Transfer of Development Waste Mined from Stockpile to Loader  | 4.67E-03               | 2.21E-03         | 1.38E-03          | 2.65E-05       | 0.08                   | 0.04             | 0.01              | 0.00           |
| DP-132                | Transfer of Development Waste Mined from Loader to Haul Truck | 4.67E-03               | 2.21E-03         | 1.38E-03          | 2.65E-05       | 0.08                   | 0.04             | 0.01              | 0.00           |
| DP-134                | Transfer of Stope Ore from Stope to Loader                    | 2.57E-03               | 1.21E-03         | 7.62E-04          | 4.52E-05       | 0.04                   | 0.02             | 0.00              | 0.00           |
| DP-135                | Transfer of Stope Ore from Loader to Stockpile                | 2.57E-03               | 1.21E-03         | 7.62E-04          | 4.52E-05       | 0.04                   | 0.02             | 0.00              | 0.00           |
| DP-136                | Transfer of Stope Ore from Stockpile to Loader                | 2.57E-03               | 1.21E-03         | 7.62E-04          | 4.52E-05       | 0.04                   | 0.02             | 0.00              | 0.00           |
| DP-137                | Transfer of Stope Ore from Loader to Haul Truck               | 2.57E-03               | 1.21E-03         | 7.62E-04          | 4.52E-05       | 0.04                   | 0.02             | 0.00              | 0.00           |
|                       | <b>Total</b>                                                  | <b>6.18</b>            | <b>2.93</b>      | <b>0.45</b>       | <b>0.07</b>    | <b>14.09</b>           | <b>6.66</b>      | <b>1.01</b>       | <b>0.21</b>    |

Mine Development  
Dust Collectors

Table A-15. Dust Collectors - Emissions

| Emission Point Number | Description                                                         | Max Outlet Grain Loading <sup>1</sup><br>(gr/dscf) | Stack Flow Rate <sup>2</sup><br>(cfm) | Hours of Operation<br>(hr/yr) | Material                                   | Lead Content in Material<br>(%) | Annual Emissions <sup>3</sup> |                           |                            |                                      | Hourly Emissions <sup>3</sup> |                             |                              |                                        | Daily Emissions <sup>3</sup> |                              |                               |                                         |
|-----------------------|---------------------------------------------------------------------|----------------------------------------------------|---------------------------------------|-------------------------------|--------------------------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------------------|-------------------------------|-----------------------------|------------------------------|----------------------------------------|------------------------------|------------------------------|-------------------------------|-----------------------------------------|
|                       |                                                                     |                                                    |                                       |                               |                                            |                                 | PM<br>(tpy)                   | PM <sub>10</sub><br>(tpy) | PM <sub>2.5</sub><br>(tpy) | Lead Compounds <sup>4</sup><br>(tpy) | PM<br>(lb/hr)                 | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) | Lead Compounds <sup>4</sup><br>(lb/hr) | PM<br>(lb/day)               | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | Lead Compounds <sup>4</sup><br>(lb/day) |
|                       |                                                                     |                                                    |                                       |                               |                                            |                                 |                               |                           |                            |                                      |                               |                             |                              |                                        |                              |                              |                               |                                         |
| Taylor                |                                                                     |                                                    |                                       |                               |                                            |                                 |                               |                           |                            |                                      |                               |                             |                              |                                        |                              |                              |                               |                                         |
| DC-1                  | 21210-CX-00002 Main Shaft Ore Discharge Dust Collector <sup>7</sup> | 0.002                                              | 3,250                                 | 8,760                         | Stope Ore & Developmental Ore & Waste Rock | 3.88%                           | 0.24                          | 0.24                      | 0.24                       | 9.46E-03                             | 0.06                          | 0.06                        | 0.06                         | 0.00                                   | 1.34                         | 1.34                         | 1.34                          | 0.05                                    |
| DC-2                  | 21210-CX-00001 Coarse Ore Overland Dust Collector <sup>7</sup>      | 0.002                                              | 5,000                                 | 8,760                         | Stope Ore & Developmental Ore              | 4.73%                           | 0.38                          | 0.38                      | 0.38                       | 1.78E-02                             | 0.09                          | 0.09                        | 0.09                         | 0.00                                   | 2.06                         | 2.06                         | 2.06                          | 0.10                                    |
| DC-3                  | 21210-CX-00003 Transfer Tower Silo Dust Collector <sup>4</sup>      | 0.002                                              | 30,000                                | 8,760                         | Stope Ore & Developmental Ore & Waste Rock | 3.88%                           | 2.25                          | 2.25                      | 2.25                       | 8.73E-02                             | 0.51                          | 0.51                        | 0.51                         | 0.02                                   | 12.34                        | 12.34                        | 12.34                         | 0.48                                    |
| DC-4                  | 21510-CX-00001 Coarse Ore Silo Dust Collector <sup>4</sup>          | 0.002                                              | 11,000                                | 8,760                         | Stope Ore & Developmental Ore              | 4.73%                           | 0.83                          | 0.83                      | 0.83                       | 3.91E-02                             | 0.19                          | 0.19                        | 0.19                         | 0.01                                   | 4.53                         | 4.53                         | 4.53                          | 0.21                                    |
| DC-5                  | 21710-CX-00002 Silo Discharge Dust Collector <sup>5</sup>           | 0.002                                              | 10,850                                | 8,760                         | Stope Ore & Developmental Ore              | 4.73%                           | 0.81                          | 0.81                      | 0.81                       | 3.85E-02                             | 0.19                          | 0.19                        | 0.19                         | 8.80E-03                               | 4.46                         | 4.46                         | 4.46                          | 2.11E-01                                |
| DC-12                 | 22620-CX-00001 Copper Sulphate Mix Tank Dust Collector              | 0.008                                              | 1,000                                 | 8,760                         | Copper Sulphate                            | 0.00%                           | 0.30                          | 0.30                      | 0.30                       | 0.00E+00                             | 0.07                          | 0.07                        | 0.07                         | 0.00                                   | 1.65                         | 1.65                         | 1.65                          | 0.00                                    |
| DC-13                 | 22620-CX-00002 10% Zinc Sulphate Mix Tank Dust Collector            | 0.008                                              | 1,000                                 | 8,760                         | 10% Zinc Sulphate                          | 0.00%                           | 0.30                          | 0.30                      | 0.30                       | 0.00E+00                             | 0.07                          | 0.07                        | 0.07                         | 0.00                                   | 1.65                         | 1.65                         | 1.65                          | 0.00                                    |
| DC-14                 | 22620-CX-00005 50% Zinc Sulphate Mix Tank Dust Collector            | 0.008                                              | 1,000                                 | 8,760                         | 50% Zinc Sulphate                          | 0.00%                           | 0.30                          | 0.30                      | 0.30                       | 0.00E+00                             | 0.07                          | 0.07                        | 0.07                         | 0.00                                   | 1.65                         | 1.65                         | 1.65                          | 0.00                                    |
| DC-15                 | 22620-CX-00004 Gausitic Mix Tank Dust Collector                     | 0.008                                              | 1,000                                 | 8,760                         | Gausitic Mix                               | 0.00%                           | 0.30                          | 0.30                      | 0.30                       | 0.00E+00                             | 0.07                          | 0.07                        | 0.07                         | 0.00                                   | 1.65                         | 1.65                         | 1.65                          | 0.00                                    |
| DC-16                 | 22210-CX-00001 Pebble Crusher Dust Collector <sup>4</sup>           | 0.002                                              | 12,350                                | 8,760                         | Stope Ore & Developmental Ore              | 4.73%                           | 0.93                          | 0.93                      | 0.93                       | 4.39E-02                             | 0.21                          | 0.21                        | 0.21                         | 0.01                                   | 5.08                         | 5.08                         | 5.08                          | 0.24                                    |
| DC-PPBS1              | 18610-SI-00001 Paste Plant Binder Storage Silo 1 <sup>6</sup>       | 0.005                                              | 750                                   | 8,760                         | Binder                                     | 0%                              | 0.14                          | 0.14                      | 0.14                       | 0.00E+00                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.77                         | 0.77                         | 0.77                          | 0.00                                    |
| DC-PPBS2              | 18610-SI-00002 Paste Plant Binder Storage Silo 2 <sup>6</sup>       | 0.005                                              | 750                                   | 8,760                         | Binder                                     | 0%                              | 0.14                          | 0.14                      | 0.14                       | 0.00E+00                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.77                         | 0.77                         | 0.77                          | 0.00                                    |
| DC-PPBS3              | 18610-SI-10003 Paste Plant Binder Storage Silo 3 <sup>6</sup>       | 0.005                                              | 1,500                                 | 8,760                         | Binder                                     | 0%                              | 0.28                          | 0.28                      | 0.28                       | 0.00E+00                             | 0.06                          | 0.06                        | 0.06                         | 0.00                                   | 1.54                         | 1.54                         | 1.54                          | 0.00                                    |
| DC-PPBS4              | 18610-SI-20004 Paste Plant Binder Storage Silo 4 <sup>6</sup>       | 0.005                                              | 1,500                                 | 8,760                         | Binder                                     | 0%                              | 0.28                          | 0.28                      | 0.28                       | 0.00E+00                             | 0.06                          | 0.06                        | 0.06                         | 0.00                                   | 1.54                         | 1.54                         | 1.54                          | 0.00                                    |
| DC-PPM1M              | 18610-DC-20002 Paste Plant Module 1 Mixer <sup>4</sup>              | 0.005                                              | 3,000                                 | 8,760                         | Paste                                      | 0%                              | 0.56                          | 0.56                      | 0.56                       | 0.00E+00                             | 0.13                          | 0.13                        | 0.13                         | 0.00                                   | 3.09                         | 3.09                         | 3.09                          | 0.00                                    |
| DC-PPM2M              | 18610-DC-20002 Paste Plant Module 2 Mixer <sup>4</sup>              | 0.005                                              | 3,000                                 | 8,760                         | Paste                                      | 0%                              | 0.56                          | 0.56                      | 0.56                       | 0.00E+00                             | 0.13                          | 0.13                        | 0.13                         | 0.00                                   | 3.09                         | 3.09                         | 3.09                          | 0.00                                    |
| Clark                 |                                                                     |                                                    |                                       |                               |                                            |                                 |                               |                           |                            |                                      |                               |                             |                              |                                        |                              |                              |                               |                                         |
| DC-7                  | Coarse Ore Dust Collection System 23100-FAN-0001                    | 0.001                                              | 3,200                                 | 8,760                         | Clark Stope Ore                            | 1.76%                           | 0.12                          | 0.12                      | 0.12                       | 2.11E-03                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.66                         | 0.66                         | 0.66                          | 0.01                                    |
| DC-8                  | Coarse Ore Dust Collection System 23100-FAN-0002                    | 0.001                                              | 3,200                                 | 8,760                         | Clark Stope Ore                            | 1.76%                           | 0.12                          | 0.12                      | 0.12                       | 2.11E-03                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.66                         | 0.66                         | 0.66                          | 0.01                                    |
| DC-CPPBS1             | Paste Plant Binder Silo 1 <sup>6</sup>                              | 0.005                                              | 750                                   | 8,760                         | Binder                                     | 0.00%                           | 0.14                          | 0.14                      | 0.14                       | 0.00E+00                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.77                         | 0.77                         | 0.77                          | 0.00                                    |
| DC-CPPBS2             | Paste Plant Binder Silo 2 <sup>6</sup>                              | 0.005                                              | 750                                   | 8,760                         | Binder                                     | 0.00%                           | 0.14                          | 0.14                      | 0.14                       | 0.00E+00                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.77                         | 0.77                         | 0.77                          | 0.00                                    |
| DC-CPPBS3             | Paste Plant Binder Silo 3 <sup>6</sup>                              | 0.005                                              | 1,500                                 | 8,760                         | Binder                                     | 0.00%                           | 0.28                          | 0.28                      | 0.28                       | 0.00E+00                             | 0.06                          | 0.06                        | 0.06                         | 0.00                                   | 1.54                         | 1.54                         | 1.54                          | 0.00                                    |
| DC-CPPBS4             | Paste Plant Binder Silo 4 <sup>6</sup>                              | 0.005                                              | 1,500                                 | 8,760                         | Binder                                     | 0.00%                           | 0.28                          | 0.28                      | 0.28                       | 0.00E+00                             | 0.06                          | 0.06                        | 0.06                         | 0.00                                   | 1.54                         | 1.54                         | 1.54                          | 0.00                                    |
| DC-CPPM1M             | Paste Plant Module 1 Mixer <sup>4</sup>                             | 0.005                                              | 3,000                                 | 8,760                         | Paste                                      | 0.00%                           | 0.56                          | 0.56                      | 0.56                       | 0.00E+00                             | 0.13                          | 0.13                        | 0.13                         | 0.00                                   | 3.09                         | 3.09                         | 3.09                          | 0.00                                    |
| DC-CPPM2M             | Paste Plant Module 2 Mixer <sup>4</sup>                             | 0.005                                              | 3,000                                 | 8,760                         | Paste                                      | 0.00%                           | 0.56                          | 0.56                      | 0.56                       | 0.00E+00                             | 0.13                          | 0.13                        | 0.13                         | 0.00                                   | 3.09                         | 3.09                         | 3.09                          | 0.00                                    |
| DC-10                 | Coarse Ore Dust Collection System 23100-DCD-0005                    | 0.001                                              | 3,200                                 | 8,760                         | Clark Stope Ore                            | 1.76%                           | 0.12                          | 0.12                      | 0.12                       | 2.11E-03                             | 0.03                          | 0.03                        | 0.03                         | 0.00                                   | 0.66                         | 0.66                         | 0.66                          | 0.01                                    |
| General               |                                                                     |                                                    |                                       |                               |                                            |                                 |                               |                           |                            |                                      |                               |                             |                              |                                        |                              |                              |                               |                                         |
| WTP1LS                | Waste Water Treatment Plant #1 Lime Silo                            | 0.005                                              | 1,001                                 | 8,760                         | Lime                                       | 0%                              | 0.19                          | 0.19                      | 0.19                       | 0.00E+00                             | 0.04                          | 0.04                        | 0.04                         | 0.00                                   | 1.03                         | 1.03                         | 1.03                          | 0.00                                    |
| WTP2 DC               | Sodium Sulfate Indoor Dust Collector <sup>5</sup>                   | 0.010                                              | 77                                    | 8,760                         | Sodium Sulfate                             | 0%                              | 5.78E-03                      | 5.78E-03                  | 5.78E-03                   | 0.00E+00                             | 1.32E-03                      | 1.32E-03                    | 1.32E-03                     | 0.00E+00                               | 3.17E-02                     | 3.17E-02                     | 3.17E-02                      | 0.00                                    |
| Total                 |                                                                     |                                                    |                                       |                               |                                            |                                 | 11.14                         | 11.14                     | 11.14                      | 0.24                                 | 2.54                          | 2.54                        | 2.54                         | 0.06                                   | 61.03                        | 61.03                        | 61.03                         | 1.33                                    |

1. Per email from Sarah Richman, South32, on 07/06/2021 (Per Fluor Canada Ltd. Engineering)

Per RFI responses from Rodolfo Moctezuma on 4/29/2024

Per "Clark Deposit General RFI for Air Permit 030922" RFI received on 3/3/2022

2. Per RFI responses from Rodolfo Moctezuma on 4/29/2024

3. Using the conversion factors given below:

7000 grains/lb  
2000 lb/ton  
60 min/hr  
4.96 %  
1.76 %  
0.00 %

4. Lead Conc.

For Taylor deposit  
For Clark deposit  
Lead at paste plant assumed to be negligible

5. Per email from Sarah Richman, South32, on 08/24/2022 (Per Fluor Canada Ltd. Engineering)

6. Per email from Sarah Richman, South32, on 08/31/2022 (Per Fluor Canada Ltd. Engineering and Paterson Cooke)

7. Per PFD's received on 5/29/2024 from Sarah Richman, South32.

Table A-16a. Engines - Emission Factors

| Pollutant                           | Value    | Unit     | Source                                                                                                                                                                                                                                                                                                |
|-------------------------------------|----------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NO <sub>x</sub>                     | 7.87E-02 | g/kW-hr  | Per Natural Gas Generator 100% load Emissions Performance on G3520 Caterpillar engine provided by Brad Kaufman, VoltaGrid, on 9/22/2021                                                                                                                                                               |
| NO <sub>2</sub>                     | 7.50E-03 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO                                  | 1.31E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| PM <sub>10</sub> /PM <sub>2.5</sub> | 2.08E-03 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| VOC                                 | 1.18E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO <sub>2</sub>                     | 5.05E+02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| CH <sub>4</sub>                     | 1.29E+00 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| N <sub>2</sub> O                    | 1.10E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| Acetaldehyde                        | 7.10E-03 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| Formaldehyde                        | 4.70E-03 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| NO <sub>x</sub>                     | 5.26E-02 | g/kW-hr  | Per Natural Gas Generator 75% load Emissions Performance on G3520 Caterpillar engine provided by Brad Kaufman, VoltaGrid, on 9/22/2021                                                                                                                                                                |
| NO <sub>2</sub>                     | 1.00E-04 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO                                  | 1.88E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| PM <sub>10</sub> /PM <sub>2.5</sub> | 2.21E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| VOC                                 | 5.40E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO <sub>2</sub>                     | 5.30E+02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| CH <sub>4</sub>                     | 1.48E+00 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| N <sub>2</sub> O                    | 1.40E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| Acetaldehyde                        | 2.55E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| Formaldehyde                        | 0.00E+00 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| NO <sub>x</sub>                     | 6.27E-02 | g/kW-hr  | Per Natural Gas Generator 50% load Emissions Performance on G3520 Caterpillar engine provided by Brad Kaufman, VoltaGrid, on 9/22/2021                                                                                                                                                                |
| NO <sub>2</sub>                     | 0.00E+00 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO                                  | 3.23E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| PM <sub>10</sub> /PM <sub>2.5</sub> | 7.30E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| VOC                                 | 5.30E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO <sub>2</sub>                     | 5.56E+02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| CH <sub>4</sub>                     | 1.53E+00 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| N <sub>2</sub> O                    | 1.55E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| Acetaldehyde                        | 1.45E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| Formaldehyde                        | 4.00E-04 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| NO <sub>x</sub>                     | 7.80     | tpy      | Per voluntary limit accepted by South32, as referenced in South32 Response to Public Comments, Supplement #1, on May 17, 2024                                                                                                                                                                         |
| CO                                  | 40.00    | tpy      |                                                                                                                                                                                                                                                                                                       |
| VOC                                 | 15.00    | tpy      |                                                                                                                                                                                                                                                                                                       |
| PM <sub>10</sub> /PM <sub>2.5</sub> | 1.00E-02 | g/kW-hr  | Per Caterpillar engine emissions certification, provided by Kara Haas, South32, on 7/18/2022                                                                                                                                                                                                          |
| SO <sub>2</sub>                     | 5.88E-04 | lb/MMBtu | AP-42 Section 3.2, Natural Gas Engines (Maximum Emission Factor Available), dated October 2024                                                                                                                                                                                                        |
| VOC                                 | 1.20E-01 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzene                             | 4.40E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Toluene                             | 4.08E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Xylene                              | 1.84E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 1,3-Butadiene                       | 2.67E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acrolein                            | 5.14E-03 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Naphthalene                         | 7.44E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 1,1,2,2-Tetrachloroethane           | 4.00E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 1,1,2-Trichloroethane               | 3.18E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 1,3-Dichloropropene                 | 2.64E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 2-Methylnaphthalene                 | 3.32E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 2,2,4-Trimethylpentane              | 3.50E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acenaphthene                        | 1.25E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acenaphthylene                      | 5.53E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(b)fluoranthene                | 1.66E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(a)pyrene                      | 4.15E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(g,h,i)perylene                | 4.14E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Biphenyl                            | 2.12E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Carbon Tetrachloride                | 3.67E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Chlorobenzene                       | 3.94E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Chloroform                          | 2.85E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Chrysene                            | 6.93E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Ethylbenzene                        | 3.97E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Ethylene Dibromide                  | 4.43E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Formaldehyde                        | 5.28E-02 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Fluoranthene                        | 1.11E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Fluorene                            | 5.67E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Methanol                            | 2.58E-03 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Methylene Chloride                  | 2.00E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Hexane                              | 1.11E-03 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| PAH                                 | 7.75E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Phenanthrene                        | 1.04E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Phenol                              | 2.40E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Pyrene                              | 1.36E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Styrene                             | 2.36E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Tetrachloroethane                   | 2.48E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Vinyl Chloride                      | 1.49E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| PM <sub>10</sub> /PM <sub>2.5</sub> | 4.00E-02 | g/kW-hr  | Tier 4 emission factors for diesel engines from Table 1 of §1039.101                                                                                                                                                                                                                                  |
| NO <sub>x</sub>                     | 3.50E+00 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| CO                                  | 3.50E+00 | g/kW-hr  |                                                                                                                                                                                                                                                                                                       |
| VOC                                 | 1.90E-01 | g/kW-hr  | Tier 4 NMHC emission factors for diesel engines from Table 1 of §1039.101                                                                                                                                                                                                                             |
| SO <sub>2</sub>                     | 1.21E-05 | lb/hp-hr | AP-42, Table 3.4-1 (April 2025) based on Ultra Low Sulfur Diesel (15 ppm sulfur or 0.0015%) for Large Uncontrolled Stationary Diesel Engines (<600 HP).                                                                                                                                               |
| CO <sub>2</sub>                     | 7.40E+01 | kg/MMBtu |                                                                                                                                                                                                                                                                                                       |
| CH <sub>4</sub>                     | 3.00E-03 | kg/MMBtu | 40 CFR Part 98, Subpart C, Table C-1 for Distillate Fuel Oil No. 2 (diesel)                                                                                                                                                                                                                           |
| N <sub>2</sub> O                    | 6.00E-04 | kg/MMBtu | AP-42 Section 3.2, Natural Gas Engines (4 stroke lean burn) dated October 2024                                                                                                                                                                                                                        |
| PM (condensable)                    | 9.91E-03 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| CO <sub>2</sub>                     | 5.31E+01 | kg/MMBtu | 40 CFR Part 98, Subpart C, Table C-1 and C-2 for Natural Gas (Weighted U.S Average)                                                                                                                                                                                                                   |
| CH <sub>4</sub>                     | 1.00E-03 | kg/MMBtu |                                                                                                                                                                                                                                                                                                       |
| N <sub>2</sub> O                    | 1.00E-04 | kg/MMBtu | AP-42 Section 3.4, HAP Emission Factors for Large Uncontrolled Stationary Diesel Engines (>600 HP) dated April 2025. The emission factor for PAH (which are POMs) because they are POMs is the value for 'Total PAH' listed in AP-42 minus the value listed for naphthalene, as it is specified here. |
| Benzene                             | 7.76E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Toluene                             | 2.81E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Xylene                              | 1.85E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| 1,3-Butadiene                       | 3.91E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Formaldehyde                        | 2.89E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acetaldehyde                        | 2.52E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acrolein                            | 7.88E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Naphthalene                         | 1.30E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Propylene                           | 2.79E-03 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acenaphthylene                      | 9.23E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Acenaphthene                        | 4.68E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Fluorene                            | 1.28E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Phenanthrene                        | 4.08E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Anthracene                          | 1.23E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Fluoranthene                        | 4.03E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Pyrene                              | 1.71E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(a)anthracene                  | 6.22E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Chrysene                            | 1.53E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(b)fluoranthene                | 1.11E-06 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(k)fluoranthene                | 2.18E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(a)pyrene                      | 2.57E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Indeno(1,2,3-cd)pyrene              | 4.14E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Dibenz(a,h)anthracene               | 3.46E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| Benzo(g,h,i)perylene                | 5.56E-07 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| PAH                                 | 8.20E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                       |
| SO <sub>2</sub>                     | 2.05E-03 | lb/hp-hr | AP-42 Section 3.3 for Diesel Engines (<600 HP) dated April 2025                                                                                                                                                                                                                                       |

|                   |          |          |                                                                                                                                                                                                                                                                                                                         |
|-------------------|----------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NOx               | 4.00E-01 | g/kW-hr  | Tier 4 emission factors for diesel engines of rated capacity 130 ≤ kW < 560 from Table 1 of §1039.101                                                                                                                                                                                                                   |
| CO                | 3.50E+00 | g/kW-hr  |                                                                                                                                                                                                                                                                                                                         |
| PM                | 2.00E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                                         |
| PM <sub>10</sub>  | 2.00E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                                         |
| PM <sub>2.5</sub> | 2.00E-02 | g/kW-hr  |                                                                                                                                                                                                                                                                                                                         |
| VOC               | 1.90E-01 | g/kW-hr  | AP-42 Section 3.3 Table 3.3-2 Speciated Organic Compound Emission Factors For Uncontrolled Diesel Engines (< 600 HP) dated April 2025. The emission factor for PAH (which are HAPs because they are POPs) is the value for 'Total PAH' listed in AP-42 minus the value listed for naphthalene, as it is speciated here. |
| Benzene           | 9.33E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                                         |
| Toluene           | 4.09E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                                         |
| Xylene            | 2.85E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                                         |
| 1,3-Butadiene     | 3.91E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                                         |
| Formaldehyde      | 1.18E-03 | lb/MMBtu |                                                                                                                                                                                                                                                                                                                         |
| Acetaldehyde      | 7.67E-04 | lb/MMBtu |                                                                                                                                                                                                                                                                                                                         |
| Acrolein          | 9.25E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                                         |
| Naphthalene       | 8.48E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                                         |
| PAH               | 8.32E-05 | lb/MMBtu |                                                                                                                                                                                                                                                                                                                         |

Table A-16b. Generator - Criteria Pollutant Emissions (Annual)

| Emission Point Number           | Location  | Equipment Name       | Number of Engines | Engine Rating (kW) |              | Fuel Type | Operation Hours<br>(hrs/yr) | Criteria Pollutants Annual Emissions (tpy) |                 |               |              |                  |                   |                  |                 | GHG Annual Emissions (tpy) |                 |                  |                   |
|---------------------------------|-----------|----------------------|-------------------|--------------------|--------------|-----------|-----------------------------|--------------------------------------------|-----------------|---------------|--------------|------------------|-------------------|------------------|-----------------|----------------------------|-----------------|------------------|-------------------|
|                                 |           |                      |                   | (Electrical)       | (Mechanical) |           |                             | NO <sub>x</sub>                            | NO <sub>y</sub> | CO            | PM           | PM <sub>10</sub> | PM <sub>2.5</sub> | VOC <sup>1</sup> | SO <sub>x</sub> | CO <sub>2</sub>            | CH <sub>4</sub> | N <sub>2</sub> O | CO <sub>2</sub> e |
| ENGINE 0013 - 0056 (50% Load)   | Trench    | CAT 3520 DSL 2600 kW | 40                | 52050              | 57,200       | NG        | 8,760                       | 45.02                                      | 0.00            | 23.19         | 52.42        | 52.42            | 52.42             | 38.06            | 1.53            | 399,423.42                 | 1,100.04        | 11.13            | 430,046.92        |
| ENGINE 0013 - 0056 (75% Load)   | Trench    |                      |                   | 78,000             | 85,800       | NG        | 8,760                       | 56.65                                      | 0.32            | 20.25         | 23.80        | 23.80            | 23.80             | 58.16            | 2.15            | 570,840.63                 | 1,591.78        | 15.08            | 615,128.71        |
| ENGINE 0013 - 0056 (100% Load)  | Trench    |                      |                   | 104,000            | 114,400      | NG        | 8,760                       | 113.02                                     | 10.77           | 18.81         | 2.87         | 2.87             | 2.87              | 16.95            | 2.76            | 730,963.23                 | 1,850.24        | 15.80            | 781,926.73        |
| ENGINE 0007 - 0012 <sup>2</sup> | Hardshell | CAT C18 580 kW       | 6                 | 2,730              | 3,534        | Diesel    | 8,760                       | 3.9                                        | 1.95            | 20            | 0.34         | 0.34             | 0.34              | 7.5              | 4.14E-04        | 23,692.22                  | 0.96            | 0.19             | 23,773.52         |
|                                 |           | CAT C18 580 kW       | 6                 | 2,730              | 3,534        | Diesel    | 8,760                       | 3.9                                        | 1.95            | 20            | 0.34         | 0.34             | 0.34              | 7.5              | 4.14E-04        | 23,692.22                  | 0.96            | 0.19             | 23,773.52         |
| ENGINE 0002 - 0006              | Taylor    | CAT C175 3000 kW     | 5                 | 3,000              | 3,300        | Diesel    | 500                         | 31.83                                      | 31.83           | 31.83         | 3.64E-01     | 3.64E-01         | 3.64E-01          | 1.73E+00         | 6.71E-02        | 1,262.75                   | 0.05            | 0.01             | 1,267.09          |
| ENGINE 0001                     | WW1       | C200D2RE             | 1                 | 200                | 213          | Diesel    | 8,760                       | 0.82                                       | 0.82            | 7.20          | 0.04         | 0.04             | 0.04              | 0.39             | 2.56            | 1,427.97                   | 0.06            | 0.01             | 1,432.87          |
| <b>Total Annual Emissions</b>   |           |                      |                   |                    |              |           |                             | <b>153.47</b>                              | <b>47.32</b>    | <b>102.22</b> | <b>53.50</b> | <b>53.50</b>     | <b>53.50</b>      | <b>75.28</b>     | <b>5.39</b>     | <b>781038.39</b>           | <b>1852.27</b>  | <b>16.20</b>     | <b>832173.73</b>  |

1. VOC emission factors for NG engines assumed to be total of VOC, Acetaldehyde, and Formaldehyde emission factors from performance test.

