

**TECHNICAL REVIEW AND EVALUATION
OF APPLICATION FOR
AIR QUALITY PERMIT No. 100924**

I. INTRODUCTION

This Class II new permit is for the operation of Mineral Research Inc.'s (MRI) Cottonwood Plant. The plant previously operated under the Crushing and Screening General Permit (GP); however, the Department has determined that the plant does not qualify for the GP because the copper ore slag processed at this plant does not meet the definition of non-metallic minerals specified in 40 CFR 60.671. Pursuant to Arizona Administrative Code (A.A.C.) R18-2-510.D, the Department has required MRI to apply for a Class II permit for the plant.

A. Company Information

Company Name: Minerals Research, Inc.

Company Address: 705 E Birch St
Cottonwood, AZ 86326

Facility Name: Cottonwood Plant

Facility Address: 705 E Birch St
Cottonwood, AZ 86326

B. Attainment Classification

The MRI Cottonwood Plant is located in Yavapai County, which is designated attainment or undesignated for all criteria pollutants.

II. PROCESS DESCRIPTION

A. Process Description

The MRI Cottonwood Plant processes a historical copper smelter slag pile from the United Verde Extension Clemenceau Smelter to produce abrasive blasting products, roofing materials, and construction aggregate. Primary operations at the MRI Cottonwood Plant include secondary slag crushing, drying, screening, product storage, and product bagging and loading. Explosive blasting, primary slag crushing, and crushed slag stockpiling are conducted intermittently to replenish the crushed slag stockpile, allowing for a continuous stream of material available for the secondary crushing plant.

1. Explosive Blasting

Due to the material characteristics of slag, drilling and blasting must be conducted to separate fragments of slag from the raw slag pile for processing. Holes are drilled into the slag pile, and ammonium nitrate and fuel oil (ANFO) is used to fragment a portion of the slag pile for recovery by earthmoving equipment.

2. Primary Crushing and Screening Plant

Fragmented slag is fed to a primary crushing circuit, where it is crushed and screened to separate undersized slag ready for stockpiling from oversized slag requiring further processing. Undersized slag from the primary cone crusher is discharged to a stacker conveyor, where it is conveyed to the crushed slag stockpile for storage and further processing in the secondary crushing and screening plant.

3. Secondary Crushing and Screening Plant

Crushed slag is fed through a feed hopper into the secondary crushing plant, where a screen separates undersized material for drying and oversized material for further crushing. Oversized material is conveyed to the vertical shaft impact (VSI) crusher before being conveyed back to the initial screen for separation. Undersize slag from the screen is transferred to a fluidized bed dryer to dry the material and remove and capture fine particulates from the crushed slag before being conveyed to a triple deck split screen for separation into product grades. Material from the screens is conveyed to storage silos, where it is loaded into bulk bags and delivery trucks by gravity.

B. Control Devices

The MRI Cottonwood Plant operates two baghouses (BH-600 and BH-601) to control emissions of particulate matter from the fluidized bed dryer, triple deck screen, rotary air wash, and material transfer points. A bin vent is operated to control emissions of particulate matter from loading product into silos. Water sprays are used to control emissions of particulate matter from the primary crushing process and the secondary crushing plant's VSI crusher.

C. Process Flow Diagram(s)

Figure 1 illustrates the process flow diagram for the MRI Cottonwood Plant operation and details the emission release points.