2. ENGINE 0007 - 0012 generators will be CAT XQ1140 make/model. Each XQ1140 generator set will consist of two CAT C18 engines exhausting to a shared stack

Table A-16c. Generator - HAP Emissions (Annual)<sup>1</sup>

| Emission Point Number            | ENGINE 0013 - 0056<br>(50%) | ENGINE 0013 - 0056<br>(75%) | ENGINE 0013 - 0056<br>(100%) | ENGINE 0007 - 0012 | ENGINE 0002 - 0006 | ENGINE 0001 | Total Annual<br>Emissions<br>(tpy) |
|----------------------------------|-----------------------------|-----------------------------|------------------------------|--------------------|--------------------|-------------|------------------------------------|
| Engine Rating (kW)               | 57,200                      | 85,800                      | 114,400                      | 3,534              | 3,534              | 3,300       | 213                                |
| Fuel Consumption Rate (SCFH)     | 582,360                     | 818,200                     | 1,051,120                    | -                  | -                  | -           | -                                  |
| Fuel Input (MMBtu/hr)            | 594.01                      | 834.56                      | 1,072.14                     | 33.17              | 33.17              | 30.98       | 2.00                               |
| Benzene                          | 1.17E-01                    | 1.64E-01                    | 2.11E-01                     | 1.13E-01           | 1.13E-01           | 1.13E-01    | 0.450                              |
| Toluene                          | 1.08E-01                    | 1.52E-01                    | 1.95E-01                     | 4.08E-02           | 4.08E-02           | 2.18E-03    | 0.283                              |
| Xylene                           | 4.88E-02                    | 6.88E-02                    | 8.81E-02                     | 2.80E-02           | 2.80E-02           | 2.50E-03    | 0.148                              |
| 1,3-Butadiene                    | 7.09E-02                    | 9.99E-02                    | 1.28E-01                     | 5.68E-03           | 5.68E-03           | 3.45E-04    | 0.140                              |
| Formaldehyde                     | 2.87E-01                    | 0.00E+00                    | 6.75E+00                     | 1.15E-02           | 1.15E-02           | 6.11E-04    | 6.783                              |
| Acetaldehyde                     | 1.04E+01                    | 2.75E+01                    | 1.02E+01                     | 3.66E-03           | 3.66E-03           | 1.95E-04    | 27.479                             |
| Acetone                          | 1.36E+00                    | 1.96E+00                    | 2.46E+00                     | 1.14E-01           | 1.14E-01           | 6.10E-05    | 2.465                              |
| Naphthalene                      | 1.97E-02                    | 2.77E-02                    | 3.56E-02                     | 1.89E-02           | 1.89E-02           | 1.01E-03    | 0.074                              |
| 1,1,2,2-Tetrachloroethane        | 1.04E-01                    | 1.46E-01                    | 1.88E-01                     | -                  | -                  | -           | 0.188                              |
| 1,1,2-Trichloroethane            | 8.27E-02                    | 1.16E-01                    | 1.49E-01                     | -                  | -                  | -           | 0.149                              |
| 1,3-Dichlorobenzene              | 7.01E-03                    | 9.84E-03                    | 1.26E-02                     | -                  | -                  | -           | 0.013                              |
| 2-Methylnaphthalene              | 8.81E-03                    | 1.24E-02                    | 1.59E-02                     | -                  | -                  | -           | 0.016                              |
| 2,2,4-Trimethylpentane           | 6.63E-02                    | 9.32E-02                    | 1.20E-01                     | -                  | -                  | -           | 0.120                              |
| Biphenyl                         | 5.63E-02                    | 7.90E-02                    | 1.02E-01                     | -                  | -                  | -           | 0.102                              |
| Carbon Tetrachloride             | 9.55E-02                    | 1.34E-01                    | 1.72E-01                     | -                  | -                  | -           | 0.172                              |
| Chlorobenzene                    | 7.91E-02                    | 1.11E-01                    | 1.43E-01                     | -                  | -                  | -           | 0.143                              |
| Chloroform                       | 7.51E-02                    | 1.06E-01                    | 1.34E-01                     | -                  | -                  | -           | 0.134                              |
| Ethylbenzene                     | 1.05E-02                    | 1.48E-02                    | 1.89E-02                     | -                  | -                  | -           | 0.019                              |
| Ethylene Dibromide               | 1.15E-01                    | 1.62E-01                    | 2.08E-01                     | -                  | -                  | -           | 0.208                              |
| Methanol                         | 6.63E-01                    | 9.32E-01                    | 1.20E+00                     | -                  | -                  | -           | 1.197                              |
| Methylene Chloride               | 9.20E-02                    | 7.31E-02                    | 9.39E-02                     | -                  | -                  | -           | 0.094                              |
| Hexane                           | 2.95E-01                    | 4.14E-01                    | 5.32E-01                     | -                  | -                  | -           | 0.532                              |
| PM <sub>10</sub>                 | 2.03E-01                    | 2.83E-01                    | 3.64E-01                     | 1.19E-02           | 1.19E-02           | 6.35E-04    | 0.389                              |
| Phenol                           | 6.24E-02                    | 8.77E-02                    | 1.13E-01                     | -                  | -                  | -           | 0.113                              |
| Tetrachloroethane                | 6.45E-03                    | 9.07E-03                    | 1.16E-02                     | -                  | -                  | -           | 0.012                              |
| Vinyl Chloride                   | 3.88E-02                    | 5.45E-02                    | 7.03E-02                     | -                  | -                  | -           | 0.070                              |
| Total Annual HAP Emissions (tpy) |                             |                             |                              |                    |                    |             | 41.49                              |

1. The CAT N6 engines (EU, T, ENG) are Tier 4 emissions certified and equipped with oxidation catalysts. Oxidation catalysts reduce emissions of organic HAPs. To develop an appropriate control efficiency (CE) for the HAP emissions from these engines that could be applied to the AP-42 Ch. 3.2 HAP Emission factors, Formaldehyde and VOC emission factors determined through stack testing were compared with Formaldehyde and VOC emission factors from AP-42 for natural gas engines, and the resulting ratio was applied to all organic HAPs.

**100% Load CAT 3520 engines** CE based on formaldehyde or VOC emission factors: CE % = (1 - (Stack Testing Emission Factor) / (AP-42 Ch. 3.2 Emission Factor)) x 100

Formaldehyde CE = 97.9%

VOC CE = 97.7%

**75% Load CAT 3520 engines** CE based on formaldehyde emission factors: CE % = (Stack Testing Emission Factor) / (AP-42 Ch. 3.2 Emission Factor) x 100

Formaldehyde CE = 100.0%

VOC CE = 89.8%

**50% Load CAT 3520 engines** CE based on formaldehyde emission factors: CE % = (Stack Testing Emission Factor) / (AP-42 Ch. 3.2 Emission Factor) x 100

Formaldehyde CE = 99.8%

VOC CE = 90.6%

Based on the calculations above, a conservative CE of

**89.8%** was applied to all AP-42 organic HAP emission factors for these engines.

Table A-16d. Generator - Criteria Pollutant Emissions (Daily)

| Emission Point Number     | Location  | Equipment Name       | Number of Engines | Engine Rating (kW) <sup>1,2</sup> |              | Fuel Type | Operation Hours | Criteria Pollutants Daily Emissions (lb/day) <sup>3,4,5</sup> |                 |          |        |                  |                   |        |                 |
|---------------------------|-----------|----------------------|-------------------|-----------------------------------|--------------|-----------|-----------------|---------------------------------------------------------------|-----------------|----------|--------|------------------|-------------------|--------|-----------------|
|                           |           |                      |                   | (Electrical)                      | (Mechanical) |           |                 | NO <sub>x</sub>                                               | NO <sub>x</sub> | CO       | PM     | PM <sub>10</sub> | PM <sub>2.5</sub> | VOC    | SO <sub>x</sub> |
| ENGINE 0013 - 0056 (50%)  | Trench    | CAT 3520 DSL 2600 kW | 40                | 78,000                            | 85,800       | NG        | 8,760           | 310.43                                                        | 1.77            | 110.95   | 130.43 | 130.43           | 130.43            | 318.69 | 11.78           |
| ENGINE 0013 - 0056 (75%)  | Trench    | CAT 3520 DSL 2600 kW |                   | 104,000                           | 114,400      | NG        | 8,760           | 619.28                                                        | 59.02           | 103.08   | 15.74  | 15.74            | 15.74             | 92.85  | 15.13           |
| ENGINE 0013 - 0056 (100%) | Trench    | CAT 3520 DSL 2600 kW |                   | 52,000                            | 57,200       | NG        | 8,760           | 246.69                                                        | 0.00            | 127.08   | 287.22 | 287.22           | 287.22            | 208.53 | 8.38            |
| ENGINE 0007 - 0012        | Hardshell | CAT C18, 589 bkW     | 6                 | 2,730                             | 3,534        | Diesel    | 8,760           | 21.37                                                         | 10.68           | 109.59   | 1.87   | 1.87             | 1.87              | 41.10  | 2.27E-03        |
|                           |           | CAT C18, 589 bkW     | 6                 | 2,730                             | 3,534        | Diesel    | 8,760           | 21.37                                                         | 10.68           | 109.59   | 1.87   | 1.87             | 1.87              | 41.10  | 2.27E-03        |
| ENGINE 0002 - 0006        | Taylor    | CAT C175 3000 kW     | 5                 | 3,000                             | 3,300        | Diesel    | 500             | 3055.61                                                       | 3055.61         | 3055.61  | 34.92  | 34.92            | 34.92             | 165.88 | 6.44            |
| ENGINE 0001               | WW1       | C2000.2RE            | 1                 | 200                               | 213          | Diesel    | 8,760           | 4.51                                                          | 4.51            | 39.45    | 0.23   | 0.23             | 0.23              | 2.14   | 14.05           |
| Total Daily Emissions     |           |                      |                   |                                   |              |           |                 | 3,722.14                                                      | 3,140.50        | 3,441.31 | 326.10 | 326.10           | 326.10            | 568.90 | 35.63           |

Table A-16e. Generator - Criteria Pollutant Emissions (Hourly)

| Emission Point Number     | Location  | Equipment Name       | Number of Engines | Engine Rating (kW) <sup>1,2</sup> |              | Fuel Type | Operation Hours | Criteria Pollutants Hourly Emissions (lb/hr) <sup>3,4,5</sup> |                 |        |       |                  |                   |       |                 |
|---------------------------|-----------|----------------------|-------------------|-----------------------------------|--------------|-----------|-----------------|---------------------------------------------------------------|-----------------|--------|-------|------------------|-------------------|-------|-----------------|
|                           |           |                      |                   | (Electrical)                      | (Mechanical) |           |                 | NO <sub>x</sub>                                               | NO <sub>x</sub> | CO     | PM    | PM <sub>10</sub> | PM <sub>2.5</sub> | VOC   | SO <sub>x</sub> |
| ENGINE 0013 - 0056 (50%)  | Trench    | CAT 3520 DSL 2600 kW | 40                | 78,000                            | 85,800       | NG        | 8,760           | 12.93                                                         | 0.07            | 4.62   | 5.43  | 5.43             | 5.43              | 13.28 | 0.49            |
| ENGINE 0013 - 0056 (75%)  | Trench    | CAT 3520 DSL 2600 kW |                   | 104,000                           | 114,400      | NG        | 8,760           | 25.80                                                         | 2.46            | 4.39   | 0.66  | 0.66             | 0.66              | 3.87  | 0.63            |
| ENGINE 0013 - 0056 (100%) | Trench    | CAT 3520 DSL 2600 kW |                   | 52,000                            | 57,200       | NG        | 8,760           | 10.28                                                         | 0.00            | 5.30   | 11.97 | 11.97            | 11.97             | 8.69  | 0.35            |
| ENGINE 0007 - 0012        | Hardshell | CAT C18, 589 bkW     | 6                 | 2,730                             | 3,534        | Diesel    | 8760            | 0.89                                                          | 0.45            | 4.57   | 0.08  | 0.08             | 0.08              | 1.71  | 9.45E-05        |
|                           |           | CAT C18, 589 bkW     | 6                 | 2,730                             | 3,534        | Diesel    | 8760            | 0.89                                                          | 0.45            | 4.57   | 0.08  | 0.08             | 0.08              | 1.71  | 9.45E-05        |
| ENGINE 0002 - 0006        | Taylor    | CAT C175 3000 kW     | 5                 | 3,000                             | 3,300        | Diesel    | 500             | 127.32                                                        | 127.32          | 1.46   | 1.46  | 1.46             | 1.46              | 6.51  | 0.27            |
| ENGINE 0001               | WW1       | C2000.2RE            | 1                 | 200                               | 213          | Diesel    | 8760            | 0.19                                                          | 0.19            | 1.64   | 0.01  | 0.01             | 0.01              | 0.09  | 0.59            |
| Total Hourly Emissions    |           |                      |                   |                                   |              |           |                 | 155.09                                                        | 130.85          | 143.39 | 13.59 | 13.59            | 13.59             | 23.70 | 1.48            |

1. A 10% increase in rating in the 2.6MW engines has been accounted for the change in electrical to mechanical rating.

2. Engine rating per Request for Information dated 02/16/2021

3. Average brake specific fuel consumption of

7,000

1.34

1020

10.00%

Increase

8b/tp-hr, Per AP-42 Chapter 3.3, is used to convert from lb/MMBtu to lb/tp-hr for diesel generators

lb/kWh

lb/MMBtu, per AP-42 Chapter 1.4 for natural gas engines

4. GHG emissions were converted to CO<sub>2</sub>e emissions based on the GWP for each GHG.

GWP of CO<sub>2</sub> 1

GWP of CH<sub>4</sub> 25

GWP of N<sub>2</sub>O 98

5. Safety factor of 30% has been added to the emission factors for 2.6MW NG engines.

lbs CO<sub>2</sub>e/lb CO<sub>2</sub>

lbs CO<sub>2</sub>e/lb CH<sub>4</sub>

lbs CO<sub>2</sub>e/lb N<sub>2</sub>O

30.00%

Increase

Table A-16f. Number of Generators

|                                      |       |                   |
|--------------------------------------|-------|-------------------|
| Power Supplied by CAT 3520 DSL       | 2,500 | kW                |
| 2600 kW                              | 2,600 | kW                |
| Total                                | 40    | Generators        |
| Number of Engines                    | 910   | kW                |
| Power Supplied by CAT XCL140 - 910kW | 2     | Engines/Generator |
| Engines per CAT XCL140 Generator     | 589   | bkW               |
| Engine mechanical rating             | 6     | Generators        |
| CAT 3520 DSL 2600 kW - Hardshell     |       |                   |

1. Actual output is 2,500 kW due to 100kW of parasitic load, per email from Sebastian Gutierrez on 5/1/2024. Engine certified to perform optimally up to 5,500 ft of elevation based on email from Sebastian Gutierrez on 5/1/2024

**Mine Development  
Wind Erosion**

**Table A-17a. Wind Erosion Emission Factors**

| Type of Material    | Particulate Matter Emission Factors <sup>1,2,3,4</sup> |                  |                   |             | Particulate Matter Emission Factor Inputs <sup>5,6</sup> |                              |                |                | Notes                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------|--------------------------------------------------------|------------------|-------------------|-------------|----------------------------------------------------------|------------------------------|----------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     | PM/TSP                                                 | PM <sub>10</sub> | PM <sub>2.5</sub> | Units       | Max 5-minute wind speed (m/s)                            | u <sub>10</sub> <sup>+</sup> | u <sup>*</sup> | u <sub>t</sub> |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Aggregate/shotcrete | 0.02                                                   | 0.01             | 0.002             | ton/acre-yr | 16.71                                                    | 27.9                         | 1.48           | 1.33           | u <sup>*</sup> = (0.053)(u <sub>10</sub> <sup>+</sup> ), where u <sub>10</sub> <sup>+</sup> = fastest mile for the time period between disturbances (see below for information on fastest mile calculation).<br>The fastest mile was calculated using the linear regression proposed by ADEQ. The maximum 5-minute wind speed is the max 5-minute wind speed collected at the onsite meteorological station. |
| TSF                 | 0.33                                                   | 0.17             | 0.025             | ton/acre-yr | 16.71                                                    | 27.9                         | 1.48           | 0.54           |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Rock/Ore/ROM        | 0.10                                                   | 0.05             | 0.008             | ton/acre-yr | 16.71                                                    | 27.9                         | 1.48           | 1.02           |                                                                                                                                                                                                                                                                                                                                                                                                              |

1. u<sub>10</sub><sup>+</sup> is calculated as 1.662 \* the max 5-minute wind speed + 0.0913. The 1.662 and 0.0913 value was determined from the linear regression analysis.

2. Per AP-42 13.2.5 Equation 3:

$$P = 58 (u^* - u_t)^2 + 25 (u^* - u_t)$$

$$P = 0 \text{ for } u^* \leq u_t$$

where

u<sub>t</sub> = threshold velocity

3. Threshold friction velocity per AP-42 Table 13.2.5-2:

1.02 m/s  
1.33 m/s  
0.54 m/s

Overburden can be used to represent Rock/Ore/ROM  
Roadbed material can be used to represent TSFs/aggregate/shotcrete  
Conservatively assumed that fine coal dust on concrete pad can be used to represent TSFs

4. Particle size multiplier for emission factors per AP-42 13.2.5:

PM 1  
PM<sub>10</sub> 0.5  
PM<sub>2.5</sub> 0.075

5. k = particle size multiplier, u<sup>\*</sup> = friction velocity, u<sub>t</sub> = threshold friction velocity

6. The fastest mile was calculated using linear regression method historically accepted by ADEQ for other facilities. The maximum 5-minute wind speed is the max 5-minute wind speed collected at the onsite meteorological station.

**Mine Development  
Wind Erosion**

**Table A-17b. Wind Erosion Emissions**

| Emission Point Number | Location                       | Annual Potential Emissions <sup>1,2,3</sup><br>(tpy) |                  |                   |                | Daily Potential Emissions <sup>1,2,3</sup><br>(lb/day) |                  |                   |                | Hourly Potential Emissions <sup>1,2,3</sup><br>(lb/hr) |                  |                   |                |
|-----------------------|--------------------------------|------------------------------------------------------|------------------|-------------------|----------------|--------------------------------------------------------|------------------|-------------------|----------------|--------------------------------------------------------|------------------|-------------------|----------------|
|                       |                                | PM                                                   | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead Compounds |
| TSF2                  | USFS Tailings Storage Facility | 40.47                                                | 20.24            | 3.04              | 0.17           | 221.75                                                 | 110.88           | 16.63             | 0.94           | 9.24                                                   | 4.62             | 0.69              | 0.039          |
| TSF_1                 | Tailing Storage Facility       | 16.45                                                | 8.23             | 1.23              | 0.07           | 90.15                                                  | 45.08            | 6.76              | 3.84E-01       | 3.76                                                   | 1.88             | 0.28              | 0.02           |
| WRS                   | West Rock Stockpile            | 0.67                                                 | 0.34             | 0.05              | 0.0024         | 3.67                                                   | 1.84             | 0.28              | 1.30E-02       | 0.15                                                   | 0.08             | 0.01              | 0.001          |
| EOS                   | East Ore Stockpile             | 0.74                                                 | 0.37             | 0.06              | 0.04           | 4.07                                                   | 2.03             | 0.30              | 1.92E-01       | 0.17                                                   | 0.08             | 0.01              | 0.008          |
| TAGG                  | Taylor Agg Stockpile           | 0.0005                                               | 0.0002           | 0.0000            | --             | 0.00                                                   | 0.00             | 0.00              | --             | 0.00                                                   | 0.00             | 0.00              | --             |
| TSHOT                 | Taylor Shotcrete Stockpile     | 0.0008                                               | 0.0004           | 0.0001            | --             | 0.00                                                   | 0.00             | 0.00              | --             | 0.00                                                   | 0.00             | 0.00              | --             |
| HRS                   | Hardshell Rock Stockpile       | 3.95                                                 | 1.98             | 0.30              | 2.25E-02       | 21.66                                                  | 10.83            | 1.62              | 0.12           | 0.90                                                   | 0.45             | 0.07              | 0.005          |
| ORE                   | Clark Ore Stockpile            | 0.12                                                 | 0.06             | 0.01              | 2.12E-03       | 0.66                                                   | 0.33             | 0.05              | 1.16E-02       | 0.03                                                   | 0.01             | 0.00              | 0.0005         |
| ROM                   | Clark ROM Stockpile            | 0.0357                                               | 0.0179           | 0.0027            | 6.29E-04       | 0.20                                                   | 0.10             | 0.01              | 3.45E-03       | 0.01                                                   | 0.00             | 0.00              | 0.0001         |
| AGG                   | Clark Agg Stockpile            | 0.0005                                               | 0.0002           | 0.0000            | --             | 0.00                                                   | 0.00             | 0.00              | --             | 0.00                                                   | 0.00             | 0.00              | --             |
| SHOT                  | Clark Shotcrete Stockpile      | 0.0008                                               | 0.0004           | 0.0001            | --             | 0.00                                                   | 0.00             | 0.00              | --             | 0.00                                                   | 0.00             | 0.00              | --             |
| CHUTE                 | Waste Chute Stockpile          | 2.59E-03                                             | 1.30E-03         | 1.94E-04          | 1.49E-05       | 1.42E-02                                               | 7.10E-03         | 1.07E-03          | 8.14E-05       | 5.92E-04                                               | 2.96E-04         | 4.44E-05          | 3.39E-06       |
| <b>Total</b>          |                                | <b>62.45</b>                                         | <b>31.22</b>     | <b>4.68</b>       | <b>0.31</b>    | <b>342.19</b>                                          | <b>171.09</b>    | <b>25.66</b>      | <b>1.67</b>    | <b>14.26</b>                                           | <b>7.13</b>      | <b>1.07</b>       | <b>0.07</b>    |

1. Emissions based on maximum hours

2. Conversion from grams to pounds

3. Percent of lead in PM emissions and total exposed surface are in table below

|                                |            |            |                 |                           |            |                                 |                 |
|--------------------------------|------------|------------|-----------------|---------------------------|------------|---------------------------------|-----------------|
| 8760 hrs<br>453.6 g/lb         |            |            |                 |                           |            |                                 |                 |
| USFS Tailings Storage Facility | Lead       | 0.43%      | %               | Tailings Storage Facility | Lead       | 0.43%                           | %               |
|                                | Material   | Tailings   |                 |                           | Material   | Tailings                        |                 |
|                                | Area       | 5,317,757  | ft <sup>2</sup> |                           | Area       | 2,161,944                       | ft <sup>2</sup> |
| Taylor Shotcrete Stockpile     |            | 122        | acre            | East Ore Stockpile        |            | 50                              | acre            |
|                                | Lead       | 0.00       | %               |                           | Lead Grade | 4.73%                           |                 |
|                                | Material   | Shotcrete  |                 |                           | Material   | Stope Ore & Developmental Ore   |                 |
| Taylor Agg Stockpile           | Area       | 1,600      | ft <sup>2</sup> | West Rock Stockpile       | Area       | 308,126                         | ft <sup>2</sup> |
|                                |            | 0.04       | acre            |                           |            | 7                               | acre            |
|                                | Lead       | 0.00       | %               |                           | Lead       | 0.35                            | %               |
| Hardshell Rock Stockpile       | Material   | Aggregate  |                 | Clark Ore Stockpile       | Material   | Waste Rock                      |                 |
|                                | Area       | 900        | ft <sup>2</sup> |                           | Area       | 278,225                         | ft <sup>2</sup> |
|                                |            | 0.02       | acre            |                           |            | 6                               | acre            |
| Clark Shotcrete Stockpile      | Lead Grade | 0.57%      |                 | Clark ROM Stockpile       | Lead       | 1.76                            | %               |
|                                | Material   | Waste Rock |                 |                           | Material   | Clark Stope & Developmental Ore |                 |
|                                | Area       | 1,641,033  | ft <sup>2</sup> |                           | Area       | 50,001                          | ft <sup>2</sup> |
| Clark Agg Stockpile            |            | 37.7       | acre            | Waste Chute Stockpile     |            | 1.15                            | acre            |
|                                | Lead       | 0.00       | %               |                           | Lead       | 1.76                            | %               |
|                                | Material   | Shotcrete  |                 |                           | Material   | Clark Stope & Developmental Ore |                 |
|                                | Area       | 1,600      | ft <sup>2</sup> |                           | Area       | 14,840                          | ft <sup>2</sup> |
|                                |            | 0.04       | acre            |                           |            | 0.34                            | acre            |
|                                | Lead       | 0.00       | %               |                           | Lead Grade | 0.57%                           |                 |
|                                | Material   | Aggregate  |                 |                           | Material   | Waste Chute Material            |                 |
|                                | Area       | 900        | ft <sup>2</sup> |                           | Area       | 1,076                           | ft <sup>2</sup> |
|                                |            | 0.02       | acre            |                           |            | 0.02                            | acre            |



**Mine Development  
WTP2 CT**

**Table A-18a. WTP2 Cooling Tower Parameters**

| <b>Emission Point Number</b> | <b>Flowrate <sup>1</sup><br/>(gal/min)</b> | <b>Drift <sup>2</sup><br/>(%)</b> | <b>TDS <sup>3</sup><br/>(ppm)</b> |
|------------------------------|--------------------------------------------|-----------------------------------|-----------------------------------|
| WTP2CT                       | 4500                                       | 0.0005                            | 455                               |

1. Flowrate per July 18th, 2022 email from Sarah Richman
2. Drift % per July 18th, 2022 email from Sarah Richman
3. Influent TDS (455 ppm) concentration per July 18th, 2022 email from Sarah Richman

|                             |                           |     |                                                                                                                                                                 |
|-----------------------------|---------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drift loss                  | 0.0005%                   |     | High Efficiency                                                                                                                                                 |
| Circulating water flow rate | 4,500                     | gpm |                                                                                                                                                                 |
| Total dissolved solids      | 455                       | ppm |                                                                                                                                                                 |
| Density of TDS constituents | 2.5 g/cc                  |     | <i>Average density of common salts (CaCO<sub>3</sub>, CaSO<sub>4</sub>, CaCl<sub>2</sub>, NaCl, Na<sub>2</sub>SO<sub>4</sub>, Na<sub>2</sub>CO<sub>3</sub>)</i> |
| Volume of a sphere          | $V = \frac{4}{3}\pi r^3$  |     |                                                                                                                                                                 |
| Annual drift                | 11 lb H <sub>2</sub> O/hr |     |                                                                                                                                                                 |

**Mine Development  
WTP2 CT**

**Table A-18b. Water Drop Size Distribution for Low Efficiency Drift Eliminators\***

*Based on a drift rate of 0.001%*

| Droplet          |        | H <sub>2</sub> O Droplet |             | Solids       |                  | Emissions     |                             |                              |
|------------------|--------|--------------------------|-------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass | % mass<br>smaller        | Mass<br>(g) | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 22               | 0.43   | 0.43                     | 5.6E-09     | 1.0E-12      | 1.2              |               |                             |                              |
| 29               | 1.49   | 1.92                     | 1.3E-08     | 2.3E-12      | 1.6              |               |                             |                              |
| 44               | 3.76   | 5.68                     | 4.5E-08     | 8.1E-12      | 2.5              |               |                             |                              |
| 58               | 2.09   | 7.77                     | 1.0E-07     | 1.9E-11      | 3.3              |               |                             | 7.8%                         |
| 65               | 1.86   | 9.63                     | 1.4E-07     | 2.6E-11      | 3.7              |               |                             |                              |
| 87               | 1.56   | 11.19                    | 3.4E-07     | 6.3E-11      | 4.9              |               |                             |                              |
| 108              | 1.43   | 12.62                    | 6.6E-07     | 1.2E-10      | 6.1              |               |                             |                              |
| 120              | 1.26   | 13.88                    | 9.0E-07     | 1.6E-10      | 6.8              |               |                             |                              |
| 132              | 1.09   | 14.97                    | 1.2E-06     | 2.2E-10      | 7.5              |               |                             |                              |
| 144              | 1.32   | 16.29                    | 1.6E-06     | 2.8E-10      | 8.2              |               |                             |                              |
| 174              | 5.81   | 22.1                     | 2.8E-06     | 5.0E-10      | 9.9              |               |                             |                              |
| 300              | 5.04   | 27.14                    | 1.4E-05     | 2.6E-09      | 17.0             |               | 27.1%                       |                              |
| 450**            | 4.17   | 31.31                    | 4.8E-05     | 8.7E-09      | 25.5             | 31.3%         |                             |                              |
| 600              | 4.01   | 35.32                    | 1.1E-04     | 2.1E-08      | 34.0             |               |                             |                              |
| 750              | 4.00   | 39.32                    | 2.2E-04     | 4.0E-08      | 42.5             |               |                             |                              |
| 900              | 4.03   | 43.35                    | 3.8E-04     | 6.9E-08      | 51.0             |               |                             |                              |
| 1,050            | 4.57   | 47.92                    | 6.1E-04     | 1.1E-07      | 59.5             |               |                             |                              |
| 1,200            | 5.46   | 53.38                    | 9.0E-04     | 1.6E-07      | 68.0             |               |                             |                              |
| 1,350            | 6.80   | 60.18                    | 1.3E-03     | 2.3E-07      | 76.5             |               |                             |                              |
| 2,250            | 17.99  | 78.17                    | 6.0E-03     | 1.1E-06      | 127.5            |               |                             |                              |
| 2,400            | 21.83  | 100                      | 7.2E-03     | 1.3E-06      | 136.0            |               |                             |                              |

\* EPA. 1979. *Effects of Pathogenic and Toxic Material Transport Via Cooling Device Drift - Vol. 1*  
Technical Report. EPA-600/7-79-251a. November 1979.

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).

**Mine Development  
WTP2 CT**

**Table A-18c. Water Drop Size Distribution for High Efficiency Drift Eliminators\***

*Based on a drift rate of 0.0003%*

| <b>Droplet</b>  |                | <b>H<sub>2</sub>O Droplet</b> | <b>Solids</b> |                 | <b>Emissions</b> |                        |                         |
|-----------------|----------------|-------------------------------|---------------|-----------------|------------------|------------------------|-------------------------|
| <b>Dia.</b>     | <b>% mass</b>  | <b>Mass</b>                   | <b>Vol.</b>   | <b>Dia.</b>     | <b>PM</b>        | <b>PM<sub>10</sub></b> | <b>PM<sub>2.5</sub></b> |
| <b>(micron)</b> | <b>smaller</b> | <b>(g)</b>                    | <b>(cc)</b>   | <b>(micron)</b> | <b>(lb/hr)</b>   | <b>(lb/hr)</b>         | <b>(lb/hr)</b>          |
| 10              | 0              | 5.2E-10                       | 9.5E-14       | 0.6             |                  |                        |                         |
| 20              | 0.196          | 4.2E-09                       | 7.6E-13       | 1.1             |                  |                        |                         |
| 30              | 0.226          | 1.4E-08                       | 2.6E-12       | 1.7             |                  |                        |                         |
| 40              | 0.514          | 3.4E-08                       | 6.1E-12       | 2.3             |                  |                        |                         |
| 50              | 1.816          | 6.5E-08                       | 1.2E-11       | 2.8             |                  |                        | 1.8%                    |
| 60              | 5.702          | 1.1E-07                       | 2.1E-11       | 3.4             |                  |                        |                         |
| 70              | 21.348         | 1.8E-07                       | 3.3E-11       | 4.0             |                  |                        |                         |
| 90              | 49.812         | 3.8E-07                       | 6.9E-11       | 5.1             |                  |                        |                         |
| 110             | 70.509         | 7.0E-07                       | 1.3E-10       | 6.2             |                  |                        |                         |
| 130             | 82.023         | 1.2E-06                       | 2.1E-10       | 7.4             |                  |                        |                         |
| 150             | 88.012         | 1.8E-06                       | 3.2E-10       | 8.5             |                  |                        |                         |
| 180             | 91.032         | 3.1E-06                       | 5.6E-10       | 10.2            |                  | 91.0%                  |                         |
| 210             | 92.468         | 4.8E-06                       | 8.8E-10       | 11.9            |                  |                        |                         |
| 240             | 94.091         | 7.2E-06                       | 1.3E-09       | 13.6            |                  |                        |                         |
| 270             | 94.689         | 1.0E-05                       | 1.9E-09       | 15.3            |                  |                        |                         |
| 300             | 96.288         | 1.4E-05                       | 2.6E-09       | 17.0            |                  |                        |                         |
| 350             | 97.011         | 2.2E-05                       | 4.1E-09       | 19.8            |                  |                        |                         |
| 400             | 98.34          | 3.4E-05                       | 6.1E-09       | 22.7            |                  |                        |                         |
| 450**           | 99.071         | 4.8E-05                       | 8.7E-09       | 25.5            | 99.1%            |                        |                         |
| 500             | 99.071         | 6.5E-05                       | 1.2E-08       | 28.3            |                  |                        |                         |
| 600             | 100            | 1.1E-04                       | 2.1E-08       | 34.0            |                  |                        |                         |

\* Reisman, J. and G. Frisbie. 2002. "Calculating Realistic PM<sub>10</sub> Emissions from Cooling Towers."

*Environmental Progress & Sustainable Energy. American Institute of Chemical Engineers. Volume 21, Issue 2, pp. 127-130. July 2002.*

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).

**Mine Development  
WTP2 CT**

**Table A-18d. WTP2 Cooling Towers - Emissions**

| Emission Point Number | Annual Emissions (tpy) |                  |                   | Daily Emissions (lb/day) |                  |                   | Hourly Emissions (lb/hr) |                  |                   |
|-----------------------|------------------------|------------------|-------------------|--------------------------|------------------|-------------------|--------------------------|------------------|-------------------|
|                       | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> |
| WTP2CT                | 2.22E-02               | 2.04E-02         | 4.07E-04          | 1.22E-01                 | 1.12E-01         | 2.23E-03          | 5.07E-03                 | 4.66E-03         | 9.29E-05          |
| <b>TOTAL</b>          | <b>0.0222</b>          | <b>0.0204</b>    | <b>4.07E-04</b>   | <b>0.122</b>             | <b>0.112</b>     | <b>2.23E-03</b>   | <b>0.0051</b>            | <b>4.66E-03</b>  | <b>9.29E-05</b>   |

**Mine Development  
Surface Refrigeration Plant**

**Table A-19a. Surface Refrigeration Plant Parameters**

| <b>Emission Point Number</b> | <b>Flowrate <sup>1</sup><br/>(gal/min)</b> | <b>Drift <sup>2</sup><br/>(%)</b> | <b>TDS <sup>2,3</sup><br/>(ppm)</b> |
|------------------------------|--------------------------------------------|-----------------------------------|-------------------------------------|
| PRODREF                      | 7,529                                      | 0.001                             | 1000                                |
| BBREF                        | 11,095                                     | 0.001                             | 1000                                |
| MILLREF                      | 512                                        | 0.001                             | 1000                                |

1. Provided by Ross Wilson (BBE Consulting) on 07/06/2023 via email.

2. Per parameters provided by South32 on 09/07/2021.

3. Provided by Matt Novak on 04/26/2024 via RFI

**PRODREF:**

|                             |                               |                                                                                                                                                                 |
|-----------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drift loss                  | 0.0010%                       | Low Efficiency                                                                                                                                                  |
| Circulating water flow rate | 7,529 gpm                     |                                                                                                                                                                 |
| Total dissolved solids      | 1,000 ppm                     |                                                                                                                                                                 |
| Density of TDS constituents | 2.5 g/cc                      | <i>Average density of common salts (CaCO<sub>3</sub>, CaSO<sub>4</sub>, CaCl<sub>2</sub>, NaCl, Na<sub>2</sub>SO<sub>4</sub>, Na<sub>2</sub>CO<sub>3</sub>)</i> |
| Volume of a sphere          | $V = 4/3 \cdot \pi \cdot r^3$ |                                                                                                                                                                 |
| Annual drift                | 38 lb H <sub>2</sub> O/hr     |                                                                                                                                                                 |

**BBREF:**

|                             |                               |                                                                                                                                                                 |
|-----------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drift loss                  | 0.0010%                       | Low Efficiency                                                                                                                                                  |
| Circulating water flow rate | 11,095 gpm                    |                                                                                                                                                                 |
| Total dissolved solids      | 1,000 ppm                     |                                                                                                                                                                 |
| Density of TDS constituents | 2.5 g/cc                      | <i>Average density of common salts (CaCO<sub>3</sub>, CaSO<sub>4</sub>, CaCl<sub>2</sub>, NaCl, Na<sub>2</sub>SO<sub>4</sub>, Na<sub>2</sub>CO<sub>3</sub>)</i> |
| Volume of a sphere          | $V = 4/3 \cdot \pi \cdot r^3$ |                                                                                                                                                                 |
| Annual drift                | 55 lb H <sub>2</sub> O/hr     |                                                                                                                                                                 |

**MILLREF**

|                             |                               |                                                                                                                                                                 |
|-----------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drift loss                  | 0.0010%                       | Low Efficiency                                                                                                                                                  |
| Circulating water flow rate | 512 gpm                       |                                                                                                                                                                 |
| Total dissolved solids      | 1,000 ppm                     |                                                                                                                                                                 |
| Density of TDS constituents | 2.5 g/cc                      | <i>Average density of common salts (CaCO<sub>3</sub>, CaSO<sub>4</sub>, CaCl<sub>2</sub>, NaCl, Na<sub>2</sub>SO<sub>4</sub>, Na<sub>2</sub>CO<sub>3</sub>)</i> |
| Volume of a sphere          | $V = 4/3 \cdot \pi \cdot r^3$ |                                                                                                                                                                 |
| Annual drift                | 0 lb H <sub>2</sub> O/hr      |                                                                                                                                                                 |

**Mine Development  
Surface Refrigeration Plant**

**Table A-19b. Water Drop Size Distribution for Low Efficiency Drift Eliminators\***

*Based on a drift rate of 0.001%*

| Droplet          |        | H <sub>2</sub> O Droplet |             | Solids       |                  | Emissions     |                             |                              |
|------------------|--------|--------------------------|-------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass | % mass<br>smaller        | Mass<br>(g) | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 22               | 0.43   | 0.43                     | 5.6E-09     | 2.2E-12      | 1.6              |               |                             |                              |
| 29               | 1.49   | 1.92                     | 1.3E-08     | 5.1E-12      | 2.1              |               |                             |                              |
| 44               | 3.76   | 5.68                     | 4.5E-08     | 1.8E-11      | 3.2              |               |                             | 5.7%                         |
| 58               | 2.09   | 7.77                     | 1.0E-07     | 4.1E-11      | 4.3              |               |                             |                              |
| 65               | 1.86   | 9.63                     | 1.4E-07     | 5.8E-11      | 4.8              |               |                             |                              |
| 87               | 1.56   | 11.19                    | 3.4E-07     | 1.4E-10      | 6.4              |               |                             |                              |
| 108              | 1.43   | 12.62                    | 6.6E-07     | 2.6E-10      | 8.0              |               |                             |                              |
| 120              | 1.26   | 13.88                    | 9.0E-07     | 3.6E-10      | 8.8              |               |                             |                              |
| 132              | 1.09   | 14.97                    | 1.2E-06     | 4.8E-10      | 9.7              |               |                             |                              |
| 144              | 1.32   | 16.29                    | 1.6E-06     | 6.3E-10      | 10.6             |               | 16.3%                       |                              |
| 174              | 5.81   | 22.1                     | 2.8E-06     | 1.1E-09      | 12.8             |               |                             |                              |
| 300              | 5.04   | 27.14                    | 1.4E-05     | 5.7E-09      | 22.1             |               |                             |                              |
| 450**            | 4.17   | 31.31                    | 4.8E-05     | 1.9E-08      | 33.2             | 31.3%         |                             |                              |
| 600              | 4.01   | 35.32                    | 1.1E-04     | 4.5E-08      | 44.2             |               |                             |                              |
| 750              | 4.00   | 39.32                    | 2.2E-04     | 8.8E-08      | 55.3             |               |                             |                              |
| 900              | 4.03   | 43.35                    | 3.8E-04     | 1.5E-07      | 66.3             |               |                             |                              |
| 1,050            | 4.57   | 47.92                    | 6.1E-04     | 2.4E-07      | 77.4             |               |                             |                              |
| 1,200            | 5.46   | 53.38                    | 9.0E-04     | 3.6E-07      | 88.4             |               |                             |                              |
| 1,350            | 6.80   | 60.18                    | 1.3E-03     | 5.2E-07      | 99.5             |               |                             |                              |
| 2,250            | 17.99  | 78.17                    | 6.0E-03     | 2.4E-06      | 165.8            |               |                             |                              |
| 2,400            | 21.83  | 100                      | 7.2E-03     | 2.9E-06      | 176.8            |               |                             |                              |

\* EPA. 1979. *Effects of Pathogenic and Toxic Material Transport Via Cooling Device Drift - Vol. 1*  
Technical Report. EPA-600/7-79-251a. November 1979.

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).

**Mine Development  
Surface Refrigeration Plant**

**Table A-19c. Water Drop Size Distribution for High Efficiency Drift Eliminators\***

*Based on a drift rate of 0.0003%*

| Droplet          |                   | H <sub>2</sub> O Droplet | Solids       |                  | Emissions     |                             |                              |
|------------------|-------------------|--------------------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass<br>smaller | Mass<br>(g)              | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 10               | 0                 | 5.2E-10                  | 2.1E-13      | 0.7              |               |                             |                              |
| 20               | 0.196             | 4.2E-09                  | 1.7E-12      | 1.5              |               |                             |                              |
| 30               | 0.226             | 1.4E-08                  | 5.7E-12      | 2.2              |               |                             |                              |
| 40               | 0.514             | 3.4E-08                  | 1.3E-11      | 2.9              |               |                             | 0.5%                         |
| 50               | 1.816             | 6.5E-08                  | 2.6E-11      | 3.7              |               |                             |                              |
| 60               | 5.702             | 1.1E-07                  | 4.5E-11      | 4.4              |               |                             |                              |
| 70               | 21.348            | 1.8E-07                  | 7.2E-11      | 5.2              |               |                             |                              |
| 90               | 49.812            | 3.8E-07                  | 1.5E-10      | 6.6              |               |                             |                              |
| 110              | 70.509            | 7.0E-07                  | 2.8E-10      | 8.1              |               |                             |                              |
| 130              | 82.023            | 1.2E-06                  | 4.6E-10      | 9.6              |               |                             |                              |
| 150              | 88.012            | 1.8E-06                  | 7.1E-10      | 11.1             |               | 88.0%                       |                              |
| 180              | 91.032            | 3.1E-06                  | 1.2E-09      | 13.3             |               |                             |                              |
| 210              | 92.468            | 4.8E-06                  | 1.9E-09      | 15.5             |               |                             |                              |
| 240              | 94.091            | 7.2E-06                  | 2.9E-09      | 17.7             |               |                             |                              |
| 270              | 94.689            | 1.0E-05                  | 4.1E-09      | 19.9             |               |                             |                              |
| 300              | 96.288            | 1.4E-05                  | 5.7E-09      | 22.1             |               |                             |                              |
| 350              | 97.011            | 2.2E-05                  | 9.0E-09      | 25.8             |               |                             |                              |
| 400              | 98.34             | 3.4E-05                  | 1.3E-08      | 29.5             |               |                             |                              |
| 450**            | 99.071            | 4.8E-05                  | 1.9E-08      | 33.2             | 99.1%         |                             |                              |
| 500              | 99.071            | 6.5E-05                  | 2.6E-08      | 36.8             |               |                             |                              |
| 600              | 100               | 1.1E-04                  | 4.5E-08      | 44.2             |               |                             |                              |

\* Reisman, J. and G. Frisbie. 2002. "Calculating Realistic PM<sub>10</sub> Emissions from Cooling Towers." *Environmental Progress & Sustainable Energy. American Institute of Chemical Engineers. Volume 21, Issue 2, pp. 127-130. July 2002.*

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).

**Mine Development  
Surface Refrigeration Plant**

**EXAMPLE CALCULATIONS:**      *Low Efficiency*

**Annual drift:**

$$\frac{7,529 \text{ gal water}}{1 \text{ min}} \times \frac{8.33 \text{ lb}}{1 \text{ gal water}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times 0.001\% \text{ (drift)} = \underline{\underline{38 \text{ lb water drift}}}$$

**hr**

**Total Particulate Emissions**

$$\frac{38 \text{ lb water}}{\text{hr}} \times \frac{1,000 \text{ lb PM}}{1\text{E}+6 \text{ lb water}} \times 31.3\% \text{ PM} = \frac{0.012 \text{ lb PM}}{\text{hr}} = \underline{\underline{0.052 \text{ ton PM}}}$$

**yr**

**PM<sub>10</sub> Emissions**

$$\frac{38 \text{ lb water}}{\text{hr}} \times \frac{1,000 \text{ lb PM}}{1\text{E}+6 \text{ lb water}} \times 16.3\% \text{ PM}_{10} = \frac{0.006 \text{ lb PM}_{10}}{\text{hr}} = \underline{\underline{0.027 \text{ ton PM}_{10}}}$$

**yr**

**PM<sub>2.5</sub> Emissions**

$$\frac{38 \text{ lb water}}{\text{hr}} \times \frac{1,000 \text{ lb PM}}{1\text{E}+6 \text{ lb water}} \times 5.7\% \text{ PM}_{2.5} = \frac{0.002 \text{ lb PM}_{2.5}}{\text{hr}} = \underline{\underline{0.009 \text{ ton PM}_{2.5}}}$$

**yr**



**Mine Development  
Surface Refrigeration Plant**

**Water Drop Size Distribution for Low Efficiency Drift Eliminators\***

*Based on a drift rate of 0.001%*

| Droplet          |        | H <sub>2</sub> O Droplet |             | Solids       |                  | Emissions     |                             |                              |
|------------------|--------|--------------------------|-------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass | % mass<br>smaller        | Mass<br>(g) | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 22               | 0.43   | 0.43                     | 5.6E-09     | 2.2E-12      | 1.6              |               |                             |                              |
| 29               | 1.49   | 1384.139                 | 1.3E-08     | 5.1E-12      | 2.1              |               |                             |                              |
| 44               | 3.76   | 5.68                     | 4.5E-08     | 1.8E-11      | 3.2              |               |                             | 5.7%                         |
| 58               | 2.09   | 7.77                     | 1.0E-07     | 4.1E-11      | 4.3              |               |                             |                              |
| 65               | 1.86   | 9.63                     | 1.4E-07     | 5.8E-11      | 4.8              |               |                             |                              |
| 87               | 1.56   | 11.19                    | 3.4E-07     | 1.4E-10      | 6.4              |               |                             |                              |
| 108              | 1.43   | 12.62                    | 6.6E-07     | 2.6E-10      | 8.0              |               |                             |                              |
| 120              | 1.26   | 13.88                    | 9.0E-07     | 3.6E-10      | 8.8              |               |                             |                              |
| 132              | 1.09   | 14.97                    | 1.2E-06     | 4.8E-10      | 9.7              |               |                             |                              |
| 144              | 1.32   | 16.29                    | 1.6E-06     | 6.3E-10      | 10.6             |               | 16.3%                       |                              |
| 174              | 5.81   | 22.1                     | 2.8E-06     | 1.1E-09      | 12.8             |               |                             |                              |
| 300              | 5.04   | 27.14                    | 1.4E-05     | 5.7E-09      | 22.1             |               |                             |                              |
| 450**            | 4.17   | 31.31                    | 4.8E-05     | 1.9E-08      | 33.2             | 31.3%         |                             |                              |
| 600              | 4.01   | 35.32                    | 1.1E-04     | 4.5E-08      | 44.2             |               |                             |                              |
| 750              | 4.00   | 39.32                    | 2.2E-04     | 8.8E-08      | 55.3             |               |                             |                              |
| 900              | 4.03   | 43.35                    | 3.8E-04     | 1.5E-07      | 66.3             |               |                             |                              |
| 1,050            | 4.57   | 47.92                    | 6.1E-04     | 2.4E-07      | 77.4             |               |                             |                              |
| 1,200            | 5.46   | 53.38                    | 9.0E-04     | 3.6E-07      | 88.4             |               |                             |                              |
| 1,350            | 6.80   | 60.18                    | 1.3E-03     | 5.2E-07      | 99.5             |               |                             |                              |
| 2,250            | 17.99  | 78.17                    | 6.0E-03     | 2.4E-06      | 165.8            |               |                             |                              |
| 2,400            | 21.83  | 100                      | 7.2E-03     | 2.9E-06      | 176.8            |               |                             |                              |

\* EPA. 1979. *Effects of Pathogenic and Toxic Material Transport Via Cooling Device Drift - Vol. 1*

*Technical Report. EPA-600/7-79-251a. November 1979.*

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).

**Mine Development  
Surface Refrigeration Plant**

**Water Drop Size Distribution for High Efficiency Drift Eliminators\***

*Based on a drift rate of 0.0003%*

| Droplet          |                   | H <sub>2</sub> O Droplet | Solids       |                  | Emissions     |                             |                              |
|------------------|-------------------|--------------------------|--------------|------------------|---------------|-----------------------------|------------------------------|
| Dia.<br>(micron) | % mass<br>smaller | Mass<br>(g)              | Vol.<br>(cc) | Dia.<br>(micron) | PM<br>(lb/hr) | PM <sub>10</sub><br>(lb/hr) | PM <sub>2.5</sub><br>(lb/hr) |
| 10               | 0                 | 5.2E-10                  | 2.1E-13      | 0.7              |               |                             |                              |
| 20               | 0.196             | 4.2E-09                  | 1.7E-12      | 1.5              |               |                             |                              |
| 30               | 0.226             | 1.4E-08                  | 5.7E-12      | 2.2              |               |                             |                              |
| 40               | 0.514             | 3.4E-08                  | 1.3E-11      | 2.9              |               |                             | 0.5%                         |
| 50               | 1.816             | 6.5E-08                  | 2.6E-11      | 3.7              |               |                             |                              |
| 60               | 5.702             | 1.1E-07                  | 4.5E-11      | 4.4              |               |                             |                              |
| 70               | 21.348            | 1.8E-07                  | 7.2E-11      | 5.2              |               |                             |                              |
| 90               | 49.812            | 3.8E-07                  | 1.5E-10      | 6.6              |               |                             |                              |
| 110              | 70.509            | 7.0E-07                  | 2.8E-10      | 8.1              |               |                             |                              |
| 130              | 82.023            | 1.2E-06                  | 4.6E-10      | 9.6              |               |                             |                              |
| 150              | 88.012            | 1.8E-06                  | 7.1E-10      | 11.1             |               | 88.0%                       |                              |
| 180              | 91.032            | 3.1E-06                  | 1.2E-09      | 13.3             |               |                             |                              |
| 210              | 92.468            | 4.8E-06                  | 1.9E-09      | 15.5             |               |                             |                              |
| 240              | 94.091            | 7.2E-06                  | 2.9E-09      | 17.7             |               |                             |                              |
| 270              | 94.689            | 1.0E-05                  | 4.1E-09      | 19.9             |               |                             |                              |
| 300              | 96.288            | 1.4E-05                  | 5.7E-09      | 22.1             |               |                             |                              |
| 350              | 97.011            | 2.2E-05                  | 9.0E-09      | 25.8             |               |                             |                              |
| 400              | 98.34             | 3.4E-05                  | 1.3E-08      | 29.5             |               |                             |                              |
| 450**            | 99.071            | 4.8E-05                  | 1.9E-08      | 33.2             | 99.1%         |                             |                              |
| 500              | 99.071            | 6.5E-05                  | 2.6E-08      | 36.8             |               |                             |                              |
| 600              | 100               | 1.1E-04                  | 4.5E-08      | 44.2             |               |                             |                              |

\* Reisman, J. and G. Frisbie. 2002. "Calculating Realistic PM10 Emissions from Cooling Towers." *Environmental Progress & Sustainable Energy. American Institute of Chemical Engineers. Volume 21, Issue 2, pp. 127-130. July 2002.*

\*\* Maximum droplet size governed by atmospheric dispersion. Larger droplets fall to the ground before evaporating into a particle (EPA 1979).

**Mine Development  
Surface Refrigeration Plant**

**EXAMPLE CALCULATIONS:**      *Low Efficiency*

**Annual drift:**

|                           |                        |                |                |   |                                 |
|---------------------------|------------------------|----------------|----------------|---|---------------------------------|
| 11,095 gal water<br>1 min | 8.33 lb<br>1 gal water | 60 min<br>1 hr | 0.001% (drift) | = | <b>55 lb water drift<br/>hr</b> |
|---------------------------|------------------------|----------------|----------------|---|---------------------------------|

**Total Particulate Emissions**

|                   |                              |          |   |                   |   |                            |
|-------------------|------------------------------|----------|---|-------------------|---|----------------------------|
| 55 lb water<br>hr | 1,000 lb PM<br>1E+6 lb water | 31.3% PM | = | 0.017 lb PM<br>hr | = | <b>0.076 ton PM<br/>yr</b> |
|-------------------|------------------------------|----------|---|-------------------|---|----------------------------|

**PM<sub>10</sub> Emissions**

|                   |                              |                        |   |                                 |   |                                         |
|-------------------|------------------------------|------------------------|---|---------------------------------|---|-----------------------------------------|
| 55 lb water<br>hr | 1,000 lb PM<br>1E+6 lb water | 16.3% PM <sub>10</sub> | = | 0.009 lb PM <sub>10</sub><br>hr | = | <b>0.040 ton PM<sub>10</sub><br/>yr</b> |
|-------------------|------------------------------|------------------------|---|---------------------------------|---|-----------------------------------------|

**PM<sub>2.5</sub> Emissions**

|                   |                              |                        |   |                                  |   |                                          |
|-------------------|------------------------------|------------------------|---|----------------------------------|---|------------------------------------------|
| 55 lb water<br>hr | 1,000 lb PM<br>1E+6 lb water | 5.7% PM <sub>2.5</sub> | = | 0.003 lb PM <sub>2.5</sub><br>hr | = | <b>0.014 ton PM<sub>2.5</sub><br/>yr</b> |
|-------------------|------------------------------|------------------------|---|----------------------------------|---|------------------------------------------|

**EXAMPLE CALCULATIONS:**      *Low Efficiency*      MILLREF

**Annual drift:**

|                        |                        |                |                |   |                                |
|------------------------|------------------------|----------------|----------------|---|--------------------------------|
| 512 gal water<br>1 min | 8.33 lb<br>1 gal water | 60 min<br>1 hr | 0.001% (drift) | = | <b>3 lb water drift<br/>hr</b> |
|------------------------|------------------------|----------------|----------------|---|--------------------------------|

**Total Particulate Emissions**

|                  |                              |          |   |                   |   |                            |
|------------------|------------------------------|----------|---|-------------------|---|----------------------------|
| 3 lb water<br>hr | 1,000 lb PM<br>1E+6 lb water | 31.3% PM | = | 0.001 lb PM<br>hr | = | <b>0.004 ton PM<br/>yr</b> |
|------------------|------------------------------|----------|---|-------------------|---|----------------------------|

**PM<sub>10</sub> Emissions**

**Mine Development  
Surface Refrigeration Plant**

|            |               |                        |   |               |   |                       |
|------------|---------------|------------------------|---|---------------|---|-----------------------|
| 3 lb water | 1,000 lb PM   | 16.3% PM <sub>10</sub> | = | 0.000 lb PM10 | = | <b>0.002 ton PM10</b> |
| hr         | 1E+6 lb water |                        |   | hr            |   | <b>yr</b>             |

**PM<sub>2.5</sub> Emissions**

|            |               |                        |   |                |   |                        |
|------------|---------------|------------------------|---|----------------|---|------------------------|
| 3 lb water | 1,000 lb PM   | 5.7% PM <sub>2.5</sub> | = | 0.000 lb PM2.5 | = | <b>0.001 ton PM2.5</b> |
| hr         | 1E+6 lb water |                        |   | hr             |   | <b>yr</b>              |

**Mine Development  
Surface Refrigeration Plant**

**Table A-19d. Surface Refrigeration Plant - Emissions**

| Emission Point Number | Annual Emissions (tpy) |                  |                   | Daily Emissions (lb/day) |                  |                   | Hourly Emissions (lb/hr) |                  |                   |
|-----------------------|------------------------|------------------|-------------------|--------------------------|------------------|-------------------|--------------------------|------------------|-------------------|
|                       | PM                     | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> |
| PRODREF               | 0.052                  | 0.027            | 0.009             | 2.83E-01                 | 1.47E-01         | 5.13E-02          | 1.18E-02                 | 6.13E-03         | 2.14E-03          |
| BBREF                 | 0.076                  | 0.040            | 0.014             | 4.17E-01                 | 2.17E-01         | 7.56E-02          | 1.74E-02                 | 9.03E-03         | 3.15E-03          |
| MILLREF               | 0.004                  | 0.002            | 0.001             | 1.92E-02                 | 1.00E-02         | 3.49E-03          | 8.01E-04                 | 4.17E-04         | 1.45E-04          |
| <b>TOTAL:</b>         | <b>0.13</b>            | <b>0.07</b>      | <b>0.02</b>       | <b>0.72</b>              | <b>0.37</b>      | <b>0.13</b>       | <b>0.03</b>              | <b>0.02</b>      | <b>0.01</b>       |

**Mine Development  
CBP - Taylor**

**Table A-20a. Taylor Concrete Batch Plant Emission Factors and Parameters**

| Operation            | Equipment                                  | Activity                        | Material  | Maximum Rates<br>Capacity <sup>1</sup><br>(tpy) | Emission Factors <sup>2</sup> |                                     |        |
|----------------------|--------------------------------------------|---------------------------------|-----------|-------------------------------------------------|-------------------------------|-------------------------------------|--------|
|                      |                                            |                                 |           |                                                 | PM                            | PM <sub>10</sub> /PM <sub>2.5</sub> | Units  |
| Concrete Batch Plant | Aggregate delivery to ground storage       | Unloading of Aggregate Material | Aggregate | 18,666                                          | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand delivery to ground storage            | Unloading of Sand               | Sand      | 14,292                                          | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer to hopper               | Transferring aggregate material | Aggregate | 18,666                                          | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer to hopper                    | Transferring Sand               | Sand      | 14,292                                          | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer from hopper to conveyor | Transferring aggregate material | Aggregate | 18,666                                          | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer from hopper to conveyor      | Transferring Sand               | Sand      | 14,292                                          | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer to elevated storage     | Transferring aggregate material | Aggregate | 18,666                                          | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer to elevated storage          | Transferring Sand               | Sand      | 14,292                                          | 0.0021                        | 0.00099                             | lb/ton |
|                      | Cement delivery to silo                    | Unloading of Cement             | Cement    | 4,914                                           | 0.00099                       | 0.00034                             | lb/ton |
|                      | Cement supplement delivery to silo         | Unloading of Cement Supplement  | Cement    | 731                                             | 0.0089                        | 0.0049                              | lb/ton |
|                      | Weigh hopper loading                       | Loading of Weigh hopper         | Concrete  | 40,274                                          | 0.0048                        | 0.0028                              | lb/ton |
|                      | Central mix loading                        | Loading of Mixer                | Concrete  | 40,274                                          | 0.0184                        | 0.0055                              | lb/ton |

1. EPA AP-42 Section 11.12, mixing ratios used:

|                   |      |
|-------------------|------|
| Concrete          | 1    |
| Aggregate         | 0.46 |
| Sand              | 0.35 |
| Cement            | 0.12 |
| Cement Supplement | 0.02 |

2. EPA AP-42 Section 11.12, Table 11.12-2. emission factors were utilized. If a controlled emission factor was unavailable, an uncontrolled emission factor was used.