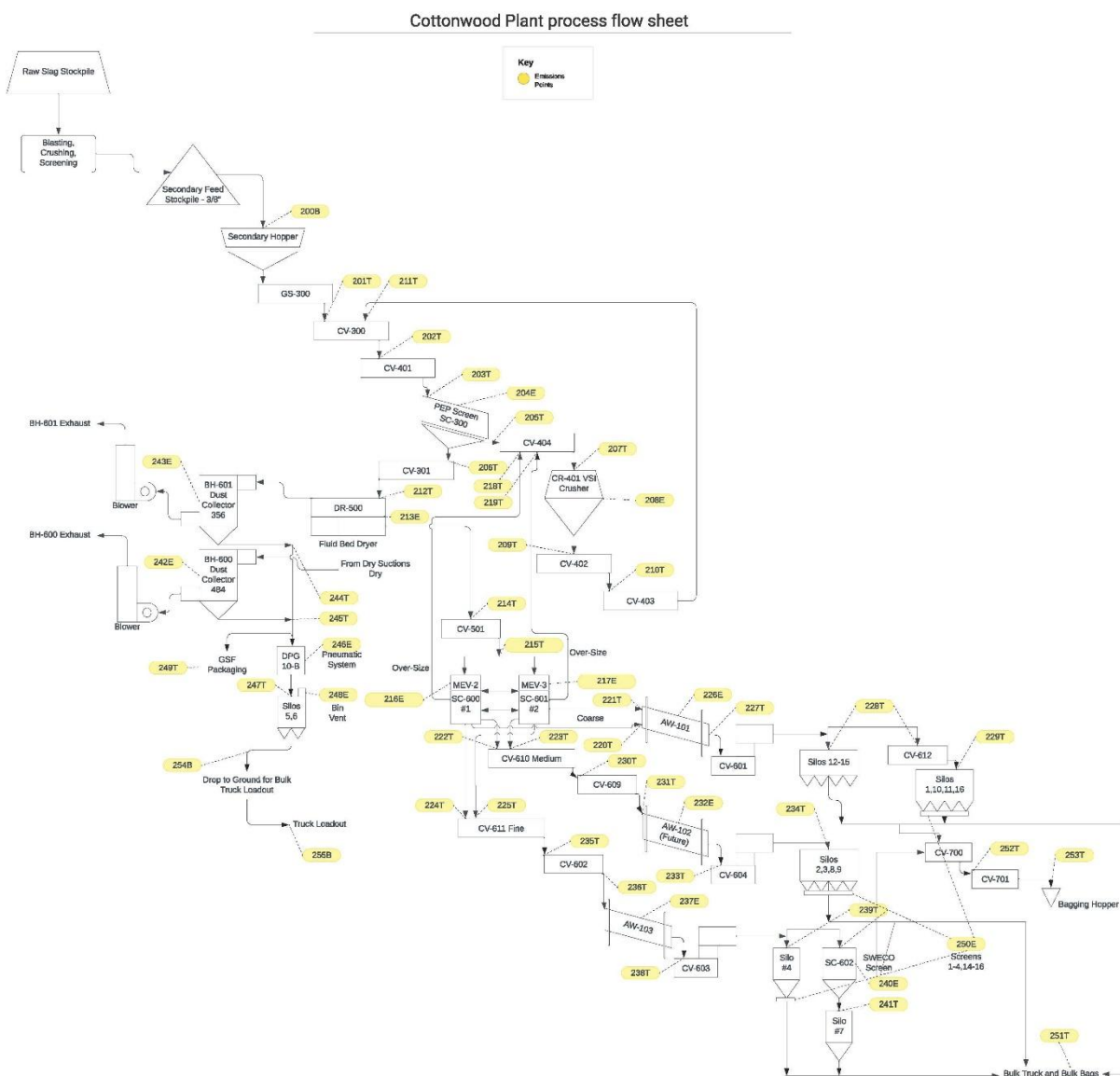


Figure 1: Cottonwood Facility Process Flow Diagram

III. COMPLIANCE HISTORY

The Arizona Department of Environmental Quality (ADEQ) performed twenty-eight (28) inspections at MRI since 2016: eight (8) complaints, eleven (11) full, and nine (9) partial inspections. Four (4) enforcement cases were generated following those inspections as detailed below:

A. Case ID 212764

A Notice of Opportunity to Correct (NOC) was issued to MRI on June 1, 2023 following the May 22, 2023 complaint inspection for failing to adequately wet material to minimize visible emissions. The ADEQ inspector observed visible emissions due to material leaking from the air wash seal, a sample port in the same area, and a hole in the dryer discharge hood. Documentation of repairs made was submitted to ADEQ and the NOC was closed on July 12, 2023.

B. Case ID 213422

A Notice of Violation (NOV) was issued to MRI on September 11, 2023 following the June 13, 2023 full inspection for failing to obtain the correct permit prior to operating a source subject to regulation. Initially, MRI applied for and was granted the Crushing and Screening General Permit after consulting with ADEQ and receiving instructions to apply for that permit.

After a File review and on-site inspection performed on June 13, 2023, ADEQ has determined that Minerals Research – Cottonwood Plant does not qualify for operation of its copper ore slag processing plant under ADEQ's Crushing & Screening General Permit. Title 40 Code of Federal Regulations (CFR) Part 60, Subpart OOO and the General Permit for Crushing and Screening is applicable to "Owners/operators of crushing and screening plants for non-metallic minerals as defined in 40 CFR 60.671." Furthermore, 40 CFR 60.671 defines Nonmetallic mineral as follows.