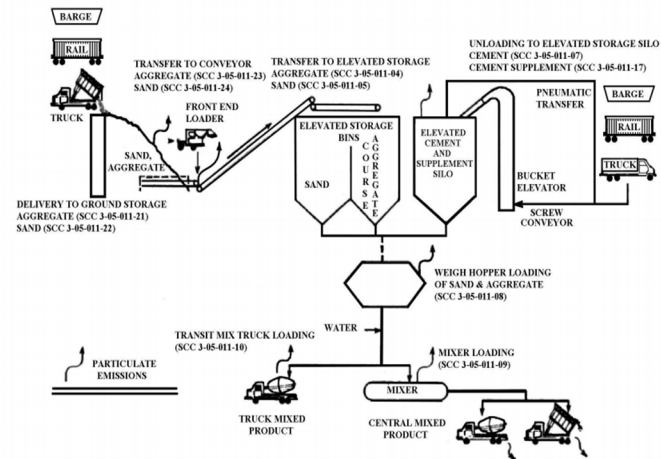
**Table A-20b. Taylor Concrete Batch Plant - Emissions**

| Operation            | Activity                        | Annual Emissions<br>(tpy) |                  |                   | Daily Emissions<br>(lb/day) |                  |                   | Hourly Emissions (lb/hr) |                  |                   |
|----------------------|---------------------------------|---------------------------|------------------|-------------------|-----------------------------|------------------|-------------------|--------------------------|------------------|-------------------|
|                      |                                 | PM                        | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                          | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                       | PM <sub>10</sub> | PM <sub>2.5</sub> |
| Concrete Batch Plant | Unloading of Aggregate Material | 0.06                      | 0.03             | 0.03              | 0.35                        | 0.17             | 0.17              | 0.01                     | 0.01             | 0.01              |
|                      | Unloading of Sand               | 0.02                      | 0.01             | 0.01              | 0.08                        | 0.04             | 0.04              | 0.00                     | 0.00             | 0.00              |
|                      | Transferring aggregate material | 0.06                      | 0.03             | 0.03              | 0.35                        | 0.17             | 0.17              | 1.47E-02                 | 7.03E-03         | 7.03E-03          |
|                      | Transferring Sand               | 0.02                      | 0.01             | 0.01              | 0.08                        | 0.04             | 0.04              | 3.43E-03                 | 1.62E-03         | 1.62E-03          |
|                      | Transferring aggregate material | 0.06                      | 0.03             | 0.03              | 0.35                        | 0.17             | 0.17              | 0.01                     | 0.01             | 0.01              |
|                      | Transferring Sand               | 0.02                      | 0.01             | 0.01              | 0.08                        | 0.04             | 0.04              | 0.00                     | 0.00             | 0.00              |
|                      | Transferring aggregate material | 0.06                      | 0.03             | 0.03              | 0.35                        | 0.17             | 0.17              | 1.47E-02                 | 7.03E-03         | 7.03E-03          |
|                      | Transferring Sand               | 0.02                      | 0.01             | 0.01              | 0.08                        | 0.04             | 0.04              | 3.43E-03                 | 1.62E-03         | 1.62E-03          |
|                      | Unloading of Cement             | 0.00                      | 0.00             | 0.00              | 0.01                        | 0.00             | 0.005             | 0.00                     | 0.00             | 0.00              |
|                      | Unloading of Cement Supplement  | 0.00                      | 0.00             | 0.00              | 0.02                        | 0.01             | 0.01              | 0.00                     | 0.00             | 0.00              |
|                      | Loading of Weigh hopper         | 0.10                      | 0.06             | 0.06              | 0.53                        | 0.31             | 0.31              | 0.02                     | 0.01             | 0.01              |
|                      | Loading of Mixer                | 0.37                      | 0.11             | 0.11              | 2.03                        | 0.61             | 0.61              | 0.08                     | 0.03             | 0.03              |
| <b>Total:</b>        |                                 | <b>0.79</b>               | <b>0.32</b>      | <b>0.32</b>       | <b>4.33</b>                 | <b>1.76</b>      | <b>1.76</b>       | <b>0.18</b>              | <b>0.07</b>      | <b>0.07</b>       |

6/06

11.12-3

Figure 11.12-1. Typical Concrete Batching Process.



**Mine Development  
CBP - Clark**

**Table A-21a. Clark Concrete Batch Plant Emission Factors and Parameters**

| Operation            | Equipment                                  | Activity                        | Material  | Maximum Rates<br>Capacity <sup>1</sup><br>(tpy) | Emission Factors <sup>2</sup> |                                     |        |
|----------------------|--------------------------------------------|---------------------------------|-----------|-------------------------------------------------|-------------------------------|-------------------------------------|--------|
|                      |                                            |                                 |           |                                                 | PM                            | PM <sub>10</sub> /PM <sub>2.5</sub> | Units  |
| Concrete Batch Plant | Aggregate delivery to ground storage       | Unloading of Aggregate Material | Aggregate | 920                                             | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand delivery to ground storage            | Unloading of Sand               | Sand      | 704                                             | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer to hopper               | Transferring aggregate material | Aggregate | 920                                             | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer to hopper                    | Transferring Sand               | Sand      | 704                                             | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer from hopper to conveyor | Transferring aggregate material | Aggregate | 920                                             | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer from hopper to conveyor      | Transferring Sand               | Sand      | 704                                             | 0.0021                        | 0.00099                             | lb/ton |
|                      | Aggregate transfer to elevated storage     | Transferring aggregate material | Aggregate | 920                                             | 0.0069                        | 0.0033                              | lb/ton |
|                      | Sand transfer to elevated storage          | Transferring Sand               | Sand      | 704                                             | 0.0021                        | 0.00099                             | lb/ton |
|                      | Cement delivery to silo                    | Unloading of Cement             | Cement    | 242                                             | 0.00099                       | 0.00034                             | lb/ton |
|                      | Cement supplement delivery to silo         | Unloading of Cement Supplement  | Cement    | 242                                             | 0.0089                        | 0.0049                              | lb/ton |
|                      | Weigh hopper loading                       | Loading of Weigh hopper         | Concrete  | 1,984                                           | 0.0048                        | 0.0028                              | lb/ton |
|                      | Central mix loading                        | Loading of Mixer                | Concrete  | 1,984                                           | 0.0184                        | 0.0055                              | lb/ton |

1. EPA AP-42 Section 11.12, mixing ratios used:

|                   |      |
|-------------------|------|
| Concrete          | 1    |
| Aggregate         | 0.46 |
| Sand              | 0.35 |
| Cement            | 0.12 |
| Cement Supplement | 0.02 |

2. EPA AP-42 Section 11.12, Table 11.12-2. emission factors were utilized. If a controlled emission factor was unavailable, an uncontrolled emission factor was used.

**Table A-21b. Clark Concrete Batch Plant - Emissions**

| Operation            | Activity                        | Annual Emissions<br>(tpy) |                  |                   | Daily Emissions<br>(lb/day) |                  |                   | Hourly Emissions<br>(lb/hr) |                  |                   |
|----------------------|---------------------------------|---------------------------|------------------|-------------------|-----------------------------|------------------|-------------------|-----------------------------|------------------|-------------------|
|                      |                                 | PM                        | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                          | PM <sub>10</sub> | PM <sub>2.5</sub> | PM                          | PM <sub>10</sub> | PM <sub>2.5</sub> |
| Concrete Batch Plant | Unloading of Aggregate Material | 3.17E-03                  | 1.52E-03         | 1.52E-03          | 1.74E-02                    | 8.31E-03         | 8.31E-03          | 7.24E-04                    | 3.46E-04         | 3.46E-04          |
|                      | Unloading of Sand               | 7.39E-04                  | 3.49E-04         | 3.49E-04          | 4.05E-03                    | 1.91E-03         | 1.91E-03          | 1.69E-04                    | 7.96E-05         | 7.96E-05          |
|                      | Transferring aggregate material | 3.17E-03                  | 1.52E-03         | 1.52E-03          | 1.74E-02                    | 8.31E-03         | 8.31E-03          | 7.24E-04                    | 3.46E-04         | 3.46E-04          |
|                      | Transferring Sand               | 7.39E-04                  | 3.49E-04         | 3.49E-04          | 4.05E-03                    | 1.91E-03         | 1.91E-03          | 1.69E-04                    | 7.96E-05         | 7.96E-05          |
|                      | Transferring aggregate material | 3.17E-03                  | 1.52E-03         | 1.52E-03          | 1.74E-02                    | 8.31E-03         | 8.31E-03          | 7.24E-04                    | 3.46E-04         | 3.46E-04          |
|                      | Transferring Sand               | 7.39E-04                  | 3.49E-04         | 3.49E-04          | 4.05E-03                    | 1.91E-03         | 1.91E-03          | 1.69E-04                    | 7.96E-05         | 7.96E-05          |
|                      | Transferring aggregate material | 3.17E-03                  | 1.52E-03         | 1.52E-03          | 1.74E-02                    | 8.31E-03         | 8.31E-03          | 7.24E-04                    | 3.46E-04         | 3.46E-04          |
|                      | Transferring Sand               | 7.39E-04                  | 3.49E-04         | 3.49E-04          | 4.05E-03                    | 1.91E-03         | 1.91E-03          | 1.69E-04                    | 7.96E-05         | 7.96E-05          |
|                      | Unloading of Cement             | 1.20E-04                  | 4.12E-05         | 4.12E-05          | 6.57E-04                    | 2.26E-04         | 2.26E-04          | 2.74E-05                    | 9.40E-06         | 9.40E-06          |
|                      | Unloading of Cement Supplement  | 1.08E-03                  | 5.93E-04         | 5.93E-04          | 5.90E-03                    | 3.25E-03         | 3.25E-03          | 2.46E-04                    | 1.35E-04         | 1.35E-04          |
|                      | Loading of Weigh hopper         | 4.76E-03                  | 2.78E-03         | 2.78E-03          | 2.61E-02                    | 1.52E-02         | 1.52E-02          | 1.09E-03                    | 6.34E-04         | 6.34E-04          |
|                      | Loading of Mixer                | 1.83E-02                  | 5.46E-03         | 5.46E-03          | 1.00E-01                    | 2.99E-02         | 2.99E-02          | 4.17E-03                    | 1.25E-03         | 1.25E-03          |
| <b>Total:</b>        |                                 | <b>0.040</b>              | <b>0.016</b>     | <b>0.016</b>      | <b>0.22</b>                 | <b>0.09</b>      | <b>0.09</b>       | <b>0.009</b>                | <b>0.0037</b>    | <b>0.0037</b>     |



11.12-3



**Mine Development  
Evaporator Emissions**

**Table A-22. Evaporation Pond Mechanical Evaporators - PM Emissions**

| Unit   | Evaporator Type | TDS Conc. (mg/L) | System Flow Rate <sup>1</sup> (gpm) | Operation Time <sup>2</sup> (hr/yr) | Calculated Emission Rate (lb/hr) <sup>3</sup> |                   | Calculated Emission Rate (lb/day) <sup>3,4</sup> |                   | Calculated Emission Rate (tpy) <sup>3</sup> |                   |
|--------|-----------------|------------------|-------------------------------------|-------------------------------------|-----------------------------------------------|-------------------|--------------------------------------------------|-------------------|---------------------------------------------|-------------------|
|        |                 |                  |                                     |                                     | PM <sub>10</sub>                              | PM <sub>2.5</sub> | PM <sub>10</sub>                                 | PM <sub>2.5</sub> | PM <sub>10</sub>                            | PM <sub>2.5</sub> |
| MEVAP1 | Nozzles         | 2,100            | 66                                  | 876                                 | 0.0911                                        | 0.014             | 1.30                                             | 0.19              | 3.99E-02                                    | 5.94E-03          |
| MEVAP2 | Nozzles         | 2,100            | 66                                  | 876                                 | 0.0911                                        | 0.014             | 1.30                                             | 0.19              | 3.99E-02                                    | 5.94E-03          |
| MEVAP3 | Nozzles         | 2,100            | 66                                  | 876                                 | 0.0911                                        | 0.014             | 1.30                                             | 0.19              | 3.99E-02                                    | 5.94E-03          |

1. Volume (gpm) calculated based on 66 gpm

2. Only 3 out of 4 units operating at once and 10% of the year based on meeting notes from 7/19/2022 with Sarah Richman

3. Emission rates are calculated using the following equation and parameters, provided by ADEQ via meeting on 5/30/2023:

$$PM = TDS \left( \frac{mg}{L} \right) \times \frac{Drift(\%)}{100\%} \times Q \text{ Rate} \left( \frac{gal}{min} \right) \times 3.78 \frac{L}{gal} \times \frac{2.2lb}{10^6 mg} \times \frac{60min}{hr}$$

Where:

Drift loss: 0.327%

PM<sub>10</sub>: 40.3% of PM

PM<sub>2.5</sub>: 6% of PM

4. For daily emissions, evaporators can run during the daylight hours only; conservatively, daylight hour of the summer solstice (14.25 hours) is used.

**Mine Development  
AGGDF -Taylor**

**Table A-23a. Aboveground Gasoline Dispensing Facility - Taylor - VOC Emissions**

| Emission Unit | Maximum Estimated Rate |            |                        | Emission Factor <sup>2</sup><br>(lbs/10 <sup>3</sup> gal) | VOC Emissions |             |             |
|---------------|------------------------|------------|------------------------|-----------------------------------------------------------|---------------|-------------|-------------|
|               | (gals/hr)              | (gals/day) | (gals/yr) <sup>1</sup> |                                                           | lb/hr         | lb/day      | ton/yr      |
| AGGDF-T       | 17                     | 411        | 150,000                | 11.3                                                      | 0.19          | 4.63        | 0.85        |
| <b>Total:</b> |                        |            |                        |                                                           | <b>0.19</b>   | <b>4.63</b> | <b>0.85</b> |

1. Based on aboveground annual gasoline usage provided by South32. All gasoline is treated as being emitted aboveground, despite some being dispensed underground.

2. Emission factor for gasoline is based on petroleum loading loss equation in USEPA publication AP-42, Table 5.2-7, Evaporative Emissions from Gasoline Service Station Operations (7/08). The loading loss equation is :

$$\text{Loading Loss (lb/1000 gal)} = 12.46 \times \text{SPM/T}$$

where,

S= saturation factor (assume 1.00 for submerged loading),

P = true vapor pressure of liquid loaded, pounds per square inch absolute (assume 7.4 psia for Gasoline RVP 10 @ 80°F),

M = molecular weight of vapors, pounds per pound-mole (assume 66 lb/lb-mole),

T = temperature of bulk liquid loaded, °R (80°F + 460 = 540°R), based on AP-42 Chapter 7 Tucson average daily maximum ambient temperature

**Sample Calculations**

VOC emissions (lb/hr) = 17.12 gal/day x 11.3 lb/1,000 gal x 1.0 day/24 hours = 0.19 lb/hr

VOC emissions (ton/yr) = 150000 gal/yr x 11.3 lb/1,000 gal x 1.0 ton/2,000 lbs = 0.85 ton/yr

**Table A-23b. Aboveground Gasoline Dispensing Facility - Taylor - HAP Emissions**

| Emission Unit               | Source Description                       | VOC Emissions <sup>1</sup> |        | HAP Emissions <sup>2</sup> |        |          |        |          |        |          |        |              |        |
|-----------------------------|------------------------------------------|----------------------------|--------|----------------------------|--------|----------|--------|----------|--------|----------|--------|--------------|--------|
|                             |                                          |                            |        | Benzene                    |        | Hexane   |        | Toluene  |        | Xylene   |        | Ethylbenzene |        |
|                             |                                          | lb/hr                      | ton/yr | lb/hr                      | ton/yr | lb/hr    | ton/yr | lb/hr    | ton/yr | lb/hr    | ton/yr | lb/hr        | ton/yr |
| AGGDF-T                     | Aboveground Gasoline Dispensing Facility | 0.19                       | 0.85   | 3.47E-03                   | 0.02   | 1.93E-03 | 0.01   | 1.35E-02 | 0.06   | 1.35E-02 | 0.06   | 2.70E-03     | 0.01   |
| <b>Total HAPs (ton/yr):</b> |                                          |                            |        | <b>0.15</b>                |        |          |        |          |        |          |        |              |        |

1. Based on emission calculations in Table A-23a

2. Mass percent is based on the average percent content of the HAP constituent in gasoline per TankESP Gasoline RVP\_X speciation:

| Storage Tank Content | HAP Mass Percent |        |         |        |              |
|----------------------|------------------|--------|---------|--------|--------------|
|                      | Benzene          | Hexane | Toluene | Xylene | Ethylbenzene |
| Gasoline             | 1.80%            | 1.00%  | 7.00%   | 7.00%  | 1.40%        |

**Mine Development  
AGGDF - Clark**

**Table A-24a. Aboveground Gasoline Dispensing Facility - Clark - VOC Emissions**

| Emission Unit | Maximum Estimated Rate |          |                      | Emission Factor <sup>2</sup><br>(lbs/10 <sup>3</sup> gal) | VOC Emissions |             |             |
|---------------|------------------------|----------|----------------------|-----------------------------------------------------------|---------------|-------------|-------------|
|               | gals/hr                | gals/day | gals/yr <sup>1</sup> |                                                           | lb/hr         | lb/day      | ton/yr      |
| AGGDF-C       | 8                      | 201      | 73,500               | 11.3                                                      | 0.09          | 2.27        | 0.41        |
| <b>Total:</b> |                        |          |                      |                                                           | <b>0.09</b>   | <b>2.27</b> | <b>0.41</b> |

1. Based on aboveground annual gasoline usage provided by South32. All gasoline is treated as being emitted aboveground, despite some being dispensed underground.

2. Emission factor for gasoline is based on petroleum loading loss equation in USEPA publication AP-42, Table 5.2-7, Evaporative Emissions from Gasoline Service Station Operations (7/08). The loading loss equation is :

$$\text{Loading Loss (lb/1000 gal)} = 12.46 \times \text{SPM/T}$$

where,

S= saturation factor (assume 1.00 for submerged loading),

P = true vapor pressure of liquid loaded, pounds per square inch absolute (assume 7.4 psia for Gasoline RVP 10 @ 80°F),

M = molecular weight of vapors, pounds per pound-mole (assume 66 lb/lb-mole),

T = temperature of bulk liquid loaded, °R (80°F + 460 = 540°R), based on AP-42 Chapter 7 Tucson average daily maximum ambient temperature

**Sample Calculations**

VOC emissions (lb/hr) = 8.39 gal/day x 11.3 lb/1,000 gal x 1.0 day/24 hours = 0.09 lb/hr

VOC emissions (ton/yr) = 73500 gal/yr x 11.3 lb/1,000 gal x 1.0 ton/2,000 lbs = 0.41 ton/yr

**Table A-24b. Aboveground Gasoline Dispensing Facility - Clark - HAP Emissions**

| Emission Unit               | Source Description                       | VOC Emissions <sup>1</sup> |        | HAP Emissions <sup>2</sup> |        |        |        |         |        |        |        |              |        |
|-----------------------------|------------------------------------------|----------------------------|--------|----------------------------|--------|--------|--------|---------|--------|--------|--------|--------------|--------|
|                             |                                          | lb/hr                      | ton/yr | Benzene                    |        | Hexane |        | Toluene |        | Xylene |        | Ethylbenzene |        |
|                             |                                          |                            |        | lb/hr                      | ton/yr | lb/hr  | ton/yr | lb/hr   | ton/yr | lb/hr  | ton/yr | lb/hr        | ton/yr |
| AGGDF-C                     | Aboveground Gasoline Dispensing Facility | 0.09                       | 0.41   | 0.002                      | 0.01   | 0.001  | 0.00   | 0.01    | 0.03   | 0.007  | 0.03   | 0.001        | 0.01   |
| <b>Total HAPs (ton/yr):</b> |                                          |                            |        | <b>0.08</b>                |        |        |        |         |        |        |        |              |        |

1. Based on emission calculations in Table A-24a

2. Mass percent is based on the average percent content of the HAP constituent in gasoline per TankESP Gasoline RVP\_X speciation:

| Storage Tank Content | HAP Mass Percent |        |         |        |              |
|----------------------|------------------|--------|---------|--------|--------------|
|                      | Benzene          | Hexane | Toluene | Xylene | Ethylbenzene |
| Gasoline             | 1.80%            | 1.00%  | 7.00%   | 7.00%  | 1.40%        |

**Mine Development  
Dozer**

**Table A-25a. Roads - Dozer - Input Parameters**

| Emission Point No. | Road Surface | Equipment | Total Combined Operation Hour <sup>1</sup> |                |                | Emission Factor (lb/hr) <sup>3</sup> |                  |                   |           |                  |                   | Material                      | Lead (%) | Control    |                |
|--------------------|--------------|-----------|--------------------------------------------|----------------|----------------|--------------------------------------|------------------|-------------------|-----------|------------------|-------------------|-------------------------------|----------|------------|----------------|
|                    |              |           | Hourly (hr/hr)                             | Daily (hr/day) | Annual (hr/yr) | Short Term                           |                  |                   | Long Term |                  |                   |                               |          | Type       | Efficiency (%) |
|                    |              |           |                                            |                |                | PM                                   | PM <sub>10</sub> | PM <sub>2.5</sub> | PM        | PM <sub>10</sub> | PM <sub>2.5</sub> |                               |          |            |                |
| DOZER1-TSF2        | Unpaved      | Bulldozer | 1                                          | 12             | 4,380          | 4.09                                 | 0.86             | 0.43              | 4.09      | 0.86             | 0.43              | Tailings                      | 0.43%    | No Control | 0%             |
| DOZER2-TSF2        | Unpaved      | Bulldozer | 1                                          | 12             | 4,380          | 4.09                                 | 0.86             | 0.43              | 4.09      | 0.86             | 0.43              | Tailings                      | 0.43%    | No Control | 0%             |
| DOZER-WRS          | Unpaved      | Bulldozer | 1                                          | 12             | 4,380          | 1.65                                 | 0.22             | 0.17              | 1.65      | 0.22             | 0.17              | Waste Rock                    | 0.35%    | Watering   | 70%            |
| DOZER-HRS          | Unpaved      | Bulldozer | 1                                          | 12             | 4,380          | 1.65                                 | 0.22             | 0.17              | 1.65      | 0.22             | 0.17              | Waste Rock                    | 0.57%    | Watering   | 70%            |
| DOZER-TSF          | Unpaved      | Bulldozer | 1                                          | 12             | 4,380          | 4.09                                 | 0.86             | 0.43              | 4.09      | 0.86             | 0.43              | Tailings                      | 0.43%    | No Control | 0%             |
| DOZER-EOS          | Unpaved      | Bulldozer | 1                                          | 12             | 4,380          | 1.65                                 | 0.22             | 0.17              | 1.65      | 0.22             | 0.17              | Stope Ore & Developmental Ore | 4.73%    | Watering   | 70%            |

1. Assumed to operate 12 hours a day and 365 days a year.

2. At South32, watering will be performed to sufficiently to achieve a control efficiency of 70%

3. Emission factors for bulldozers per Table 11.9-1, U.S. EPA AP-42, Section 11.9 (Western Surface Coal Mining), October 1998

$$PM = TSP = k * \frac{5.7 (s)^{1.2}}{(M)^{1.3}}$$

$$PM_{10} = k * PM_{15} = k * \frac{1.0 (s)^{1.5}}{(M)^{1.4}}$$

$$PM_{2.5} = k * TSP = k * \frac{5.7 (s)^{1.2}}{(M)^{1.3}}$$

where

k = Scaling factor

|       |                  |                   |
|-------|------------------|-------------------|
| PM    | PM <sub>10</sub> | PM <sub>2.5</sub> |
| k = 1 | 0.75             | 0.105             |

Per AP-42, Table 11.9-1

s = Material silt content (%)

1.6 Rock silt content assumed as to be similar to Crushed limestone in Western Surface Coal Mining in AP-42, Section 13.2.4 (11/2006)

11 Tailings silt content assumed as to be similar to Taconite mining tailings in Western Surface Coal Mining in AP-42, Section 13.2.4 (11/2006)

M = Material moisture content (%)

11.80 for Tailings 4 for ore/rock

|         |                  |                   |
|---------|------------------|-------------------|
| PM      | PM <sub>10</sub> | PM <sub>2.5</sub> |
| a = 5.7 | 1                | 5.7               |
| b = 1.2 | 1.5              | 1.2               |
| c = 1.3 | 1.4              | 1.3               |

**Table A-25b. Roads -Dozer - Controlled Emissions**

| Emission Point No. | Road Surface | Equipment | Controlled Emissions <sup>1,2</sup> |                  |                   |          |                |                  |                   |      |              |                  |                   |          | Uncontrolled Emissions (tpy) |                  |                   |          |
|--------------------|--------------|-----------|-------------------------------------|------------------|-------------------|----------|----------------|------------------|-------------------|------|--------------|------------------|-------------------|----------|------------------------------|------------------|-------------------|----------|
|                    |              |           | Hourly (lb/hr)                      |                  |                   |          | Daily (lb/day) |                  |                   |      | Annual (tpy) |                  |                   |          | Annual (tpy)                 |                  |                   |          |
|                    |              |           | PM                                  | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead | PM           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     |
| DOZER1-TSF2        | Unpaved      | Bulldozer | 4.09                                | 0.86             | 0.43              | 1.74E-02 | 49.12          | 10.37            | 5.16              | 0.21 | 8.96         | 1.89             | 0.94              | 3.82E-02 | 8.96                         | 1.89             | 0.94              | 3.82E-02 |
| DOZER2-TSF2        | Unpaved      | Bulldozer | 4.09                                | 0.86             | 0.43              | 1.74E-02 | 49.12          | 10.37            | 5.16              | 0.21 | 8.96         | 1.89             | 0.94              | 3.82E-02 | 8.96                         | 1.89             | 0.94              | 3.82E-02 |
| DOZER-WRS          | Unpaved      | Bulldozer | 0.50                                | 0.07             | 0.05              | 1.76E-03 | 5.95           | 0.78             | 0.62              | 0.02 | 1.09         | 0.14             | 0.11              | 3.84E-03 | 3.62                         | 0.48             | 0.38              | 1.28E-02 |
| DOZER-HRS          | Unpaved      | Bulldozer | 0.50                                | 0.07             | 0.052             | 2.83E-03 | 5.95           | 0.78             | 0.62              | 0.03 | 1.09         | 0.14             | 0.11              | 6.19E-03 | 3.62                         | 0.48             | 0.38              | 2.06E-02 |
| DOZER-TSF          | Unpaved      | Bulldozer | 4.09                                | 0.86             | 0.430             | 1.74E-02 | 49.12          | 10.37            | 5.16              | 0.21 | 8.96         | 1.89             | 0.94              | 3.82E-02 | 8.96                         | 1.89             | 0.94              | 3.82E-02 |
| DOZER-EOS          | Unpaved      | Bulldozer | 0.50                                | 0.07             | 0.052             | 2.35E-02 | 5.95           | 0.78             | 0.62              | 0.28 | 1.09         | 0.14             | 0.11              | 5.14E-02 | 3.62                         | 0.48             | 0.38              | 1.71E-01 |

1. Controlled hourly and daily emissions calculated based on short term emission factors and control efficiency.

2. Controlled annual emissions calculated based on long term emission factors and control efficiency.

**Mine Development  
Storage Tanks**

**Table A-26a. South32 Hermosa non-fuel Tank Emissions Summary †**

| Tank ID              | Max Capacity (gal) | Stock                               | Losses (tpy)     |             |             | Speciated HAP Emissions (tpy) |                                |                 | Total HAP (tpy) |
|----------------------|--------------------|-------------------------------------|------------------|-------------|-------------|-------------------------------|--------------------------------|-----------------|-----------------|
|                      |                    |                                     | Standing         | Working     | Total VOC   | Cresol                        | Ethylene Glycol Dimethyl Ether | Urethane        |                 |
| TNK-040 <sup>1</sup> | 7,925              | F549/MIBC                           | 0.166            | 0.122       | 0.289       | -                             | 0.262                          | -               | 0.262           |
| TNK-041 <sup>2</sup> | 6,604              | 3407-A                              | 4.65E-04         | 1.02E-03    | 1.48E-03    | 9.52E-05                      | -                              | -               | 9.52E-05        |
| TNK-044 <sup>3</sup> | 6,604              | Solvay 5100                         | 6.26E-03         | 8.67E-03    | 1.49E-02    | -                             | -                              | 3.67E-05        | 3.67E-05        |
| TNK-045              | 2,642              | Copper Sulphate                     | No VOC Emissions |             |             |                               |                                |                 |                 |
| TNK-046              | 5,283              | Copper Sulphate                     |                  |             |             |                               |                                |                 |                 |
| TNK-047              | 2,642              | Zinc Sulphate                       |                  |             |             |                               |                                |                 |                 |
| TNK-048              | 5,283              | Zinc Sulphate                       |                  |             |             |                               |                                |                 |                 |
| TNK-051              | 2,642              | Zinc Cyanide                        |                  |             |             |                               |                                |                 |                 |
| TNK-052              | 3,963              | Zinc Cyanide                        |                  |             |             |                               |                                |                 |                 |
| TNK-053              | #REF!              | SMBS                                |                  |             |             |                               |                                |                 |                 |
| TNK-054              | #REF!              | SMBS                                |                  |             |             |                               |                                |                 |                 |
| TNK-057              | 17,171             | Tailings Flocculant (SNF AN910-VHM) |                  |             |             |                               |                                |                 |                 |
| TNK-058              | 1,320              | Tailings Flocculant (SNF AN910-VHM) |                  |             |             |                               |                                |                 |                 |
| TNK-059              | #REF!              | Tailings Flocculant (SNF AN910-VHM) |                  |             |             |                               |                                |                 |                 |
| TNK-060              | 6,604              | 3418-A                              | 2.14E-05         | 1.68E-04    | 1.90E-04    |                               |                                |                 |                 |
| TNK-061              | 10,293             | Shaft ANE                           | 1.43E-04         | 9.54E-05    | 2.38E-04    |                               |                                |                 |                 |
| <b>Total</b>         |                    |                                     | <b>0.17</b>      | <b>0.13</b> | <b>0.31</b> | <b>9.52E-05</b>               | <b>0.262</b>                   | <b>3.67E-05</b> | <b>0.263</b>    |

† Based on the SDS for tanks TNK-045 through TNK-059, there are no VOC or HAP emissions associated with these tanks.

1. This tank contains a 50/50 mixture of MIBC and F-549. F-549 is comprised of "mixed glycol ethers" according to Section 3 of the SDS. As such, it was conservatively modeled as 100% ethylene glycol dimethyl ether (1,2-dimethoxyethane), the lightest glycol ether.

2. The "test reagent" is not always the same stock, so a representative chemical, 3407-A, was used to estimate tank emissions. "Dithiophosphate" and "modified dithiophosphate" listed in Section 3 of the SDS are assumed to be sodium diisobutylidithiophosphinate. Due to the unavailability for Antoine coefficients of this chemical, the A and B coefficients for No. 6 fuel oil are used as a conservative estimate.

3. Due to unavailability of Antoine coefficients for the majority constituent chemical (Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester), the vapor pressure given in the SDS was assumed to be constant to generate usable Antoine coefficients.

**Table A-26b. Diesel & Gasoline Storage Tanks - VOC Emissions**

| Tank ID          | Max Capacity (gal) | Stock                      | VOC Emissions <sup>1</sup> |             |
|------------------|--------------------|----------------------------|----------------------------|-------------|
|                  |                    |                            | (lb/yr)                    | (tpy)       |
| T-01             | 1,000              | Unleaded Gasoline (S32)    | 750.03                     | 0.38        |
| T-02             | 5,000              | Diesel (Red Dyed S32)      | 3.27                       | 1.64E-03    |
| T-03             | 5,000              | Diesel (Red Dyed S32)      | 3.27                       | 1.64E-03    |
| T-04             | 12,000             | Diesel (Red Dyed Rummel)   | 4.08                       | 2.04E-03    |
| T-05             | 1,000              | Unleaded Gasoline (Rummel) | 650.59                     | 0.33        |
| T-06             | 1,000              | Diesel (Rummel)            | 0.95                       | 4.74E-04    |
| T-07             | 10,000             | Unleaded Gasoline          | 3831.10                    | 1.92        |
| T-08             | 10,000             | Unleaded Gasoline          | 3831.10                    | 1.92        |
| T-09             | 10,000             | Unleaded Gasoline          | 3831.10                    | 1.92        |
| T-10             | 50,000             | Diesel                     | 78.34                      | 0.04        |
| T-11             | 50,000             | Diesel                     | 71.75                      | 3.59E-02    |
| <b>Total VOC</b> |                    |                            | <b>13,055.59</b>           | <b>6.53</b> |
| <b>Max VOC</b>   |                    |                            | <b>3831.10</b>             | <b>1.92</b> |

1. VOC Emissions per EPA-approved TankESP Software (AP-42 Chapter 7.1, June 2020)

**Mine Development  
Storage Tanks**

**Table A-26c. Diesel & Gasoline Storage Tanks - HAP Weight Percent's**

| Tank ID | Stock                      | HAP Liquid Weight Percent's <sup>1</sup> |                          |        |              |         |                                         |             |        |         |        |
|---------|----------------------------|------------------------------------------|--------------------------|--------|--------------|---------|-----------------------------------------|-------------|--------|---------|--------|
|         |                            | Benzene                                  | Benzo(g,h,i)p<br>erylene | Cumene | Ethylbenzene | Hexane  | Iso-octane (2,2,4-<br>Trimethylpentane) | Naphthalene | PAC's  | Toluene | Xylene |
| T-01    | Unleaded Gasoline (S32)    | 1.80%                                    | 0.00%                    | 0.50%  | 1.40%        | 1.00%   | 4.00%                                   | 0.42%       | 0.00%  | 7.00%   | 7.00%  |
| T-02    | Diesel (Red Dyed S32)      | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.08%       | 0.002% | 0.03%   | 0.29%  |
| T-03    | Diesel (Red Dyed S32)      | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.08%       | 0.002% | 0.03%   | 0.29%  |
| T-04    | Diesel (Red Dyed Rummel)   | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.08%       | 0.002% | 0.03%   | 0.29%  |
| T-05    | Unleaded Gasoline (Rummel) | 1.80%                                    | 0.00%                    | 0.50%  | 1.40%        | 1.00%   | 4.00%                                   | 0.42%       | 0.00%  | 7.00%   | 7.00%  |
| T-06    | Diesel (Rummel)            | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.080%      | 0.002% | 0.030%  | 0.290% |
| T-07    | Unleaded Gasoline          | 1.80%                                    | 0.00%                    | 0.50%  | 1.40%        | 1.00%   | 4.00%                                   | 0.42%       | 0.00%  | 7.00%   | 7.00%  |
| T-08    | Unleaded Gasoline          | 1.80%                                    | 0.00%                    | 0.50%  | 1.40%        | 1.00%   | 4.00%                                   | 0.42%       | 0.00%  | 7.00%   | 7.00%  |
| T-09    | Unleaded Gasoline          | 1.80%                                    | 0.00%                    | 0.50%  | 1.40%        | 1.00%   | 4.00%                                   | 0.42%       | 0.00%  | 7.00%   | 7.00%  |
| T-10    | Diesel                     | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.08%       | 0.002% | 0.03%   | 0.29%  |
| T-11    | Diesel                     | 0.0008%                                  | 0.0009%                  | --     | 0.01%        | 0.0001% | --                                      | 0.08%       | 0.002% | 0.03%   | 0.29%  |

1. Speciation data for each HAP is based on individual content speciation.

**Table A-26d. Diesel and Gasoline Storage Tanks - HAP Emissions (lb/yr)**

| Tank ID           | Stock                      | HAP Emissions<br>(lb/yr) <sup>1</sup> |                          |                 |                 |                 |                 |                 |                 |                 |                 |               |
|-------------------|----------------------------|---------------------------------------|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------------|
|                   |                            | Benzene                               | Benzo(g,h,i)p<br>erylene | Cumene          | Ethylbenzene    | Hexane          | Isooctane       | Naphthalene     | PAC's           | Toluene         | Xylene          | Total HAPs    |
| T-01              | Unleaded Gasoline (S32)    | 4.05E+00                              | 2.98E-16                 | 5.19E-02        | 3.05E-01        | 3.05E-01        | 4.64E+00        | 2.36E-03        | 2.36E-03        | 4.64E+00        | 1.33E+00        | 15.33         |
| T-02              | Diesel (Red Dyed S32)      | 6.39E-03                              | 3.20E-15                 | 0.00E+00        | 1.01E-02        | 1.01E-02        | 0.00E+00        | 1.54E-03        | 1.54E-03        | 7.54E-02        | 1.96E-01        | 0.30          |
| T-03              | Diesel (Red Dyed S32)      | 6.39E-03                              | 3.20E-15                 | 0.00E+00        | 1.01E-02        | 1.01E-02        | 0.00E+00        | 1.54E-03        | 1.54E-03        | 7.54E-02        | 1.96E-01        | 0.30          |
| T-04              | Diesel (Red Dyed Rummel)   | 7.96E-03                              | 4.02E-15                 | 0.00E+00        | 1.25E-02        | 1.25E-02        | 0.00E+00        | 1.92E-03        | 1.92E-03        | 9.40E-02        | 2.45E-01        | 0.38          |
| T-05              | Unleaded Gasoline (Rummel) | 3.51E+00                              | 2.59E-16                 | 4.50E-02        | 2.64E-01        | 2.64E-01        | 4.03E+00        | 2.05E-03        | 2.05E-03        | 4.03E+00        | 1.16E+00        | 13.30         |
| T-06              | Diesel (Rummel)            | 1.85E-03                              | 9.22E-16                 | 0.00E+00        | 2.91E-03        | 2.91E-03        | 0.00E+00        | 4.45E-04        | 4.45E-04        | 2.18E-02        | 5.68E-02        | 0.09          |
| T-07              | Unleaded Gasoline          | 2.07E+01                              | 1.52E-15                 | 2.65E-01        | 1.56E+00        | 1.56E+00        | 2.37E+01        | 1.21E-02        | 1.21E-02        | 2.37E+01        | 6.80E+00        | 78.31         |
| T-08              | Unleaded Gasoline          | 2.07E+01                              | 1.52E-15                 | 2.65E-01        | 1.56E+00        | 1.56E+00        | 2.37E+01        | 1.21E-02        | 1.21E-02        | 2.37E+01        | 6.80E+00        | 78.31         |
| T-09              | Unleaded Gasoline          | 2.07E+01                              | 1.52E-15                 | 2.65E-01        | 1.56E+00        | 1.56E+00        | 2.37E+01        | 1.21E-02        | 1.21E-02        | 2.37E+01        | 6.80E+00        | 78.31         |
| T-10              | Diesel                     | 1.53E-01                              | 7.72E-14                 | 0.00E+00        | 2.41E-01        | 2.41E-01        | 0.00E+00        | 3.69E-02        | 3.69E-02        | 1.80E+00        | 4.69E+00        | 7.21          |
| T-11              | Diesel                     | 1.40E-01                              | 7.07E-14                 | 0.00E+00        | 2.20E-01        | 2.20E-01        | 0.00E+00        | 3.38E-02        | 3.38E-02        | 1.65E+00        | 4.30E+00        | 6.60          |
| <b>Total HAPs</b> |                            | <b>6.99E+01</b>                       | <b>1.64E-13</b>          | <b>8.92E-01</b> | <b>5.74E+00</b> | <b>5.74E+00</b> | <b>7.98E+01</b> | <b>1.17E-01</b> | <b>1.17E-01</b> | <b>8.35E+01</b> | <b>3.26E+01</b> | <b>278.42</b> |
| <b>Max HAP</b>    |                            | <b>-</b>                              | <b>-</b>                 | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>8.35E+01</b> | <b>-</b>        | <b>-</b>      |

1. HAP emissions are calculated based on the HAP weight percent of the content of the tank.

**Table A-26e. Diesel and Gasoline Storage Tanks - HAP Emissions (tpy)**

| Tank ID           | Stock                      | HAP Emissions<br>(tpy) |                          |                 |                 |                 |                 |                 |                 |                 |                 |                 |
|-------------------|----------------------------|------------------------|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                   |                            | Benzene                | Benzo(g,h,i)p<br>erylene | Cumene          | Ethylbenzene    | Hexane          | Isooctane       | Naphthalene     | PAC's           | Toluene         | Xylene          | Total HAPs      |
| T-01              | Unleaded Gasoline (S32)    | 2.02E-03               | 1.49E-19                 | 2.59E-05        | 1.52E-04        | 1.52E-04        | 2.32E-03        | 1.18E-06        | 1.18E-06        | 2.32E-03        | 6.66E-04        | 7.67E-03        |
| T-02              | Diesel (Red Dyed S32)      | 3.20E-06               | 1.60E-18                 | 0.00E+00        | 5.03E-06        | 5.03E-06        | 0.00E+00        | 7.69E-07        | 7.69E-07        | 3.77E-05        | 9.81E-05        | 1.51E-04        |
| T-03              | Diesel (Red Dyed S32)      | 3.20E-06               | 1.60E-18                 | 0.00E+00        | 5.03E-06        | 5.03E-06        | 0.00E+00        | 7.69E-07        | 7.69E-07        | 3.77E-05        | 9.81E-05        | 1.51E-04        |
| T-04              | Diesel (Red Dyed Rummel)   | 3.98E-06               | 2.01E-18                 | 0.00E+00        | 6.27E-06        | 6.27E-06        | 0.00E+00        | 9.61E-07        | 9.61E-07        | 4.70E-05        | 1.22E-04        | 1.88E-04        |
| T-05              | Unleaded Gasoline (Rummel) | 1.76E-03               | 1.29E-19                 | 2.25E-05        | 1.32E-04        | 1.32E-04        | 2.01E-03        | 1.02E-06        | 1.02E-06        | 2.01E-03        | 5.78E-04        | 6.65E-03        |
| T-06              | Diesel (Rummel)            | 9.26E-07               | 4.61E-19                 | 0.00E+00        | 1.46E-06        | 1.46E-06        | 0.00E+00        | 2.23E-07        | 2.23E-07        | 1.09E-05        | 2.84E-05        | 4.36E-05        |
| T-07              | Unleaded Gasoline          | 1.03E-02               | 7.62E-19                 | 1.33E-04        | 7.78E-04        | 7.78E-04        | 1.19E-02        | 6.03E-06        | 6.03E-06        | 1.19E-02        | 3.40E-03        | 3.92E-02        |
| T-08              | Unleaded Gasoline          | 1.03E-02               | 7.62E-19                 | 1.33E-04        | 7.78E-04        | 7.78E-04        | 1.19E-02        | 6.03E-06        | 6.03E-06        | 1.19E-02        | 3.40E-03        | 3.92E-02        |
| T-09              | Unleaded Gasoline          | 1.03E-02               | 7.62E-19                 | 1.33E-04        | 7.78E-04        | 7.78E-04        | 1.19E-02        | 6.03E-06        | 6.03E-06        | 1.19E-02        | 3.40E-03        | 3.92E-02        |
| T-10              | Diesel                     | 7.64E-05               | 3.86E-17                 | 0.00E+00        | 1.20E-04        | 1.20E-04        | 0.00E+00        | 1.84E-05        | 1.84E-05        | 9.02E-04        | 2.35E-03        | 3.60E-03        |
| T-11              | Diesel                     | 7.00E-05               | 3.54E-17                 | 0.00E+00        | 1.10E-04        | 1.10E-04        | 0.00E+00        | 1.69E-05        | 1.69E-05        | 8.26E-04        | 2.15E-03        | 3.30E-03        |
| <b>Total HAPs</b> |                            | <b>3.50E-02</b>        | <b>8.22E-17</b>          | <b>4.46E-04</b> | <b>2.87E-03</b> | <b>2.87E-03</b> | <b>3.99E-02</b> | <b>5.84E-05</b> | <b>5.84E-05</b> | <b>4.17E-02</b> | <b>1.63E-02</b> | <b>1.39E-01</b> |
| <b>Max HAP</b>    |                            | <b>-</b>               | <b>-</b>                 | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>-</b>        | <b>4.17E-02</b> | <b>-</b>        | <b>-</b>        |

**Mine Development  
Process Tanks**

**Table A-27. South32 Hermosa Process Tanks Emission Summary**

| Tank           | Equipment Description        | CAS #      | Chemical                                                       | VOC? | HAP? | Pure Component Solubility Weight M (lb/lbmol) | Pure Component Vapor Pressure P (psia) | Henry's Law Solubility Constant H <sup>o</sup> <sub>v</sub> (Dimensionless) | Henry's Law Solubility Constant H <sup>o</sup> <sub>v</sub> (psi/mol% liq) | Liquid Mol% Liq. mol% (mol%liq) | Liquid Temperature T (°C) | Liquid Surface Area A (ft2) | Pure Component Mass Transfer Coefficient K (ft/hr) | Vapor Partial Pressure PP (psia) | Hourly Emission Rate <sup>1,2</sup> E (lb/hr) | Annual Emissions <sup>1,2</sup> E (annual) |          |
|----------------|------------------------------|------------|----------------------------------------------------------------|------|------|-----------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------|---------------------------|-----------------------------|----------------------------------------------------|----------------------------------|-----------------------------------------------|--------------------------------------------|----------|
|                |                              |            |                                                                |      |      |                                               |                                        |                                                                             |                                                                            |                                 |                           |                             |                                                    |                                  |                                               | (lb/yr)                                    | (tpy)    |
| 22310-FC-00001 | Lead Rougher                 | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 207.74                      | 98.03                                              | -                                | N/A                                           | 0.02                                       | 123.32   |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 2.63E-06                        | 301.54                    | 207.74                      | 54.97                                              | 3.82E-05                         | 0.00                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 1.16E-06                        | 301.54                    | 207.74                      | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 207.74                      | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 207.74                      | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-FC-00004 | Lead Rougher Scavenger       | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 207.74                      | 98.03                                              | -                                | N/A                                           | 0.02                                       | 121.38   |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 2.59E-06                        | 301.54                    | 207.74                      | 54.97                                              | 3.76E-05                         | 0.00                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 1.14E-06                        | 301.54                    | 207.74                      | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 207.74                      | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 207.74                      | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-FC-00008 | Lead Cleaner Scalper         | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 73.19                       | 98.03                                              | -                                | N/A                                           | 0.05                                       | 380.65   |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 2.30E-05                        | 301.54                    | 73.19                       | 54.97                                              | 3.34E-04                         | 0.00                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 1.01E-05                        | 301.54                    | 73.19                       | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 73.19                       | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 73.19                       | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-FC-00007 | Lead Cleaner                 | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 73.19                       | 98.03                                              | -                                | N/A                                           | 0.04                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 1.97E-05                        | 301.54                    | 73.19                       | 54.97                                              | 2.87E-04                         | 0.00                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 8.68E-06                        | 301.54                    | 73.19                       | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 73.19                       | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 73.19                       | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-FC-00009 | Lead Cleaner Scavenger       | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 73.19                       | 98.03                                              | -                                | N/A                                           | 0.04                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 1.84E-05                        | 301.54                    | 73.19                       | 54.97                                              | 2.67E-04                         | 0.00                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 8.08E-06                        | 301.54                    | 73.19                       | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 73.19                       | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 73.19                       | 61.19                                              | 0.00E+00                         | 0.00                                          | 0.00                                       | 0.00     |
| 22310-FC-00005 | Zinc Rougher                 | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 207.74                      | 98.03                                              | -                                | N/A                                           | 0.03                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 4.74E-06                        | 301.54                    | 207.74                      | 54.97                                              | 6.88E-05                         | 0.00                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 207.74                      | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 7.37E-06                        | 301.54                    | 207.74                      | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 2.35E-06                        | 301.54                    | 207.74                      | 61.19                                              | 4.27E-06                         | 1.38E-03                                      | 11.12                                      | 0.01     |
| 22310-FC-00006 | Zinc Rougher Scavenger       | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 207.74                      | 98.03                                              | -                                | N/A                                           | 0.03                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 4.63E-06                        | 301.54                    | 207.74                      | 54.97                                              | 6.72E-05                         | 0.00                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 207.74                      | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 7.21E-06                        | 301.54                    | 207.74                      | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 2.30E-06                        | 301.54                    | 207.74                      | 61.19                                              | 4.17E-06                         | 1.35E-03                                      | 10.87                                      | 0.01     |
| 22310-FC-00011 | Zinc Cleaner Scalper         | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 124.86                      | 98.03                                              | -                                | N/A                                           | 0.03                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 8.12E-06                        | 301.54                    | 124.86                      | 54.97                                              | 1.18E-04                         | 0.03                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 124.86                      | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 1.26E-05                        | 301.54                    | 124.86                      | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 4.03E-06                        | 301.54                    | 124.86                      | 61.19                                              | 7.32E-06                         | 1.42E-03                                      | 11.47                                      | 0.01     |
| 22310-FC-00010 | Zinc Cleaner                 | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 124.86                      | 98.03                                              | -                                | N/A                                           | 0.03                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 6.88E-06                        | 301.54                    | 124.86                      | 54.97                                              | 1.00E-04                         | 0.02                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 124.86                      | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 1.07E-05                        | 301.54                    | 124.86                      | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 3.42E-06                        | 301.54                    | 124.86                      | 61.19                                              | 6.20E-06                         | 1.21E-03                                      | 9.71                                       | 4.88E-03 |
| 22310-FC-00012 | Zinc Cleaner Scavenger       | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 124.86                      | 98.03                                              | -                                | N/A                                           | 0.03                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 6.41E-06                        | 301.54                    | 124.86                      | 54.97                                              | 9.31E-05                         | 0.02                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 124.86                      | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 9.97E-06                        | 301.54                    | 124.86                      | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 3.18E-06                        | 301.54                    | 124.86                      | 61.19                                              | 5.77E-06                         | 1.12E-03                                      | 9.04                                       | 4.52E-03 |
| 22430-TN-00001 | Lead Concentrate Tank        | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 1,017.00                    | 98.03                                              | -                                | N/A                                           | 1.47                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 5.14E-05                        | 301.54                    | 1,017.00                    | 54.97                                              | 7.47E-04                         | 1.47                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 4.72E-06                        | 301.54                    | 1,017.00                    | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 2.93E-05                        | 301.54                    | 1,017.00                    | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 9.33E-06                        | 301.54                    | 1,017.00                    | 61.19                                              | 1.69E-05                         | 0.03                                          | N/A                                        | N/A      |
| 22430-TN-00002 | Zinc Concentrate Tank        | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 1,257.00                    | 98.03                                              | -                                | N/A                                           | 1.85                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 5.26E-05                        | 301.54                    | 1,257.00                    | 54.97                                              | 7.64E-04                         | 1.85                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 4.82E-06                        | 301.54                    | 1,257.00                    | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 2.99E-05                        | 301.54                    | 1,257.00                    | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 9.53E-06                        | 301.54                    | 1,257.00                    | 61.19                                              | 1.73E-05                         | 0.03                                          | N/A                                        | N/A      |
| 22310-TN-00003 | Lead Conditioning Tank       | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 294.07                      | 98.03                                              | -                                | N/A                                           | 0.03                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 1.52E-05                        | 301.54                    | 294.07                      | 54.97                                              | 2.21E-04                         | 0.13                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 3.99E-06                        | 301.54                    | 294.07                      | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 86329-09-1 | Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester | Yes  | No   | 173.28                                        | 1.07E-03                               | -                                                                           | -                                                                          | 0.00E+00                        | 301.54                    | 294.07                      | 46.10                                              | -                                | N/A                                           | N/A                                        | N/A      |
|                |                              | 78-83-1    | 1-Propanol, 2-methyl-                                          | Yes  | No   | 74.12                                         | 3.51E-01                               | 8.99E-05                                                                    | 1.81E+00                                                                   | 0.00E+00                        | 301.54                    | 294.07                      | 61.19                                              | 0.00E+00                         | 0.00                                          | N/A                                        | N/A      |
| 22310-TN-00001 | Zinc Conditioning Tank No. 1 | 7732-18-5  | Water                                                          | No   | No   | 18.02                                         | 5.66E-01                               | -                                                                           | -                                                                          | 1.00E+00                        | 301.54                    | 330.06                      | 98.03                                              | -                                | N/A                                           | 0.00                                       | N/A      |
|                |                              | 108-11-2   | Methyl Isobutyl Carbinol                                       | Yes  | No   | 102.20                                        | 6.77E-02                               | 7.20E-04                                                                    | 1.45E+01                                                                   | 7.27E-06                        | 301.54                    | 330.06                      | 54.97                                              | 1.06E-04                         | 0.07                                          | N/A                                        | N/A      |
|                |                              | 13360-78-6 | sodium diisobutylidithiophosphinate                            | Yes  | No   | 232.32                                        | 4.37E-01                               | -                                                                           | -                                                                          | 1.33E-06                        | 301.54                    | 330.06                      | 41.81                                              | -                                | N/A                                           | N/A                                        | N/A      |



Process Tank Emission Calculation Notes

|                                                                                                 |                                                                   |                                                           |  |
|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------|--|
| Emission Factors calculated using:                                                              |                                                                   |                                                           |  |
| Ref: Section 3.7.1 - Evaporation from an Open Top Vessel or a Spill                             |                                                                   |                                                           |  |
| Methods for Estimating Air Emissions from Chemical Manufacturing Facilities, Vol. II Chapter 16 |                                                                   |                                                           |  |
| STAPPA/ALAPCO/EPA EIIP, August 2007                                                             |                                                                   |                                                           |  |
| E                                                                                               | Hourly or Annual Emission Rate, lb/hr or lb/yr <sup>3</sup>       | = (M K A P) / (R T)                                       |  |
| M                                                                                               | Molecular Weight, lb/lb-mol                                       | See Table                                                 |  |
| K                                                                                               | Mass Transfer Coefficient, ft/hr <sup>4</sup>                     | = $K_0 (M_0/M)^{1/3}$                                     |  |
| K <sub>0</sub>                                                                                  | Reference Mass Transfer Coefficient of Water, ft/hr               | 0.83                                                      |  |
| M <sub>0</sub>                                                                                  | Molecular Weight of Water, lb/lb-mol                              | 18.02                                                     |  |
| A                                                                                               | Liquid Surface Area, ft <sup>2</sup>                              | See Table                                                 |  |
| P                                                                                               | Vapor Pressure, psia                                              | See Table                                                 |  |
| T                                                                                               | Liquid temperature, °R <sup>5</sup>                               | 542.77                                                    |  |
| R                                                                                               | Ideal Gas Constant, Psia-ft <sup>3</sup> /lb-mole °R <sup>6</sup> | 10.73159                                                  |  |
| H                                                                                               | Annual Hours of Operations, hrs/yr <sup>7</sup>                   | 8060                                                      |  |
| H <sup>solv</sup> <sub>v</sub>                                                                  | Henry's Law Volatility Constant, psi/(mol%) <sub>8</sub>          | = $H^{soln}_v \times R \times T \times d(soln) / M(soln)$ |  |
| pp <sup>9</sup> <sub>v</sub>                                                                    | Gas Partial Pressure using Henry's Law Constant, psi              | = Lq Mol% * H <sup>soln</sup> <sub>v</sub>                |  |
| H <sup>soln</sup> <sub>v</sub>                                                                  | Henry's Law Volatility Constant, Dimensionless <sup>9</sup>       | See Table                                                 |  |
| M(soln)                                                                                         | Mol. Wt. of Solvent, lb/lb-mol <sup>10</sup>                      | 18.02                                                     |  |
| d(soln)                                                                                         | Density of Solvent, lb/ft <sup>3</sup> <sup>10</sup>              | 62.42721972                                               |  |

1. 100% Safety factor added while calculating emission rate to account for any atomization from material movement at the surface, such as spraying
2. Emissions from low volatile compounds (sodium diisobutylthiophosphinate & Carbamothioic acid, N-2-propen-1-yl-, O-(2-methylpropyl) ester) assumed to be negligible.
3. EIIP, Vol. II, Ch. 16, Eq. 3-24
4. EIIP, Vol. II, Ch. 16, Eq. 3-27
5. For conservative estimate - Hourly Average Max. Ambient Temperature for Tucson, AZ. As per AP 42 Section 7.1, Table 7.1-7 (Jun, 2020) is used
6. Table 1-9 Perry's Chemical Engineers' Handbook, 6th ed.
7. Provided by South32.
8. Referenced from <https://www.degruyter.com/document/doi/10.1515/pac-2020-0302/html?lang=en>
9. Referenced from Toxchem 4.4 Mar-25-2019
10. Assume as water

**Mine Development  
UG Taylor Roads - Inputs**

**Table A-28. Taylor Emission Factor Inputs**

| Road Surface | Max Miles Traveled Per Unit |        |      | Vehicle Type                               | Vehicle Model       | Max Vehicle Count | Particulate Matter Emission Factor Inputs <sup>1</sup> |                  |                   |         |        |     |           |     |                  |                   |      |                  |                   |
|--------------|-----------------------------|--------|------|--------------------------------------------|---------------------|-------------------|--------------------------------------------------------|------------------|-------------------|---------|--------|-----|-----------|-----|------------------|-------------------|------|------------------|-------------------|
|              | Day                         | Month  | Year |                                            |                     |                   | k                                                      |                  |                   | Avg. W  |        | s   | P         | a   |                  |                   | b    |                  |                   |
|              |                             |        |      |                                            |                     |                   | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | (kg)    | (ton)  | (%) | (days/vr) | PM  | PM <sub>10</sub> | PM <sub>2.5</sub> | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> |
| Unpaved      | 2                           | 60.83  | 730  | Dev Drill Rig                              | DD422i              | 3                 | 4.9                                                    | 1.5              | 0.15              | 26,000  | 28.66  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Support Drill Rig                          | DS412i              | 5                 | 4.9                                                    | 1.5              | 0.15              | 29,000  | 31.97  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Cable bolter                               | DS421               | 2                 | 4.9                                                    | 1.5              | 0.15              | 25,000  | 27.56  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | LHD (LH517i)                               | LH517i              | 2                 | 4.9                                                    | 1.5              | 0.15              | 46,500  | 51.26  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 20                          | 608.33 | 7300 | Haul Truck                                 | TH551i              | 4                 | 4.9                                                    | 1.5              | 0.15              | 97,870  | 107.88 | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Scissor lift                               | Utilift MF 540      | 2                 | 4.9                                                    | 1.5              | 0.15              | 13,100  | 14.44  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Light vehicle (general usage) Fleet 1      | Mahindra Roxor      | 2                 | 4.9                                                    | 1.5              | 0.15              | 1,678   | 1.85   | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Charging Rig Fleet 1                       | Charmec MF 605 D(V) | 2                 | 4.9                                                    | 1.5              | 0.15              | 14,600  | 16.09  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 1                           | 30.42  | 365  | LH Rigs                                    | DL422i              | 6                 | 4.9                                                    | 1.5              | 0.15              | 22,000  | 24.25  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 1                           | 30.42  | 365  | LH Rig (Ore Passes/Geo)                    | DL422i              | 1                 | 4.9                                                    | 1.5              | 0.15              | 22,000  | 24.25  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | LHD (LH518B)                               | LH518B              | 5                 | 4.9                                                    | 1.5              | 0.15              | 70,000  | 77.16  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 20                          | 608.33 | 7300 | Haul Trucks (Haul Loop)                    | TH663i              | 3                 | 4.9                                                    | 1.5              | 0.15              | 111,440 | 122.84 | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 20                          | 608.33 | 7300 | Haul Trucks                                | TH663i              | 5                 | 4.9                                                    | 1.5              | 0.15              | 111,440 | 122.84 | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Material transporter                       | Multimec MF100      | 2                 | 4.9                                                    | 1.5              | 0.15              | 22,200  | 24.47  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 4                           | 121.67 | 1460 | Light vehicle (general usage) Fleet 2      | Mahindra Roxor      | 2                 | 4.9                                                    | 1.5              | 0.15              | 1,678   | 1.85   | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Charging Rig Fleet 2                       | Charmec MF 605 D(V) | 2                 | 4.9                                                    | 1.5              | 0.15              | 14,600  | 16.09  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Personnel transporter                      | Utimec MF 205 PER   | 3                 | 4.9                                                    | 1.5              | 0.15              | 15,200  | 16.76  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Shotcreter                                 | Sprymec MF 050 D(V) | 2                 | 4.9                                                    | 1.5              | 0.15              | 18,000  | 19.84  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 16                          | 486.67 | 5840 | Transmixer                                 | Utimec MF 500       | 4                 | 4.9                                                    | 1.5              | 0.15              | 22,200  | 24.47  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Water vehicle                              | MF 350 Water        | 2                 | 4.9                                                    | 1.5              | 0.15              | 15,700  | 17.31  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 0.0027                      | 0.08   | 1    | Mobile rockbreaker                         | Maclean RB3         | 3                 | 4.9                                                    | 1.5              | 0.15              | 17,700  | 19.51  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Grader                                     | Maclean GRS         | 2                 | 4.9                                                    | 1.5              | 0.15              | 18,200  | 20.06  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 1                           | 30.42  | 365  | Skid Steer                                 | Manitou 4200 V      | 3                 | 4.9                                                    | 1.5              | 0.15              | 5,291   | 5.83   | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Light vehicle (tech services)              | Mahindra Roxor      | 4                 | 4.9                                                    | 1.5              | 0.15              | 1,678   | 1.85   | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Material transporter (logistics/Construct) | Multimec MF100      | 2                 | 4.9                                                    | 1.5              | 0.15              | 22,200  | 24.47  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 6                           | 182.50 | 2190 | Scissor lift (Construction)                | Utilift MF 540      | 2                 | 4.9                                                    | 1.5              | 0.15              | 13,100  | 14.44  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 2                           | 60.83  | 730  | Telehandler                                | GTH - 1056          | 3                 | 4.9                                                    | 1.5              | 0.15              | 14,470  | 15.95  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 4                           | 121.67 | 1460 | Maintenance Vehicle                        | Maclean FL3         | 3                 | 4.9                                                    | 1.5              | 0.15              | 33,000  | 36.38  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 8                           | 243.33 | 2920 | Fuel/Lube vehicle                          | Maclean FL3         | 2                 | 4.9                                                    | 1.5              | 0.15              | 33,000  | 36.38  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 0.1                         | 3.04   | 36.5 | Mobile Grapple equipment                   | Brokk 900           | 3                 | 4.9                                                    | 1.5              | 0.15              | 11,600  | 12.79  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |
| Unpaved      | 1                           | 30.42  | 365  | Blind Bore Machine                         | Rhino               | 2                 | 4.9                                                    | 1.5              | 0.15              | 52,000  | 57.32  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |

<sup>1</sup> Emission factors for vehicular traffic on unpaved roads per U.S. EPA AP-42, Section 13.2.2 (Unpaved Roads), November 2006.

Short-Term  $E = k (s/12)^a (W/3)^b$

(1a)

Annual  $E_{\text{tot}} = E [(365 - P)/365]$

(2)

where E = Size-specific emission factor (lb/VMt)

k, a, b = Constants for equation 1a

|          |                  |                   |
|----------|------------------|-------------------|
| PM       | PM <sub>10</sub> | PM <sub>2.5</sub> |
| k = 4.9  | 1.5              | 0.15              |
| a = 0.7  | 0.9              | 0.9               |
| b = 0.45 | 0.45             | 0.45              |

Per AP-42 Table 13.2.2-2, November 2006

s = surface material silt content (%), per AP-42 Table 13.2.2-1, 11/06, Western surface coal mining Plant Road

5.1

W = Mean vehicle weight (tons)

P = Days per year with at least 0.01 inch precipitation, based on precipitation data from 2019-2021 for Hermosa Trench Met Station, using the lowest annual value between 2019-2021.

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**Mine Development  
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**Table A-29. Taylor Underground Roads - Emission Factors**

| Road Surface | Vehicle Type                               | Averaging Period | Emission Factor <sup>1</sup> |                  |                   |        | Process Rate Unit | Particulate Matter Emission Factor Inputs <sup>1</sup> |      |      |        |      |       |      |      |      |      |      |      | Reference                                                                                           |
|--------------|--------------------------------------------|------------------|------------------------------|------------------|-------------------|--------|-------------------|--------------------------------------------------------|------|------|--------|------|-------|------|------|------|------|------|------|-----------------------------------------------------------------------------------------------------|
|              |                                            |                  | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Unit   |                   | k                                                      | W    | s    | P      | a    | b     |      |      |      |      |      |      |                                                                                                     |
| Unpaved      | Dev Drill Rig                              | Hourly/Daily     | 7.43                         | 1.92             | 0.19              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 28.66  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 | AP-42, Section 13.2.2, Expression 1a (11/06)<br>AP-42, Section 13.2.2, Expressions 1a and 2 (11/06) |
| Unpaved      | Dev Drill Rig                              | Annual           | 6.17                         | 1.59             | 0.16              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Support Drill Rig                          | Hourly/Daily     | 7.81                         | 2.01             | 0.20              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 31.97  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Support Drill Rig                          | Annual           | 6.48                         | 1.67             | 0.17              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Cable bolter                               | Hourly/Daily     | 7.30                         | 1.88             | 0.19              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 27.56  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Cable bolter                               | Annual           | 6.06                         | 1.56             | 0.16              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | LHD (LH517)                                | Hourly/Daily     | 9.66                         | 2.49             | 0.25              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 51.26  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | LHD (LH517)                                | Annual           | 8.02                         | 2.07             | 0.21              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Haul Truck                                 | Hourly/Daily     | 13.50                        | 3.48             | 0.35              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 107.88 | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Haul Truck                                 | Annual           | 11.20                        | 2.89             | 0.29              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Scissor lift                               | Hourly/Daily     | 5.46                         | 1.41             | 0.14              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 14.44  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Scissor lift                               | Annual           | 4.53                         | 1.17             | 0.12              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Light vehicle (general usage) Fleet 1      | Hourly/Daily     | 2.17                         | 0.56             | 0.06              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 1.85   | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Light vehicle (general usage) Fleet 1      | Annual           | 1.80                         | 0.46             | 0.05              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Charging Rig Fleet 1                       | Hourly/Daily     | 5.73                         | 1.48             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 16.09  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Charging Rig Fleet 1                       | Annual           | 4.76                         | 1.23             | 0.12              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | LH Rigs                                    | Hourly/Daily     | 6.89                         | 1.78             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 24.25  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | LH Rigs                                    | Annual           | 5.72                         | 1.48             | 0.15              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | LH Rig (Ore Passes/Geo)                    | Hourly/Daily     | 6.89                         | 1.78             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 24.25  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | LH Rig (Ore Passes/Geo)                    | Annual           | 5.72                         | 1.48             | 0.15              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | LHD (LH518B)                               | Hourly/Daily     | 11.61                        | 2.99             | 0.30              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 77.16  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | LHD (LH518B)                               | Annual           | 9.63                         | 2.49             | 0.25              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Haul Trucks (Haul Loop)                    | Hourly/Daily     | 14.31                        | 3.69             | 0.37              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 122.84 | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Haul Trucks (Haul Loop)                    | Annual           | 11.88                        | 3.06             | 0.31              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Haul Trucks                                | Hourly/Daily     | 14.31                        | 3.69             | 0.37              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 122.84 | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Haul Trucks                                | Annual           | 11.88                        | 3.06             | 0.31              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Material transporter                       | Hourly/Daily     | 6.92                         | 1.79             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 24.47  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Material transporter                       | Annual           | 5.75                         | 1.48             | 0.15              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Light vehicle (general usage) Fleet 2      | Hourly/Daily     | 2.17                         | 0.56             | 0.06              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 1.85   | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Light vehicle (general usage) Fleet 2      | Annual           | 1.80                         | 0.46             | 0.05              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Charging Rig Fleet 2                       | Hourly/Daily     | 5.73                         | 1.48             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 16.09  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Charging Rig Fleet 2                       | Annual           | 4.76                         | 1.23             | 0.12              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Personnel transporter                      | Hourly/Daily     | 5.84                         | 1.51             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 16.76  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Personnel transporter                      | Annual           | 4.85                         | 1.25             | 0.13              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Shotcrete                                  | Hourly/Daily     | 6.30                         | 1.62             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 19.84  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Shotcrete                                  | Annual           | 5.23                         | 1.35             | 0.13              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Transmixer                                 | Hourly/Daily     | 6.92                         | 1.79             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 24.47  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Transmixer                                 | Annual           | 5.75                         | 1.48             | 0.15              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Water vehicle                              | Hourly/Daily     | 5.92                         | 1.53             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 17.31  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Water vehicle                              | Annual           | 4.92                         | 1.27             | 0.13              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Mobile rockbreaker                         | Hourly/Daily     | 6.25                         | 1.61             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 19.51  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Mobile rockbreaker                         | Annual           | 5.19                         | 1.34             | 0.13              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Grader                                     | Hourly/Daily     | 6.33                         | 1.63             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 20.06  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Grader                                     | Annual           | 5.26                         | 1.36             | 0.14              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Skid Steer                                 | Hourly/Daily     | 3.63                         | 0.94             | 0.09              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 5.83   | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Skid Steer                                 | Annual           | 3.01                         | 0.78             | 0.08              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Light vehicle (tech services)              | Hourly/Daily     | 2.17                         | 0.56             | 0.06              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 1.85   | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Light vehicle (tech services)              | Annual           | 1.80                         | 0.46             | 0.05              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Material transporter (logistics/Construct) | Hourly/Daily     | 6.92                         | 1.79             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 24.47  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Material transporter (logistics/Construct) | Annual           | 5.75                         | 1.48             | 0.15              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Scissor lift (Construction)                | Hourly/Daily     | 5.46                         | 1.41             | 0.14              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 14.44  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Scissor lift (Construction)                | Annual           | 4.53                         | 1.17             | 0.12              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Telehandler                                | Hourly/Daily     | 5.71                         | 1.47             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 15.95  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Telehandler                                | Annual           | 4.74                         | 1.22             | 0.12              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Maintenance Vehicle                        | Hourly/Daily     | 8.27                         | 2.13             | 0.21              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 36.38  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Maintenance Vehicle                        | Annual           | 6.87                         | 1.77             | 0.18              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Fuel/Lube vehicle                          | Hourly/Daily     | 8.27                         | 2.13             | 0.21              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 36.38  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Fuel/Lube vehicle                          | Annual           | 6.87                         | 1.77             | 0.18              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Mobile Grapple equipment                   | Hourly/Daily     | 5.17                         | 1.33             | 0.13              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 12.79  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Mobile Grapple equipment                   | Annual           | 4.29                         | 1.11             | 0.11              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |
| Unpaved      | Blind Bore Machine                         | Hourly/Daily     | 10.15                        | 2.62             | 0.26              | lb/VMT | VMT               | 4.90                                                   | 1.50 | 0.15 | 57.32  | 5.10 | 62.00 | 0.70 | 0.90 | 0.90 | 0.45 | 0.45 | 0.45 |                                                                                                     |
| Unpaved      | Blind Bore Machine                         | Annual           | 8.43                         | 2.17             | 0.22              | lb/VMT | VMT               | -                                                      | -    | -    | -      | -    | 62.00 | -    | -    | -    | -    | -    | -    |                                                                                                     |

<sup>1</sup> Emission factors for vehicular traffic on unpaved roads per 11/06 EPA AP-42, Section 13.2.2 (Innervated Roads), November 2006.

$$\text{Short-Term } E = k \left( \frac{W}{12} \right)^{0.75} \left( \frac{W}{3} \right)^{0.75} \quad (1a)$$

$$\text{Annual } E_{\text{est}} = E [(365 - P)/365] \quad (2)$$

where E = Size-specific emission factor (lb/VMT) (Per AP-42 Table 13.2.2-2, November 2006)

k, a, b = Constants for equation 1a

k = 4.9 1.5 0.15

a = 0.7 0.9 0.9

b = 0.45 0.45 0.45

s = surface material silt content (%) (Silt content assumed as to be similar to Plant Road in Western Surface Coal Mining in AP-42, Section 13.2.4 (11/2006) per conversation with AMI, 10/14/22)

5.1

W = Mean vehicle weight (tons)

P = 62 Days per year with at least 0.01 inch precipitation, based on precipitation data from 2019-2021 for Hermosa Trench Met Station, using the lowest annual value between 2019-2021.

Mine Development  
UG Taylor Roads Emissions

Table A-30a. Taylor Roads - Vehicles - Input Parameters

| Road Surface | Vehicle Type                               | Trip Type | Number of Vehicles | Trip Distance (miles/vehicle/day) | Vehicle Miles Travelled (VMT) |           |          | Uncontrolled Emission Factor (lb/VMT) |                   |                   |                  |                   |                   | Control  |                               |
|--------------|--------------------------------------------|-----------|--------------------|-----------------------------------|-------------------------------|-----------|----------|---------------------------------------|-------------------|-------------------|------------------|-------------------|-------------------|----------|-------------------------------|
|              |                                            |           |                    |                                   |                               |           |          | Short Term                            |                   |                   | Long Term        |                   |                   | Type     | Efficiency <sup>1,2</sup> (%) |
|              |                                            |           |                    |                                   | (VMT/hr)                      | (VMT/day) | (VMT/yr) | PM <sub>10</sub>                      | PM <sub>2.5</sub> | PM <sub>2.5</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | PM <sub>2.5</sub> |          |                               |
| Unpaved      | Dev Drill Rig                              | Round     | 3                  | 2                                 | 0.250                         | 6.00      | 2,190    | 7.43                                  | 1.52              | 0.19              | 6.17             | 1.58              | 0.16              | Watering | 90%                           |
| Unpaved      | Support Drill Rig                          | Round     | 5                  | 2                                 | 0.417                         | 10.00     | 3,650    | 7.81                                  | 2.01              | 0.20              | 6.48             | 1.67              | 0.17              | Watering | 90%                           |
| Unpaved      | Cable bolter                               | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 7.30                                  | 1.88              | 0.19              | 6.06             | 1.56              | 0.16              | Watering | 90%                           |
| Unpaved      | LHD (LH512)                                | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 9.66                                  | 2.49              | 0.25              | 8.02             | 2.07              | 0.21              | Watering | 90%                           |
| Unpaved      | Haul Truck                                 | Round     | 4                  | 20                                | 3.333                         | 80.00     | 29,200   | 13.50                                 | 3.48              | 0.35              | 11.20            | 2.89              | 0.29              | Watering | 90%                           |
| Unpaved      | Scissor lift                               | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 5.46                                  | 1.41              | 0.14              | 4.53             | 1.17              | 0.12              | Watering | 90%                           |
| Unpaved      | Light vehicle (general usage) Fleet 1      | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 5.73                                  | 1.48              | 0.15              | 4.76             | 1.23              | 0.12              | Watering | 90%                           |
| Unpaved      | Chaining Rig Fleet 1                       | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 5.73                                  | 1.48              | 0.15              | 4.76             | 1.23              | 0.12              | Watering | 90%                           |
| Unpaved      | LH Rig                                     | Round     | 6                  | 1                                 | 0.250                         | 6.00      | 2,190    | 6.89                                  | 1.78              | 0.18              | 5.72             | 1.48              | 0.15              | Watering | 90%                           |
| Unpaved      | LH Rig (One Passes/Geo)                    | Round     | 1                  | 1                                 | 0.042                         | 1.00      | 365      | 6.89                                  | 1.78              | 0.18              | 5.72             | 1.48              | 0.15              | Watering | 90%                           |
| Unpaved      | LHD (LH518B)                               | Round     | 5                  | 2                                 | 0.417                         | 10.00     | 3,650    | 11.61                                 | 2.99              | 0.30              | 9.63             | 2.49              | 0.25              | Watering | 90%                           |
| Unpaved      | Haul Trucks (Haul Loco)                    | Round     | 3                  | 20                                | 2.500                         | 60.00     | 21,900   | 14.31                                 | 3.69              | 0.37              | 11.88            | 3.06              | 0.31              | Watering | 90%                           |
| Unpaved      | Haul Trucks                                | Round     | 5                  | 20                                | 4.167                         | 100.00    | 36,500   | 14.31                                 | 3.69              | 0.37              | 11.88            | 3.06              | 0.31              | Watering | 90%                           |
| Unpaved      | Material transporter                       | Round     | 2                  | 4                                 | 0.500                         | 12.00     | 4,380    | 6.92                                  | 1.79              | 0.18              | 5.75             | 1.48              | 0.15              | Watering | 90%                           |
| Unpaved      | Light vehicle (general usage) Fleet 2      | Round     | 2                  | 4                                 | 0.333                         | 8.00      | 2,920    | 2.17                                  | 0.56              | 0.06              | 1.80             | 0.46              | 0.05              | Watering | 90%                           |
| Unpaved      | Chaining Rig Fleet 2                       | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 5.73                                  | 1.48              | 0.15              | 4.76             | 1.23              | 0.12              | Watering | 90%                           |
| Unpaved      | Personnel transporter                      | Round     | 3                  | 6                                 | 0.750                         | 18.00     | 6,570    | 5.84                                  | 1.51              | 0.15              | 4.85             | 1.25              | 0.13              | Watering | 90%                           |
| Unpaved      | Shotcreter                                 | Round     | 2                  | 2                                 | 0.167                         | 4.00      | 1,460    | 6.30                                  | 1.62              | 0.16              | 5.23             | 1.35              | 0.13              | Watering | 90%                           |
| Unpaved      | Tramixer                                   | Round     | 4                  | 16                                | 2.667                         | 64.00     | 23,360   | 6.92                                  | 1.79              | 0.18              | 5.72             | 1.48              | 0.15              | Watering | 90%                           |
| Unpaved      | Water vehicle                              | Round     | 2                  | 6                                 | 0.500                         | 12.00     | 4,380    | 5.92                                  | 1.53              | 0.15              | 4.92             | 1.25              | 0.13              | Watering | 90%                           |
| Unpaved      | Mobile rockbreaker                         | Round     | 3                  | 0.0027                            | 0.0034                        | 0.01      | 3        | 6.25                                  | 1.61              | 0.16              | 5.19             | 1.34              | 0.13              | Watering | 90%                           |
| Unpaved      | Grader                                     | Round     | 2                  | 6                                 | 0.500                         | 12.00     | 4,380    | 6.33                                  | 1.63              | 0.16              | 5.26             | 1.36              | 0.14              | Watering | 90%                           |
| Unpaved      | Skid Steer                                 | Round     | 3                  | 1                                 | 0.125                         | 3.00      | 1,095    | 3.63                                  | 0.94              | 0.09              | 3.01             | 0.78              | 0.08              | Watering | 90%                           |
| Unpaved      | Light vehicle (tech services)              | Round     | 4                  | 2                                 | 0.333                         | 8.00      | 2,920    | 2.17                                  | 0.56              | 0.06              | 1.80             | 0.46              | 0.05              | Watering | 90%                           |
| Unpaved      | Material transporter (logistics/construct) | Round     | 2                  | 6                                 | 0.500                         | 12.00     | 4,380    | 6.92                                  | 1.79              | 0.18              | 5.75             | 1.48              | 0.15              | Watering | 90%                           |
| Unpaved      | Scissor lift (Construction)                | Round     | 2                  | 6                                 | 0.500                         | 12.00     | 4,380    | 5.46                                  | 1.41              | 0.14              | 4.53             | 1.17              | 0.12              | Watering | 90%                           |
| Unpaved      | Telehandler                                | Round     | 2                  | 2                                 | 0.250                         | 6.00      | 2,190    | 5.71                                  | 1.47              | 0.15              | 4.74             | 1.22              | 0.12              | Watering | 90%                           |
| Unpaved      | Maintenance Vehicle                        | Round     | 3                  | 4                                 | 0.500                         | 12.00     | 4,380    | 8.27                                  | 2.13              | 0.21              | 6.87             | 1.77              | 0.18              | Watering | 90%                           |
| Unpaved      | Fuel/Lube vehicle                          | Round     | 2                  | 8                                 | 0.667                         | 16.00     | 5,840    | 8.27                                  | 2.13              | 0.21              | 6.87             | 1.77              | 0.18              | Watering | 90%                           |
| Unpaved      | Mobile Granite equipment                   | Round     | 3                  | 0.1                               | 0.011                         | 0.30      | 110      | 5.17                                  | 1.33              | 0.13              | 4.29             | 1.11              | 0.11              | Watering | 90%                           |
| Unpaved      | Blind Bore Machine                         | Round     | 2                  | 1                                 | 0.083                         | 2.00      | 730      | 10.15                                 | 2.62              | 0.26              | 8.43             | 2.17              | 0.22              | Watering | 90%                           |

1. Road Watering is not contemplated every hour, but only as needed to maintain control levels.

2. At South32, the roads will be watered sufficiently to achieve a control efficiency of 90%  
Lead Content = 3.54E-03 kg/kg

Mine Development  
UG Taylor Roads Emissions

Table A-30b. Taylor Roads -Vehicles - Emissions

| Vehicle Type                                  | Road Surface | Uncontrolled Emissions         |                  |                   |             |                                |                  |                   |              |                              |                  |                   |             | Controlled Emissions           |                  |                   |                  |                                |                  |                   |                  |                           |                  |                   |                 |          |
|-----------------------------------------------|--------------|--------------------------------|------------------|-------------------|-------------|--------------------------------|------------------|-------------------|--------------|------------------------------|------------------|-------------------|-------------|--------------------------------|------------------|-------------------|------------------|--------------------------------|------------------|-------------------|------------------|---------------------------|------------------|-------------------|-----------------|----------|
|                                               |              | Hourly<br>(lb/hr) <sup>1</sup> |                  |                   |             | Daily<br>(lb/day) <sup>1</sup> |                  |                   |              | Annual<br>(tpy) <sup>2</sup> |                  |                   |             | Hourly<br>(lb/hr) <sup>1</sup> |                  |                   |                  | Daily<br>(lb/day) <sup>2</sup> |                  |                   |                  | Annual (tpy) <sup>2</sup> |                  |                   |                 |          |
|                                               |              | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead        | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead         | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead        | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead             | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead             | PM                        | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead            |          |
| Dev Drill Rig                                 | Unpaved      | 1.86                           | 0.48             | 0.05              | 6.58E-03    | 44.60                          | 11.50            | 1.15              | 0.16         | 6.76                         | 1.74             | 0.17              | 0.02        | 0.19                           | 0.05             | 0.00              | 6.58E-04         | 4.46                           | 1.15             | 0.12              | 1.58E-02         | 0.68                      | 0.17             | 0.02              | 2.38E-03        |          |
| Support Drill Rig                             | Unpaved      | 3.25                           | 0.84             | 0.08              | 0.01        | 78.07                          | 20.14            | 2.01              | 0.28         | 11.83                        | 3.05             | 0.31              | 0.04        | 0.33                           | 0.08             | 0.01              | 1.15E-03         | 7.81                           | 2.01             | 0.20              | 2.76E-02         | 1.18                      | 0.31             | 0.03              | 4.19E-03        |          |
| Cable boiler                                  | Unpaved      | 1.22                           | 0.31             | 0.03              | 4.31E-03    | 29.21                          | 7.54             | 0.75              | 0.10         | 4.43                         | 1.14             | 0.11              | 0.02        | 0.12                           | 0.03             | 0.00              | 4.31E-04         | 2.92                           | 0.75             | 0.08              | 1.03E-02         | 0.44                      | 0.11             | 0.01              | 1.57E-03        |          |
| ULD (LHS/7)                                   | Unpaved      | 1.61                           | 0.42             | 0.04              | 5.70E-03    | 38.61                          | 9.96             | 1.00              | 0.14         | 5.85                         | 1.51             | 0.15              | 0.02        | 0.16                           | 0.04             | 0.00              | 5.70E-04         | 3.86                           | 1.00             | 0.10              | 1.37E-02         | 0.59                      | 0.15             | 0.02              | 2.07E-03        |          |
| Haul Truck                                    | Unpaved      | 44.99                          | 11.60            | 1.16              | 0.16        | 1079.65                        | 278.52           | 27.85             | 3.82         | 163.57                       | 42.30            | 4.22              | 0.58        | 4.50                           | 1.16             | 0.12              | 1.59E-02         | 107.96                         | 27.85            | 2.79              | 3.82E-01         | 16.36                     | 4.22             | 0.42              | 5.79E-02        |          |
| Scissor lift                                  | Unpaved      | 0.91                           | 0.23             | 0.02              | 3.22E-03    | 21.84                          | 5.63             | 0.56              | 0.08         | 3.31                         | 0.85             | 0.09              | 0.01        | 0.09                           | 0.02             | 0.00              | 3.22E-04         | 2.18                           | 0.56             | 0.05              | 7.73E-03         | 0.33                      | 0.09             | 0.01              | 1.17E-03        |          |
| Light vehicle (general usage)                 | Unpaved      | 0.36                           | 0.09             | 0.01              | 1.28E-03    | 8.66                           | 2.23             | 0.22              | 0.03         | 1.31                         | 0.34             | 0.03              | 4.65E-03    | 0.04                           | 0.01             | 0.00              | 1.28E-04         | 0.87                           | 0.22             | 0.02              | 3.67E-03         | 0.13                      | 0.03             | 0.00              | 4.69E-04        |          |
| Fleet 1                                       | Unpaved      | 0.96                           | 0.25             | 0.02              | 3.38E-03    | 22.93                          | 5.92             | 0.59              | 0.08         | 3.47                         | 0.90             | 0.09              | 0.01        | 0.10                           | 0.02             | 0.00              | 3.38E-04         | 2.29                           | 0.59             | 0.06              | 8.12E-03         | 0.35                      | 0.09             | 0.01              | 1.23E-03        |          |
| Charanno Rio Fleet 1                          | Unpaved      | 1.72                           | 0.44             | 0.04              | 6.10E-03    | 41.37                          | 10.67            | 1.07              | 0.15         | 6.27                         | 1.62             | 0.16              | 0.02        | 0.17                           | 0.04             | 0.00              | 6.10E-04         | 4.14                           | 1.07             | 0.11              | 1.46E-02         | 0.63                      | 0.16             | 0.02              | 2.22E-03        |          |
| LH Rig (On Pavement/Gravel)                   | Unpaved      | 0.29                           | 0.07             | 0.01              | 1.02E-03    | 1.89                           | 1.78             | 0.18              | 0.02         | 1.04                         | 0.27             | 0.03              | 3.79E-03    | 0.03                           | 0.01             | 0.00              | 1.02E-04         | 0.69                           | 0.18             | 0.02              | 2.44E-03         | 0.10                      | 0.03             | 0.00              | 3.79E-04        |          |
| LH Rig (LHS/BB)                               | Unpaved      | 4.84                           | 1.25             | 0.12              | 0.02        | 116.06                         | 29.94            | 2.99              | 0.41         | 17.58                        | 4.54             | 0.45              | 0.06        | 0.48                           | 0.12             | 0.01              | 1.71E-03         | 116.1                          | 29.94            | 0.63              | 2.44E-01         | 1.76                      | 0.45             | 0.05              | 6.23E-03        |          |
| Haul Trucks (Haul Loose)                      | Unpaved      | 35.77                          | 9.23             | 0.92              | 0.13        | 858.46                         | 221.46           | 22.15             | 3.04         | 130.06                       | 33.55            | 3.36              | 0.46        | 3.58                           | 0.92             | 0.09              | 1.27E-02         | 85.85                          | 22.15            | 2.21              | 3.04E-01         | 13.01                     | 3.36             | 0.34              | 4.61E-02        |          |
| Haul Trucks                                   | Unpaved      | 59.62                          | 15.38            | 1.54              | 0.21        | 1430.77                        | 369.10           | 36.91             | 5.07         | 216.76                       | 55.92            | 5.59              | 0.77        | 5.96                           | 1.54             | 0.15              | 2.11E-02         | 143.08                         | 36.91            | 3.69              | 5.07E-01         | 21.68                     | 5.59             | 0.56              | 7.68E-02        |          |
| Material transporter                          | Unpaved      | 3.46                           | 0.89             | 0.09              | 0.01        | 83.07                          | 21.43            | 2.14              | 0.29         | 12.59                        | 3.25             | 0.32              | 0.04        | 0.35                           | 0.09             | 0.01              | 1.23E-03         | 8.31                           | 2.14             | 0.21              | 2.94E-02         | 1.26                      | 0.32             | 0.03              | 4.46E-03        |          |
| Light vehicle (general usage)                 | Unpaved      | 0.72                           | 0.19             | 0.02              | 2.56E-03    | 17.33                          | 4.47             | 0.45              | 0.06         | 2.62                         | 0.68             | 0.07              | 9.29E-03    | 0.07                           | 0.02             | 0.00              | 2.56E-04         | 1.73                           | 0.45             | 0.04              | 6.14E-03         | 0.26                      | 0.07             | 0.01              | 9.29E-04        |          |
| Fleet 2                                       | Unpaved      | 0.96                           | 0.25             | 0.02              | 3.38E-03    | 22.93                          | 5.92             | 0.59              | 0.08         | 3.47                         | 0.90             | 0.09              | 0.01        | 0.10                           | 0.02             | 0.00              | 3.38E-04         | 2.29                           | 0.59             | 0.06              | 8.12E-03         | 0.35                      | 0.09             | 0.01              | 1.23E-03        |          |
| Charanno Rio Fleet 2                          | Unpaved      | 4.98                           | 1.13             | 0.11              | 0.02        | 105.08                         | 27.11            | 2.71              | 0.37         | 15.92                        | 4.11             | 0.41              | 0.06        | 0.44                           | 0.11             | 0.01              | 1.55E-03         | 105.1                          | 27.11            | 0.76              | 2.71E-01         | 1.59                      | 0.41             | 0.04              | 5.64E-03        |          |
| Personnel transporter                         | Unpaved      | 1.05                           | 0.27             | 0.03              | 3.72E-03    | 25.20                          | 6.50             | 0.65              | 0.09         | 3.82                         | 0.98             | 0.10              | 0.01        | 0.10                           | 0.03             | 0.00              | 3.72E-04         | 2.52                           | 0.65             | 0.06              | 8.52E-03         | 0.38                      | 0.10             | 0.01              | 1.35E-03        |          |
| Shovelcrane                                   | Unpaved      | 18.46                          | 4.76             | 0.48              | 0.07        | 443.04                         | 114.29           | 11.43             | 1.57         | 67.12                        | 17.32            | 1.73              | 0.24        | 1.85                           | 0.48             | 0.05              | 6.54E-03         | 44.30                          | 11.43            | 1.14              | 1.57E-01         | 6.71                      | 1.73             | 0.17              | 2.38E-02        |          |
| Water vehicle                                 | Unpaved      | 2.86                           | 0.76             | 0.08              | 0.01        | 71.08                          | 18.34            | 1.83              | 0.25         | 10.77                        | 2.78             | 0.28              | 0.04        | 0.30                           | 0.08             | 0.01              | 1.05E-03         | 7.11                           | 1.83             | 0.18              | 2.78E-02         | 1.08                      | 0.28             | 0.03              | 3.81E-03        |          |
| Mobile rockbreaker                            | Unpaved      | 0.00                           | 0.00             | 0.00              | 7.58E-06    | 0.05                           | 0.01             | 0.00              | 0.00         | 1.82E-04                     | 0.01             | 0.00              | 0.00        | 2.76E-05                       | 0.00             | 0.00              | 0.00             | 7.58E-07                       | 0.01             | 0.00              | 0.00             | 1.82E-05                  | 0.00             | 0.00              | 0.00            | 2.76E-06 |
| Grader                                        | Unpaved      | 3.17                           | 0.82             | 0.08              | 0.01        | 75.57                          | 19.60            | 1.96              | 0.27         | 11.51                        | 2.97             | 0.30              | 0.04        | 0.32                           | 0.08             | 0.01              | 1.12E-03         | 7.60                           | 1.96             | 0.20              | 2.97E-02         | 1.15                      | 0.30             | 0.03              | 4.06E-03        |          |
| Skid Steer                                    | Unpaved      | 0.45                           | 0.12             | 0.01              | 1.61E-03    | 10.89                          | 2.81             | 0.28              | 0.04         | 1.65                         | 0.43             | 0.04              | 5.84E-03    | 0.05                           | 0.01             | 0.00              | 1.61E-04         | 1.09                           | 0.28             | 0.03              | 3.86E-03         | 0.17                      | 0.04             | 0.00              | 5.84E-04        |          |
| Light vehicle (tech services)                 | Unpaved      | 0.72                           | 0.19             | 0.02              | 2.56E-03    | 17.33                          | 4.47             | 0.45              | 0.06         | 2.62                         | 0.68             | 0.07              | 9.29E-03    | 0.07                           | 0.02             | 0.00              | 2.56E-04         | 1.73                           | 0.45             | 0.04              | 6.14E-03         | 0.26                      | 0.07             | 0.01              | 9.29E-04        |          |
| Material transporter (logistics/Construction) | Unpaved      | 3.46                           | 0.89             | 0.09              | 0.01        | 83.07                          | 21.43            | 2.14              | 0.29         | 12.59                        | 3.25             | 0.32              | 0.04        | 0.35                           | 0.09             | 0.01              | 1.23E-03         | 8.31                           | 2.14             | 0.21              | 2.94E-02         | 1.26                      | 0.32             | 0.03              | 4.46E-03        |          |
| Scissor lift (Construction)                   | Unpaved      | 2.73                           | 0.70             | 0.07              | 9.67E-03    | 65.52                          | 16.90            | 1.69              | 0.23         | 9.93                         | 2.56             | 0.26              | 0.04        | 0.27                           | 0.07             | 0.01              | 9.67E-04         | 6.55                           | 1.69             | 0.17              | 2.32E-02         | 0.99                      | 0.26             | 0.03              | 3.51E-03        |          |
| Telehandler                                   | Unpaved      | 1.43                           | 0.37             | 0.04              | 5.05E-03    | 34.26                          | 8.84             | 0.88              | 0.12         | 5.19                         | 1.34             | 0.13              | 0.02        | 0.14                           | 0.04             | 0.00              | 5.05E-04         | 3.43                           | 0.88             | 0.09              | 1.21E-02         | 0.52                      | 0.13             | 0.01              | 1.84E-03        |          |
| Maintenance Vehicle                           | Unpaved      | 4.14                           | 1.07             | 0.11              | 0.01        | 99.29                          | 25.61            | 2.56              | 0.35         | 15.04                        | 3.88             | 0.39              | 0.05        | 0.41                           | 0.11             | 0.01              | 1.47E-03         | 9.93                           | 2.56             | 0.26              | 3.57E-02         | 1.50                      | 0.39             | 0.04              | 5.33E-03        |          |
| Fuel/Lube vehicle                             | Unpaved      | 3.52                           | 1.42             | 0.14              | 0.02        | 131.39                         | 34.15            | 3.42              | 0.47         | 20.06                        | 5.17             | 0.52              | 0.07        | 0.55                           | 0.14             | 0.01              | 1.92E-03         | 131.4                          | 34.15            | 0.74              | 3.42E-01         | 2.01                      | 0.52             | 0.05              | 7.10E-03        |          |
| Mobile Grapple equipment                      | Unpaved      | 0.06                           | 0.02             | 0.00              | 2.70E-04    | 1.50                           | 0.40             | 0.04              | 5.49E-03     | 0.23                         | 0.06             | 0.01              | 8.72E-04    | 0.01                           | 0.00             | 0.00              | 2.70E-05         | 0.16                           | 0.04             | 0.00              | 5.49E-04         | 0.02                      | 0.01             | 0.00              | 8.72E-05        |          |
| Blind Bore Machine                            | Unpaved      | 0.85                           | 0.22             | 0.02              | 3.00E-03    | 20.31                          | 5.24             | 0.52              | 0.07         | 3.08                         | 0.79             | 0.08              | 0.01        | 0.08                           | 0.02             | 0.00              | 3.00E-04         | 2.03                           | 0.52             | 0.05              | 7.19E-03         | 0.31                      | 0.08             | 0.01              | 1.09E-03        |          |
| <b>Total Emissions</b>                        |              | <b>211.89</b>                  | <b>54.66</b>     | <b>5.47</b>       | <b>0.75</b> | <b>5,085.46</b>                | <b>1,311.91</b>  | <b>131.19</b>     | <b>18.01</b> | <b>770.45</b>                | <b>198.75</b>    | <b>19.88</b>      | <b>2.73</b> | <b>21.19</b>                   | <b>5.47</b>      | <b>0.55</b>       | <b>7,500E-02</b> | <b>508.55</b>                  | <b>131.19</b>    | <b>13.12</b>      | <b>1,860E-00</b> | <b>77.04</b>              | <b>19.88</b>     | <b>1.99</b>       | <b>2,73E-01</b> |          |

1. Controlled hourly and daily emissions calculated based on short term emission factors and control efficiency.  
2. Controlled annual emissions calculated based on long term emission factors and control efficiency.

Mine Development  
UG Clark Roads - Inputs

Table A-31. Clark Emission Factor Inputs

| Road Surface | Max Miles Traveled |        |       | Vehicle Type      | Vehicle Model | Max Vehicle Count | Particulate Matter Emission Factor Inputs <sup>1</sup> |                  |                   |          |       |     |           |     |                  |                   |      |                  |                   |   |  |  |  |
|--------------|--------------------|--------|-------|-------------------|---------------|-------------------|--------------------------------------------------------|------------------|-------------------|----------|-------|-----|-----------|-----|------------------|-------------------|------|------------------|-------------------|---|--|--|--|
|              | Day                | Month  | Year  |                   |               |                   | k                                                      |                  |                   |          | s     |     |           |     |                  | a                 |      |                  |                   | b |  |  |  |
|              |                    |        |       |                   |               |                   | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | Avg (kg) | (ton) | (%) | (days/yr) | PM  | PM <sub>10</sub> | PM <sub>2.5</sub> | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> |   |  |  |  |
| Unpaved      | 8                  | 243.3  | 2920  | Jumbo             | DD422i        | 2                 | 4.9                                                    | 1.5              | 0.15              | 26,000   | 28.7  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 8                  | 243.3  | 2920  | Bolter            | DD411         | 3                 | 4.9                                                    | 1.5              | 0.15              | 23,000   | 25.4  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 60                 | 1825.0 | 21900 | Haul Truck        | TH430         | 5                 | 4.9                                                    | 1.5              | 0.15              | 44,500   | 49.1  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 16                 | 486.7  | 5840  | LHD               | LH410         | 4                 | 4.9                                                    | 1.5              | 0.15              | 33,500   | 36.9  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 8                  | 243.3  | 2920  | Production Drill  | Simba ME7C    | 2                 | 4.9                                                    | 1.5              | 0.15              | 29,500   | 32.5  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 8                  | 243.3  | 2920  | Slot-Raise Drill  | Easer L       | 1                 | 4.9                                                    | 1.5              | 0.15              | 37,300   | 41.1  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 8                  | 243.3  | 2920  | Blockholer        | BH3           | 1                 | 4.9                                                    | 1.5              | 0.15              | 28,000   | 30.9  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 16                 | 486.7  | 5840  | Powder Truck      | EC3           | 2                 | 4.9                                                    | 1.5              | 0.15              | 17,950   | 19.8  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 16                 | 486.7  | 5840  | Grader            | 120 AWD       | 1                 | 4.9                                                    | 1.5              | 0.15              | 16,700   | 18.4  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 16                 | 486.7  | 5840  | Lube Truck        | FL3           | 1                 | 4.9                                                    | 1.5              | 0.15              | 13,600   | 15.0  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 16                 | 486.7  | 5840  | Shotcrete Sprayer | SSX & SS3 T4F | 1                 | 4.9                                                    | 1.5              | 0.15              | 19,200   | 21.2  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 16                 | 486.7  | 5840  | Transit Mixer     | TM3           | 2                 | 4.9                                                    | 1.5              | 0.15              | 25,050   | 27.6  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 16                 | 486.7  | 5840  | Scissor Deck      | SL3           | 2                 | 4.9                                                    | 1.5              | 0.15              | 15,400   | 17.0  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 16                 | 486.7  | 5840  | Boom Truck        | BT3           | 1                 | 4.9                                                    | 1.5              | 0.15              | 17,300   | 19.1  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 16                 | 486.7  | 5840  | Light Vehicle     | F-250         | 6                 | 4.9                                                    | 1.5              | 0.15              | 3,750    | 4.1   | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |
| Unpaved      | 24                 | 730.0  | 8760  | Water Vehicle     | WS3           | 1                 | 4.9                                                    | 1.5              | 0.15              | 16,100   | 17.7  | 5.1 | 62        | 0.7 | 0.9              | 0.9               | 0.45 | 0.45             | 0.45              |   |  |  |  |

<sup>1</sup> Emission factors for vehicular traffic on unpaved roads per U.S. EPA AP-42, Section 13.2.2 (Unpaved Roads), November 2006.

Short-Term  $E = k (g/12)^a (W/3)^b$  (1a)

Annual  $E_{\text{adj}} = E [(365 - P)/365]$  (2)

where E = Size-specific emission factor (lb/VMT)

k, a, b = Constants for equation 1a

|          |                  |                   |
|----------|------------------|-------------------|
| PM       | PM <sub>10</sub> | PM <sub>2.5</sub> |
| k = 4.9  | 1.5              | 0.15              |
| a = 0.7  | 0.9              | 0.9               |
| b = 0.45 | 0.45             | 0.45              |

Per AP-42 Table 13.2.2-2, November 2006

s = surface material silt content (%), per AP-42 Table 13.2.2-1, 11/06, Western surface coal mining Plant Road

5.1

W = Mean vehicle weight (tons)

P = Days per year with at least 0.01 inch precipitation, based on precipitation data from 2019-2021 for Hermosa Trench Met Station, using the lowest annual value between 2019-2021.

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Table A-32. Clark Underground Roads - Emission Factors

| Road Surface | Vehicle Type      | Averaging Period | Emission Factor <sup>1</sup> |                  |                   |        | Process Rate Unit | Particulate Matter Emission Factor Inputs <sup>1</sup> |                  |                   |       |      |           |      |                  |                   |      |                  |                   | Reference                                                                                           |  |  |
|--------------|-------------------|------------------|------------------------------|------------------|-------------------|--------|-------------------|--------------------------------------------------------|------------------|-------------------|-------|------|-----------|------|------------------|-------------------|------|------------------|-------------------|-----------------------------------------------------------------------------------------------------|--|--|
|              |                   |                  | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Unit   |                   | k                                                      |                  |                   | W     |      | P         |      |                  | a                 |      |                  | b                 |                                                                                                     |  |  |
|              |                   |                  |                              |                  |                   |        |                   | PM                                                     | PM <sub>10</sub> | PM <sub>2.5</sub> | (ton) | (%)  | (days/yr) | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> |                                                                                                     |  |  |
| Unpaved      | Jumbo             | Hourly/Daily     | 7.43                         | 1.92             | 0.19              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 28.66 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              | AP-42, Section 13.2.2, Expression 1a (11/06)<br>AP-42, Section 13.2.2, Expressions 1a and 2 (11/06) |  |  |
| Unpaved      | Jumbo             | Annual           | 6.17                         | 1.59             | 0.16              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Bolter            | Hourly/Daily     | 7.03                         | 1.81             | 0.18              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 25.35 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Bolter            | Annual           | 5.84                         | 1.51             | 0.15              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Haul Truck        | Hourly/Daily     | 9.47                         | 2.44             | 0.24              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 49.05 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Haul Truck        | Annual           | 7.86                         | 2.03             | 0.20              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | LHD               | Hourly/Daily     | 8.33                         | 2.15             | 0.21              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 36.93 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | LHD               | Annual           | 6.92                         | 1.78             | 0.18              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Production Drill  | Hourly/Daily     | 7.87                         | 2.03             | 0.20              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 32.52 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Production Drill  | Annual           | 6.53                         | 1.68             | 0.17              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Slot-Raise Drill  | Hourly/Daily     | 8.74                         | 2.26             | 0.23              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 41.12 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Slot-Raise Drill  | Annual           | 7.26                         | 1.87             | 0.19              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Blockholer        | Hourly/Daily     | 7.68                         | 1.98             | 0.20              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 30.86 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Blockholer        | Annual           | 6.38                         | 1.65             | 0.16              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Powder Truck      | Hourly/Daily     | 6.29                         | 1.62             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 19.79 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Powder Truck      | Annual           | 5.22                         | 1.35             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Grader            | Hourly/Daily     | 6.09                         | 1.57             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 18.41 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Grader            | Annual           | 5.06                         | 1.30             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Lube Truck        | Hourly/Daily     | 5.55                         | 1.43             | 0.14              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 14.99 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Lube Truck        | Annual           | 4.61                         | 1.19             | 0.12              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Shotcrete Sprayer | Hourly/Daily     | 6.48                         | 1.67             | 0.17              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 21.16 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Shotcrete Sprayer | Annual           | 5.38                         | 1.39             | 0.14              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Transit Mixer     | Hourly/Daily     | 7.31                         | 1.89             | 0.19              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 27.61 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Transit Mixer     | Annual           | 6.07                         | 1.57             | 0.16              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Scissor Deck      | Hourly/Daily     | 5.87                         | 1.51             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 16.98 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Scissor Deck      | Annual           | 4.87                         | 1.26             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Boom Truck        | Hourly/Daily     | 6.19                         | 1.60             | 0.16              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 19.07 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Boom Truck        | Annual           | 5.14                         | 1.33             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Light Vehicle     | Hourly/Daily     | 3.11                         | 0.80             | 0.08              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 4.13  | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Light Vehicle     | Annual           | 2.58                         | 0.67             | 0.07              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |
| Unpaved      | Water Vehicle     | Hourly/Daily     | 5.99                         | 1.55             | 0.15              | lb/VMT | VMT               | 4.90                                                   | 1.50             | 0.15              | 17.75 | 5.10 | 62.00     | 0.70 | 0.90             | 0.90              | 0.45 | 0.45             | 0.45              |                                                                                                     |  |  |
| Unpaved      | Water Vehicle     | Annual           | 4.97                         | 1.28             | 0.13              | lb/VMT | VMT               | -                                                      | -                | -                 | -     | -    | 62.00     | -    | -                | -                 | -    | -                | -                 |                                                                                                     |  |  |

<sup>1</sup> Emission factors for vehicular traffic on unpaved roads per U.S. EPA AP-42, Section 13.2.2 (Unpaved Roads), November 2006.

$$\text{Short-Term } E = k \left( \frac{s}{12} \right)^b (W/3)^b \quad (1a)$$

$$\text{Annual } E_{\text{adj}} = E \left[ \frac{365 - P}{365} \right] \quad (2)$$

where E = Size-specific emission factor (lb/VMT)

k, a, b = Constants for equation 1a

|     | PM   | PM <sub>10</sub> | PM <sub>2.5</sub> |
|-----|------|------------------|-------------------|
| k = | 4.9  | 1.5              | 0.15              |
| a = | 0.7  | 0.9              | 0.9               |
| b = | 0.45 | 0.45             | 0.45              |

Per AP-42 Table 13.2.2-2, November 2006

s = surface material silt content (%)

5.1

Silt content assumed as to be similar to Plant Road in Western Surface Coal Mining in AP-42, Section 13.2.4 (11/2006) per conversation with AMI, 10/14/22.

W = Mean vehicle weight (tons)

P = Days per year with at least 0.01 inch precipitation, based on precipitation data from 2019-2021 for Hermosa Trench Met Station, using the lowest annual value between 2019-2021.

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Table A-33a. Clark Roads - Vehicles - Input Parameters

| Road Surface | Vehicle Type      | Trip Type | Number of Vehicles | Trip Distance (miles/vehicle/day) | Vehicle Miles Travelled (VMT) |        |         | Uncontrolled Emission Factor (lb/VMT) |                  |                   |           |                  |                   | Control  |                               |
|--------------|-------------------|-----------|--------------------|-----------------------------------|-------------------------------|--------|---------|---------------------------------------|------------------|-------------------|-----------|------------------|-------------------|----------|-------------------------------|
|              |                   |           |                    |                                   |                               |        |         | Short Term                            |                  |                   | Long Term |                  |                   | Type     | Efficiency <sup>1,2</sup> (%) |
|              |                   |           |                    |                                   |                               |        |         | PM                                    | PM <sub>10</sub> | PM <sub>2.5</sub> | PM        | PM <sub>10</sub> | PM <sub>2.5</sub> |          |                               |
| Unpaved      | Jumbo             | Round     | 2                  | 8                                 | 0.667                         | 16.00  | 5,840   | 7.43                                  | 1.92             | 0.19              | 6.17      | 1.59             | 0.16              | Watering | 90%                           |
| Unpaved      | Boiler            | Round     | 3                  | 8                                 | 1.000                         | 24.00  | 8,760   | 7.03                                  | 1.81             | 0.18              | 5.84      | 1.51             | 0.15              | Watering | 90%                           |
| Unpaved      | Haul Truck        | Round     | 5                  | 60                                | 12.500                        | 300.00 | 109,500 | 9.47                                  | 2.44             | 0.24              | 7.86      | 2.03             | 0.20              | Watering | 90%                           |
| Unpaved      | LHD               | Round     | 4                  | 16                                | 2.667                         | 64.00  | 23,360  | 8.33                                  | 2.15             | 0.21              | 6.92      | 1.78             | 0.18              | Watering | 90%                           |
| Unpaved      | Production Drill  | Round     | 2                  | 8                                 | 0.667                         | 16.00  | 5,840   | 7.87                                  | 2.03             | 0.20              | 6.53      | 1.68             | 0.17              | Watering | 90%                           |
| Unpaved      | Sage-Baker Drill  | Round     | 1                  | 8                                 | 0.333                         | 8.00   | 2,920   | 8.74                                  | 2.26             | 0.23              | 7.26      | 1.87             | 0.19              | Watering | 90%                           |
| Unpaved      | Blockholer        | Round     | 1                  | 8                                 | 0.333                         | 8.00   | 2,920   | 7.68                                  | 1.98             | 0.20              | 6.38      | 1.65             | 0.16              | Watering | 90%                           |
| Unpaved      | Powder Truck      | Round     | 2                  | 16                                | 1.333                         | 32.00  | 11,680  | 6.29                                  | 1.62             | 0.16              | 5.22      | 1.35             | 0.13              | Watering | 90%                           |
| Unpaved      | Grader            | Round     | 1                  | 16                                | 0.667                         | 16.00  | 5,840   | 6.09                                  | 1.57             | 0.16              | 5.06      | 1.30             | 0.13              | Watering | 90%                           |
| Unpaved      | Lube Truck        | Round     | 1                  | 16                                | 0.667                         | 16.00  | 5,840   | 5.55                                  | 1.43             | 0.14              | 4.61      | 1.19             | 0.12              | Watering | 90%                           |
| Unpaved      | Shotcrete Sprayer | Round     | 1                  | 16                                | 0.667                         | 16.00  | 5,840   | 6.48                                  | 1.67             | 0.17              | 5.38      | 1.39             | 0.14              | Watering | 90%                           |
| Unpaved      | Transit Mixer     | Round     | 2                  | 16                                | 1.333                         | 32.00  | 11,680  | 7.31                                  | 1.89             | 0.19              | 6.07      | 1.57             | 0.16              | Watering | 90%                           |
| Unpaved      | Scissor Deck      | Round     | 2                  | 16                                | 1.333                         | 32.00  | 11,680  | 5.87                                  | 1.51             | 0.15              | 4.87      | 1.26             | 0.13              | Watering | 90%                           |
| Unpaved      | Boom Truck        | Round     | 1                  | 16                                | 0.667                         | 16.00  | 5,840   | 6.19                                  | 1.60             | 0.16              | 5.14      | 1.33             | 0.13              | Watering | 90%                           |
| Unpaved      | Light Vehicle     | Round     | 6                  | 16                                | 4.000                         | 96.00  | 35,040  | 3.11                                  | 0.80             | 0.08              | 2.58      | 0.67             | 0.07              | Watering | 90%                           |
| Unpaved      | Water Vehicle     | Round     | 1                  | 24                                | 1.000                         | 24.00  | 8,760   | 5.99                                  | 1.55             | 0.15              | 4.97      | 1.28             | 0.13              | Watering | 90%                           |

1. Road Watering is not contemplated every hour, but only as needed to maintain control levels.

2. At South32, the roads will be watered sufficiently to achieve a control efficiency of 90%  
Lead Content = 5.67E-03 kg/kg



Table A-33b. Clark Roads -Vehicles - Emissions

| Vehicle Type      | Road Surface | Uncontrolled Emissions         |                  |                   |          |                                |                  |                   |          |                              |                  |                   |          | Controlled Emissions           |                  |                   |          |                                |                  |                   |          |                              |                  |                   |          |
|-------------------|--------------|--------------------------------|------------------|-------------------|----------|--------------------------------|------------------|-------------------|----------|------------------------------|------------------|-------------------|----------|--------------------------------|------------------|-------------------|----------|--------------------------------|------------------|-------------------|----------|------------------------------|------------------|-------------------|----------|
|                   |              | Hourly<br>(lb/hr) <sup>1</sup> |                  |                   |          | Daily<br>(lb/day) <sup>1</sup> |                  |                   |          | Annual<br>(tpy) <sup>1</sup> |                  |                   |          | Hourly<br>(lb/hr) <sup>1</sup> |                  |                   |          | Daily<br>(lb/day) <sup>1</sup> |                  |                   |          | Annual<br>(tpy) <sup>1</sup> |                  |                   |          |
|                   |              | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                             | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     | PM                           | PM <sub>10</sub> | PM <sub>2.5</sub> | Lead     |
| Jumbo             | Unpaved      | 4.96                           | 1.28             | 0.13              | 0.03     | 118.92                         | 30.68            | 3.07              | 0.67     | 18.02                        | 4.65             | 0.46              | 0.10     | 0.50                           | 0.13             | 0.01              | 2.81E-03 | 11.89                          | 3.07             | 0.31              | 6.74E-02 | 1.80                         | 0.46             | 0.05              | 1.02E-02 |
| Boiler            | Unpaved      | 7.03                           | 1.81             | 0.18              | 0.04     | 168.81                         | 43.55            | 4.35              | 0.96     | 25.57                        | 6.60             | 0.66              | 0.14     | 0.70                           | 0.18             | 0.02              | 3.99E-03 | 16.88                          | 4.35             | 0.44              | 9.57E-02 | 2.56                         | 0.66             | 0.07              | 1.45E-02 |
| Haul Truck        | Unpaved      | 118.32                         | 30.52            | 3.05              | 0.67     | 2839.78                        | 723.58           | 73.26             | 16.10    | 430.23                       | 110.99           | 11.10             | 2.44     | 11.83                          | 3.05             | 0.31              | 6.71E-02 | 283.98                         | 73.26            | 7.33              | 1.61E+00 | 43.02                        | 11.10            | 1.11              | 2.44E-01 |
| LHD               | Unpaved      | 22.21                          | 5.73             | 0.57              | 0.13     | 533.15                         | 137.54           | 13.75             | 3.02     | 80.77                        | 20.84            | 2.08              | 0.46     | 2.22                           | 0.57             | 0.06              | 1.26E-02 | 53.32                          | 13.75            | 1.38              | 3.02E-01 | 8.08                         | 2.08             | 0.21              | 4.58E-02 |
| Production Drill  | Unpaved      | 5.24                           | 1.35             | 0.14              | 0.03     | 125.88                         | 32.47            | 3.25              | 0.71     | 19.07                        | 4.92             | 0.49              | 0.11     | 0.52                           | 0.14             | 0.01              | 2.97E-03 | 12.59                          | 3.25             | 0.32              | 7.14E-02 | 1.91                         | 0.49             | 0.05              | 1.08E-02 |
| Slot-Raise Drill  | Unpaved      | 2.91                           | 0.75             | 0.08              | 0.02     | 69.95                          | 18.04            | 1.80              | 0.40     | 10.60                        | 2.73             | 0.27              | 0.06     | 0.29                           | 0.08             | 0.01              | 1.65E-03 | 6.99                           | 1.80             | 0.18              | 3.97E-02 | 1.06                         | 0.27             | 0.03              | 6.01E-03 |
| Backhoe           | Unpaved      | 2.56                           | 0.66             | 0.07              | 0.01     | 61.48                          | 15.86            | 1.59              | 0.35     | 9.31                         | 2.40             | 0.24              | 0.05     | 0.26                           | 0.07             | 0.01              | 1.45E-03 | 6.15                           | 1.59             | 0.16              | 3.49E-02 | 0.93                         | 0.24             | 0.02              | 5.38E-03 |
| Powder Truck      | Unpaved      | 8.39                           | 2.16             | 0.22              | 0.05     | 201.32                         | 51.93            | 5.19              | 1.14     | 30.50                        | 7.87             | 0.79              | 0.17     | 0.84                           | 0.22             | 0.02              | 4.76E-03 | 20.13                          | 5.19             | 0.52              | 1.14E-01 | 3.05                         | 0.79             | 0.08              | 1.73E-02 |
| Grader            | Unpaved      | 4.06                           | 1.05             | 0.10              | 0.02     | 97.44                          | 25.14            | 2.51              | 0.55     | 14.76                        | 3.81             | 0.38              | 0.08     | 0.41                           | 0.10             | 0.01              | 2.30E-03 | 9.74                           | 2.51             | 0.25              | 5.52E-02 | 1.48                         | 0.38             | 0.04              | 8.37E-03 |
| Lube Truck        | Unpaved      | 3.70                           | 0.95             | 0.10              | 0.02     | 88.94                          | 22.92            | 2.29              | 0.50     | 13.46                        | 3.47             | 0.35              | 0.08     | 0.37                           | 0.10             | 0.01              | 2.10E-03 | 8.89                           | 2.29             | 0.23              | 5.04E-02 | 1.35                         | 0.35             | 0.03              | 7.63E-03 |
| Shotcrete Sprayer | Unpaved      | 4.32                           | 1.12             | 0.11              | 0.02     | 103.75                         | 26.77            | 2.68              | 0.59     | 15.72                        | 4.06             | 0.41              | 0.09     | 0.43                           | 0.11             | 0.01              | 2.45E-03 | 10.38                          | 2.68             | 0.27              | 5.88E-02 | 1.57                         | 0.41             | 0.04              | 8.91E-03 |
| Transit Mixer     | Unpaved      | 9.75                           | 2.51             | 0.25              | 0.06     | 233.89                         | 60.34            | 6.03              | 1.33     | 35.43                        | 9.14             | 0.91              | 0.20     | 0.97                           | 0.25             | 0.03              | 5.52E-03 | 23.39                          | 6.03             | 0.60              | 1.33E-01 | 3.54                         | 0.91             | 0.09              | 2.01E-02 |
| Scissor Deck      | Unpaved      | 7.83                           | 2.02             | 0.20              | 0.04     | 187.90                         | 48.47            | 4.85              | 1.07     | 28.47                        | 7.34             | 0.73              | 0.16     | 0.78                           | 0.20             | 0.02              | 4.44E-03 | 18.79                          | 4.85             | 0.48              | 1.07E-01 | 2.85                         | 0.73             | 0.07              | 1.61E-02 |
| Boom Truck        | Unpaved      | 4.13                           | 1.06             | 0.11              | 0.02     | 99.00                          | 25.54            | 2.55              | 0.56     | 15.00                        | 3.87             | 0.39              | 0.09     | 0.41                           | 0.11             | 0.01              | 2.34E-03 | 9.90                           | 2.55             | 0.26              | 5.61E-02 | 1.50                         | 0.39             | 0.04              | 8.50E-03 |
| Light Vehicle     | Unpaved      | 12.44                          | 3.21             | 0.32              | 0.07     | 298.53                         | 77.01            | 7.70              | 1.69     | 45.23                        | 11.67            | 1.17              | 0.26     | 1.24                           | 0.32             | 0.03              | 7.05E-03 | 29.85                          | 7.70             | 0.77              | 1.69E-01 | 4.52                         | 1.17             | 0.12              | 2.56E-02 |
| Water Vehicle     | Unpaved      | 5.99                           | 1.55             | 0.15              | 0.03     | 143.78                         | 37.09            | 3.71              | 0.82     | 21.78                        | 5.62             | 0.56              | 0.12     | 0.60                           | 0.15             | 0.02              | 3.40E-03 | 14.38                          | 3.71             | 0.37              | 8.15E-02 | 2.18                         | 0.56             | 0.06              | 1.23E-02 |
| Total Emissions   |              | 223.85                         | 57.75            | 5.77              | 1.27E+00 | 5,372.41                       | 1,385.93         | 138.59            | 3.05E+01 | 813.92                       | 209.97           | 21.00             | 4.61E+00 | 22.39                          | 5.77             | 0.58              | 1.27E-01 | 537.24                         | 138.59           | 13.86             | 3.05E+00 | 81.39                        | 21.00            | 2.10              | 4.61E-01 |

1. Controlled hourly and daily emissions calculated based on short term emission factors and control efficiency.  
2. Controlled annual emissions calculated based on long term emission factors and control efficiency.

**Mine Development  
Paste Plant**

**Table A-34. Truck Pneumatic Loadout Emissions**

| Emission Point Number | Description                       | Max Daily Throughput (ton/day) | Max Yearly Throughput (ton/yr) | Hourly Emissions <sup>1,2</sup> |                          |                           | Daily Emissions <sup>1,2</sup> |                           |                            | Annual Emissions <sup>1,2</sup> |                        |                         |
|-----------------------|-----------------------------------|--------------------------------|--------------------------------|---------------------------------|--------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|---------------------------------|------------------------|-------------------------|
|                       |                                   |                                |                                | PM (lb/hr)                      | PM <sub>10</sub> (lb/hr) | PM <sub>2.5</sub> (lb/hr) | PM (lb/day)                    | PM <sub>10</sub> (lb/day) | PM <sub>2.5</sub> (lb/day) | PM (tpy)                        | PM <sub>10</sub> (tpy) | PM <sub>2.5</sub> (tpy) |
| Taylor                |                                   |                                |                                |                                 |                          |                           |                                |                           |                            |                                 |                        |                         |
| PP-1                  | Truck Pneumatic Loadout to Silo 1 | 235                            | 85,746                         | 9.69E-03                        | 3.33E-03                 | 6.94E-04                  | 2.33E-01                       | 7.99E-02                  | 1.67E-02                   | 4.24E-02                        | 1.46E-02               | 3.04E-03                |
| PP-2                  | Truck Pneumatic Loadout to Silo 2 | 235                            | 85,746                         | 9.69E-03                        | 3.33E-03                 | 6.94E-04                  | 2.33E-01                       | 7.99E-02                  | 1.67E-02                   | 4.24E-02                        | 1.46E-02               | 3.04E-03                |
| Clark                 |                                   |                                |                                |                                 |                          |                           |                                |                           |                            |                                 |                        |                         |
| PP-3                  | Truck Pneumatic Loadout to Silo 1 | 117                            | 42,873                         | 4.85E-03                        | 1.66E-03                 | 3.47E-04                  | 1.16E-01                       | 3.99E-02                  | 8.33E-03                   | 2.12E-02                        | 7.29E-03               | 1.52E-03                |
| PP-4                  | Truck Pneumatic Loadout to Silo 2 | 117                            | 42,873                         | 4.85E-03                        | 1.66E-03                 | 3.47E-04                  | 1.16E-01                       | 3.99E-02                  | 8.33E-03                   | 2.12E-02                        | 7.29E-03               | 1.52E-03                |

1. Emission factors based on AP-42 Chapter 11 Section 12, Table 11.12-2.

2. Throughput based on email from South32 on June 14, 2023.

k = Particle size multiplier (dimensionless)

|         |         |            |                                 |      |      |       |
|---------|---------|------------|---------------------------------|------|------|-------|
| PM      | PM10    | PM2.5      |                                 | PM   | PM10 | PM2.5 |
| 0.00099 | 0.00034 | 7.0905E-05 | lb of pollutant/ton of material | 0.74 | 0.35 | 0.053 |

TABLE 11.12-2 (ENGLISH UNITS)  
EMISSION FACTORS FOR CONCRETE BATCHING<sup>a</sup>

| Source (SCC)                                                                                | Uncontrolled                                      |                        |                             |                        | Controlled                   |                        |                              |                        |
|---------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------|-----------------------------|------------------------|------------------------------|------------------------|------------------------------|------------------------|
|                                                                                             | Total PM                                          | Emission Factor Rating | Total PM <sub>10</sub>      | Emission Factor Rating | Total PM                     | Emission Factor Rating | Total PM <sub>10</sub>       | Emission Factor Rating |
| Aggregate transfer <sup>b</sup><br>(3-05-011-04,-21,23)                                     | 0.0069                                            | D                      | 0.0033                      | D                      | ND                           |                        | ND                           |                        |
| Sand transfer <sup>b</sup><br>(3-05-011-05,22,24)                                           | 0.0021                                            | D                      | 0.00099                     | D                      | ND                           |                        | ND                           |                        |
| Cement unloading to elevated storage silo (pneumatic) <sup>c</sup><br>(3-05-011-07)         | 0.73                                              | E                      | 0.47                        | E                      | 0.00099                      | D                      | 0.00034                      | D                      |
| Cement supplement unloading to elevated storage silo (pneumatic) <sup>c</sup> (3-05-011-17) | 3.14                                              | E                      | 1.10                        | E                      | 0.0089                       | D                      | 0.0049                       | E                      |
| Weigh hopper loading <sup>c</sup><br>(3-05-011-08)                                          | 0.0048                                            | D                      | 0.0028                      | D                      | ND                           |                        | ND                           |                        |
| Mixer loading (central mix) <sup>c</sup><br>(3-05-011-09)                                   | 0.572<br>or Egn.<br>11.12-1                       | B                      | 0.156<br>or Egn.<br>11.12-1 | B                      | 0.0184<br>or Egn.<br>11.12-1 | B                      | 0.0055<br>or Egn.<br>11.12-1 | B                      |
| Truck loading (truck mix) <sup>c</sup><br>(3-05-011-10)                                     | 1.118                                             | B                      | 0.310                       | B                      | 0.098<br>or Egn.<br>11.12-1  | B                      | 0.0263<br>or Egn.<br>11.12-1 | B                      |
| Vehicle traffic (paved roads)                                                               | See AP-42 Section 13.2.1, Paved Roads             |                        |                             |                        |                              |                        |                              |                        |
| Vehicle traffic (unpaved roads)                                                             | See AP-42 Section 13.2.2, Unpaved Roads           |                        |                             |                        |                              |                        |                              |                        |
| Wind erosion from aggregate and sand storage piles                                          | See AP-42 Section 13.2.5, Industrial Wind Erosion |                        |                             |                        |                              |                        |                              |                        |

<sup>a</sup> The uncontrolled PM & PM-10 emission factors were developed from Reference 9. The controlled emission factor for PM was developed from References 9, 10, 11, and 12. The controlled emission factor for PM-10 was developed from References 9 and 10.

<sup>b</sup> The controlled PM emission factor was developed from Reference 10 and Reference 12, whereas the controlled PM-10 emission factor was developed from only Reference 10.

Reference 10:

Tanker trucks are contracted from outside sources to deliver cement to the storage silos of the Johnson and Erie batch plants. The Johnson plant has a single cement storage silo. The Erie plant has two cement storage silos designated east and west. To transport the cement from the tanker to the silo, a 4-inch flexible line is attached to the rear of the tanker truck. The cement is then pneumatically conveyed to the top of the storage silo. It takes approximately 45-minutes to unload one tanker truck.

Each storage silo has its own dust collector attached to its roof. The dust collectors vent to the atmosphere and are not equipped with any fans or blowers. The air flow out of each silo is a result of the air being displaced by the incoming cement.

Reference 11:

**TEST RESULTS**

During the test, a truck load of cement (44,340 lbs. net) was conveyed into the cement storage silo being tested, by an air compressor mounted on the truck. The air was exhausted through two identical Tiberi Engineering Company dust collectors mounted on top of the bin. Only one of the dust collectors was tested. The test results are as follows:

**Mine Development  
Scrubber**

**Table A-35. WTP2 Scrubber Emissions**

| Emission Point Number | Unit                         | CN Concentration <sup>1</sup><br>(ppm) | Gas Flow Rate <sup>1</sup><br>(cfm) | Operating Hours <sup>2</sup><br>(hrs/yr) | HCN Emissions <sup>3</sup><br>(lb/hr) | HCN Emissions<br>(stpy) |
|-----------------------|------------------------------|----------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------|-------------------------|
| SCRUBBER-1            | Tank Exhaust HCN<br>Scrubber | 600                                    | 500                                 | 8760                                     | 1.23                                  | 5.38                    |
| Tanks Exhaust         | Process Tanks Exhaust        | 39                                     | 50                                  | 8760                                     | 7.98E-03                              | 3.50E-02                |

<sup>1</sup> Cyanide concentration uncontrolled is 2,000 ppm based on discussion with Eric H. and gas flow rate assumed to be 500 cfm based on engineering judgement.  
39 ppm based on discussion with Eric H. and 50 cfm based on engineering judgment (minimal flow rate for natural ventilation).

<sup>2</sup> Control Efficiency of scrubber 70% conservative assumption

<sup>3</sup> Assumed the following output parameters

542.77 Rankine

*Based on the temperature in the Process Tanks tab of "S32 - Mine Development - Emis Calc - 2024-1105".*

0.73 ft<sup>3</sup>.atm/R.lbmol

1 atm

27.03 Molecular Weight of Hydrogen Cyanide (g/mol)

| Equipment Type                                                                                                       | Max. Capacity | Units | Make*       | Model*   | Serial Number* | Installation/Mfg. Date* | Equipment ID Number                  | A.A.C / NSPS / NESHAP                                                      |
|----------------------------------------------------------------------------------------------------------------------|---------------|-------|-------------|----------|----------------|-------------------------|--------------------------------------|----------------------------------------------------------------------------|
| Generators                                                                                                           |               |       |             |          |                |                         |                                      |                                                                            |
| Natural Gas Engine CAT 3520 DSL<br>2600 kW (40 and 4 backups) (58, and 1 Backup)                                     | 2600          | ekW   | Caterpillar | 3520 DSL | TBD            | TBD                     | ENGINE 0013<br>- ENGINE<br>0056 0071 | NSPS 40 CFR Part 60 Subpart JJJJ and<br>NESHAP 40 CFR Part 63 Subpart ZZZZ |
| Diesel CAT XQ1140 (6)<br>(2 CAT C18 engines per package<br>with each package<br>displacement 3.02<br>liter/cylinder) | 910           | ekW   | Caterpillar | C18      | TBD            | TBD                     | ENGINE 0007<br>- ENGINE<br>0012      | NSPS 40 CFR Part 60 Subpart JJJJ and<br>NESHAP 40 CFR Part 63 Subpart ZZZZ |
| Diesel C200D2RE<br>(Displacement 1.12<br>liter/cylinder)                                                             | 200           | ekW   | Cummins     | QSB7-G9  | TBD            | TBD                     | ENGINE 0001                          | NSPS 40 CFR Part 60 Subpart IIII                                           |
| Diesel CAT C175 3000 kW (5)<br>(Displacement 5.3<br>liter/cylinder)                                                  | 3000          | ekW   | Caterpillar | C175-16  | TBD            | TBD                     | ENGINE 0002<br>- ENGINE<br>0006      | NSPS 40 CFR Part 60 Subpart JJJJ and<br>NESHAP 40 CFR Part 63 Subpart ZZZZ |

## **APPENDIX E. DRAFT PERMIT LANGUAGE**

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South32 has provided a redline draft permit to facilitate review of this Significant Permit Revision. This includes suggested permit condition changes to Attachment B of the permit as well as changes to the Equipment List.

**A. New Non-Emergency Diesel Engines Subject to New Source Performance Standards (NSPS)  
Subpart IIII Requirements**

**6. Compliance Requirements**

- c. The Permittee shall demonstrate compliance with Condition IV.A.4.c as follows:  
[A.A.C. R18-2-306.A.3.c]

(1) For the lb/hr limit, by testing pursuant to Condition IV.A.7 multiplying the emission rate for each engine in g/hp-hr or g/kwhr by the horsepower or kilowatt of the engine, depending upon the form of the standard, and dividing by 453.592 to calculate the lb/hr for each engine and summing the results for all engines subject to Condition IV.A. to compare to the pound per hour limit. This compliance demonstration shall be completed within two weeks of receipt of any stack test results pursuant to Condition IV.A.7.

(2) For the ton/year limit, by taking the operating hours for each engine within two weeks of the end of the calendar month and multiplying it by the current lb/hr for that engine calculated in Condition IV.A.6.c(1) by the number of operating hours during the prior 12 months, summing the results for all engines subject to Condition IV.A, and dividing by 2000 to compare to the ton/year limit.

**(3) For certified engines operated in accordance with Condition IV.A.6.a, the Permittee may use the certified emission rate in g/hp-hr or g/kWh in lieu of stack testing rates in Condition IV.A.7.c(1) and (2).**

**7. Testing Requirements**

- b. **Except for certified engines operated in accordance with Condition IV.A.6.a,** the Permittee shall test each engine subject to Condition IV.A.4.c within 60 days of achieving maximum load or 180 days of startup or transfer from the E&VRP pursuant to Condition I.A.4, and annually thereafter. The Permittee may propose, and ADEQ may approve, an annual schedule for testing all affected units to facilitate efficient testing.

[A.A.C. R18-2-312]

**B. New Non-Emergency Natural Gas Engines Subject to New Source Performance Standards (NSPS) Subpart JJJJ Requirements**

**1. Applicability**

This Section applies to the natural gas spark ignition (SI) internal combustion engines (ICEs) as identified in the Equipment List in Attachment "C".

## 2. General Requirements

- a. *The Permittee shall install selective catalytic reduction (SCR) and oxidation catalysts (OxCat) on the natural gas engines and program and monitor ~~interlock~~ all engines to ensure that the associated SCR and OxCat will operate at all times they are above the operating temperature and load specified for each control device by the engine vendor, including periods of startup, shutdown and malfunction, **but excluding SCR system validation checks after 4000 hour maintenance and injector clog/urea line blockage procedures, which time shall be limited to the extent practicable.***

[A.A.C. R18-2-306.01 and -331.A.3.a]

[Material Permit Conditions are indicated with underline and italics]

- b. *Except during startup and shutdown **and specified maintenance**, the Permittee may operate up to 14 of the natural gas engines from 50 to 100% load, including 100% load, and shall operate the balance of the natural gas engines from 75% and up to 100% load, including 100% load. Periods of startup, shutdown and specified maintenance are not included in the hourly load % calculation. The following required maintenance procedures are permissible at less than the 50 or 75% minimum load range but the duration of such maintenance shall be limited to a reasonable time:*

- (1) Engine coolant sample, Level 1, every 250 operating hours*
- (2) Engine oil sample, every 250 operating hours*
- (3) Alternator inspection, every 1000 operating hours*
- (4) Generator bearing lubrication, every 1000 operating hours*
- (5) Prelube pump inspection, every 12 months*
- (6) Crankcase blowby inspection, test and record every 4000 operating hours*
- (7) Corrective action to an engine malfunction event requiring one or more of the maintenance activities listed in (1) through (6) preceding.*

[A.A.C. R18-2-306.01 and -331.A.3.a]

[Material Permit Conditions are indicated with underline and italics]

- c. *If an engine, oxidation catalyst or SCR unit malfunctions while in service, the Permittee is allowed 15 minutes to assess whether the unit can be repaired in less time than it would take to start up another engine and engage its SCR unit, in which case running repair is authorized; if not, the Permittee shall start up an alternative engine and control unit and shut down the malfunctioning unit once the replacement unit is operating. If no other engine and control unit is available and shutdown creates a life-safety risk, the Permittee may continue to operate the malfunctioning unit until repaired or another unit can be brought on-line as soon as practicable but such operation must be reported together with the justification as a deviation. Operation in such situations without an objectively reasonable justification is a violation.*

- d. Startup and Shutdown.

- (1) NOx. For purposes of this Section, startup shall be the time from cold start until the unit achieves both the vendor's specified operating temperature and 50% or greater load, plus the time for an SCR system validation check, if required, and any other time when operating load is less than 50% for more than 15 consecutive minutes until the unit again achieves both load the vendor's specified operating temperature and

50% or greater load; shutdown is the time from the start of a planned shutdown or any time the operating load drops below 50% for 15 consecutive minutes until combustion ceases.

- (2) CO and VOC. For purposes of this Section, startup shall be the time from cold start until the control unit achieves 200°C and a shutdown is any other time the control unit temperature is less than 200°C until combustion ceases. A shutdown during which the control unit temperature never drops below 200°C before combustion ceases is not a shutdown for purposes of Condition IV.B.4.e.(2)(a)(ii).
- (3) Particulate matter emissions must meet the limits during startup, shutdown and planned maintenance.

[A.A.C. R18-2-306.B.3]

3. Emission Standards

- b. The Permittee shall comply with the emission limits in the following table for the group of permitted natural gas engines:

[A.A.C. R18-2-306.01]

| Pollutant                               | Lb/hr       | Ton/year    |
|-----------------------------------------|-------------|-------------|
| NOx                                     | 37.4        | 163.9       |
| CO                                      | 16.6        | 72.8        |
| VOC                                     | 19.3        | 84.3        |
| <b>PM<sub>10</sub>/PM<sub>2.5</sub></b> | <b>7.72</b> | <b>33.8</b> |

For purposes of compliance with these limits, when calculating emissions of volatile organic compounds, emissions of formaldehyde should not be included.

4. Compliance Requirements

- d. The Permittee shall program ~~and monitor interlocks on~~ the natural gas engines to ensure they operate within the range set by Condition IV.B.2.b at 50-75% to 100% load except during startup and shutdown ~~and maintenance allowed pursuant to Condition IV.B.2.b.~~ The Permittee shall record each incidence of startup, shutdown, specified maintenance, each incidence of SCR unit validation, and the date, time, duration and justification for any operation pursuant to Condition IV.B.2.c for life safety reasons.

[A.A.C. R18-2-306.01 and -331.A.3.a]

- (1) “Program and monitor” means that the Permittee shall ensure that the units are programmed to inject aqueous urea solution when operating above 50% load after achieving the manufacturer’s SCR catalyst target temperature, monitor and record the hourly average loads, and will alarm if the average load drops below 50% or 75% load, as applicable. Similarly, the system shall provide alarms if the control unit temperature drops below 350°C and 200°C.
- (2) The Permittee shall take corrective action upon receiving an alarm to prevent, to the extent reasonably possible:



- a. The hourly average load from dropping below 50% or 75% load, as applicable. An hourly average load below 50% or 75% shall be counted as a permit deviation for the hour.
- b. The hourly average temperature of the control unit falling below 350°C. An hourly average load below 350°C is a deviation for the SCR unit and below 200°C is a deviation for the oxidation catalyst unit.

[A.A.C. R18-2-306.01 and -331.A.3.a]

e. The Permittee shall demonstrate ~~compliance~~ compliance with Condition IV.B.3.b as follows:

**(1) In lieu of Condition IV.B.4.e.(1), each time an engine is installed or a performance test completed, the Permittee shall demonstrate compliance with the lb/hr limit in Condition IV.B.3.b as follows:**

**(a) For the up to 14 engines allowed to operate in the 50-100% load range, the Permittee shall calculate lb/hr emissions for each pollutant subject to a Condition IV.B.3.b limit by using the highest emissions obtained from the low, medium, moderate or high load (as defined in Condition IV.B.5.c) emission factor, in lb/MWh multiplied by the upper end MWh of each range (using nameplate as the upper end for the high load range), and multiplying this value by the number of engines logged as operating in the 50 to 100% load range.**

**(b) For the remaining engines operating in the 75 to 100% load range, the Permittee shall calculate the lb/hr emissions for each pollutant subject to a Condition IV.B.3.b limit by using the highest emissions obtained from the moderate or high load (as defined in Condition IV.B.5.c) emission factor, in lb/MWh multiplied by the upper end MWh of each range (using nameplate as the upper end for the high load range), and multiplying this value by the number of engines logged as operating in the 75 to 100% load range.**

**(c) Compliance is demonstrated if the sum of emissions for each pollutant for all engines under paragraphs (a) and (b), in lb/hr, is less than the limit for that pollutant in Condition IV.B.3.b.**

**(2) In lieu of Condition IV.B.4.e.(2), the Permittee shall demonstrate compliance with the tons/year limit in Condition IV.B.3.b as follows by the fifth working day of the month for the preceding month:**

**(a) For each pollutant for each engine, calculate hourly emissions as follows:**

**(i) For each operating hour, multiply the MWh in that hour by the applicable load emission factor, in lb/MWh, as determined in Condition IV.B.5.c;**

(ii) For each hour in which a startup event occurs, for NO<sub>x</sub>, substitute 3.34 lbs/hour; for CO add 1.68 lbs; for VOC add 0.54 lbs. For each hour in which a shutdown event occurs, for NO<sub>x</sub> substitute 1.69 lbs/hr; for CO add 0.36 lbs; for VOC add 0.08 lbs. If both a startup and shutdown occur in the same hour, for NO<sub>x</sub> substitute 4.17 lbs/hour and for CO and VOC add emissions as specified.

(iii) For any period in which the engine is running but not in startup, shutdown or malfunction, and the associated control device is off-line as allowed under Condition IV.B.2, substitute the following values: For SCR offline, substitute 3.11 lb/MW-hr; for oxidation catalyst offline, substitute 6.22 lb/MW-hr for CO and 2.18 lb/MW-hr for VOC.

(b) Sum all the hourly emissions for each pollutant for each engine for the month.

(c) Sum the hourly emissions for each pollutant from all installed engines for the month and divide by 2000.

(d) Sum the 12 prior consecutive months for each pollutant for all installed engines. Compliance is demonstrated if the the calculated value is less than the limit for that pollutant in Condition IV.B.3.b.

5. Testing Requirements

- c. **Within 60 days of achieving maximum production after the issuance of SPR No. \_\_\_\_\_, but no later than 180 days after the initial startup, whichever occurs first, the Permittee shall conduct a performance test on one engine with each different control configuration for NO<sub>x</sub>, CO, VOC, PM<sub>10</sub> and PM<sub>2.5</sub> emissions using EPA Methods 7E, 10, 25A, 5, 201A and Method 202, or an EPA-approved alternative method. The performance test shall be conducted with at least one run at 50% load or slightly higher; one run at approximately 75% load, and one run at the maximum achievable load, where load percent is defined as the gross MWh generated during the run divided by the generator nameplate capacity for the run period. Each run shall last at least one hour. The Permittee shall record the heat input, in MMBtu/hr, and the energy output, in gross megawatt hour (MWh), during each run. The performance test report shall set forth the load, in percent, PM<sub>10</sub> and PM<sub>2.5</sub> emissions in lbs/hr and lbs/MWh for PM<sub>10</sub>/PM<sub>2.5</sub>, the emissions from each run (or group of runs) at 50%, 75% and maximum achievable load. The report shall calculate and report the following emission factors for NO<sub>x</sub>, CO, VOC, PM<sub>10</sub> and PM<sub>2.5</sub>:**

[A.A.C. R18-2-312]

- (1) For low load (any load less than 50%), the emission factor shall be the 50% test value in lb/MWh;**
- (2) For medium load (any load of 50% or greater, but less than 75%), the emission factor shall be the average of the 50% and 75% test values in lb/MWh;**
- (3) For moderate load (any load of 75% or greater, but less than the maximum achieved load), the emission factor shall be the average of the 75% and maximum achieved load test values in lb/MWh; and**
- (4) For high load (any load at or above the maximum achieved load), the emission factor shall be the maximum achieved load test value in lb/MWh.**