Nonmetallic mineral means any of the following minerals or any mixture of which the majority is any of the following minerals:

- (1) Crushed and Broken Stone, including Limestone, Dolomite, Granite, Traprock, Sandstone, Quartz, Quartzite, Marl, Marble, Slate, Shale, Oil Shale, and Shell.
- (2) Sand and Gravel.
- (3) Clay including Kaolin, Fireclay, Bentonite, Fuller's Earth, Ball Clay, and Common Clay.
- (4) Rock Salt.
- (5) Gypsum (natural or synthetic).
- (6) Sodium Compounds, including Sodium Carbonate, Sodium Chloride, and Sodium Sulfate.
- (7) Pumice.
- (8) Gilsonite.
- (9) Talc and Pyrophyllite.
- (10) Boron, including Borax, Kernite, and Colemanite.
- (11) Barite.
- (12) Fluorospar.
- (13) Feldspar.
- (14) Diatomite.
- (15) Perlite.
- (16) Vermiculite.
- (17) Mica.
- (18) Kyanite, including Andalusite, Sillimanite, Topaz, and Dumortierite.

Copper Ore slag does not meet the definition of a nonmetallic mineral in 40 CFR 60.671, therefore, the Cottonwood Plant cannot operate under this General Permit.

Based on this determination, on February 28, 2024, ADEQ terminated MRI's Crushing and Screening General Permit (LTF #72319).

C. Consent Order No. A-12-23

Consent Order No. A-12-23 became effective on October 12, 2023. The order was implemented as follow-up to Case ID 213422 to require MRI's compliance with the air quality permitting standards. The main components of the compliance schedule in the consent order required MRI to:

1. Be limited to its existing operation and equipment list without modification or any new installation of process equipment.
2. Limit the Primary Crushing and Screening plant to 2,000 tons per day and the Secondary Crushing and Screening plant to 190 tons per day of material processed and maintain records of operating hours and total daily material processed.
3. Limit PM₁₀ emissions from BH-600 and BH-601 to 0.0051 and 0.0146 lbs/ton, respectively.
4. Conduct PM₁₀ compliance performance tests on baghouses BH-600 and BH-601
5. Submit an administratively complete permit application by October 31, 2023.
6. Submit a Dust Control Plan by October 31, 2023 and update it as necessary.
7. Perform inspection and maintenance on all process and air pollution control equipment to assure operation without leaks and monitor opacity from both process equipment and fugitive sources.

MRI complied with all of the conditions above. However, this consent order was terminated on February 21, 2024 due to the January 31, 2024 performance test that showed emissions exceeding the PM₁₀ emissions limit from BH-600. The consent order limited PM₁₀ emissions from BH-600 to 0.0051 pounds per ton (lb/ton) of material processed, but emissions were measured on January 31, 2024 at 0.0162 lb/ton as shown in the test report dated February 10, 2024. The second performance test was conducted on February 10, 2024 and the emissions measured were at 0.0047 lb/ton, below the limit of 0.0051 lb/ton.

In addition, in response to MRI's February 23, 2024 Complaint and Temporary Restraining Order (TRO) filing asserting its ability to continue to operate, and pursuant to A.A.C. R18-2-510(D), ADEQ confirmed MRI's authority to operate its Cottonwood Plant under the individual air quality permit application submitted on October 31, 2023 and determined by ADEQ to be administratively complete on November 14, 2023.

D. Case ID 214846

A NOV was issued to MRI on August 24, 2023 following the August 22, 2023 partial inspection for failing to adequately wet material to minimize visible emissions. The ADEQ inspector observed the VSI Crusher operating without any water spray. When

the water spray was turned on, three of the sprayers were not operating properly. The ADEQ inspector also observed material dropping from the Air Wash to Xfines conveyor due to damage. Lastly, material was observed dropping from the scrubber conveyor belt and there was also a buildup of material on the Dryer Feed Conveyor tail pulley enclosure. Repairs were made, material buildup removed, and the Slide installed between the Air Wash and Xfines conveyor. Documentation of these actions was submitted to ADEQ and the NOV was closed on September 11, 2023.

IV. EMISSIONS

Emissions of particulate matter from crushing, screening, and material handling processes were evaluated using emissions factors from the Compilation of Air Emission Factors from Stationary Sources (AP-42) Chapter 11.19.2 for Crushed Stone and Pulverized Mineral Processing in Table 11.19.2-2. Material transfer processes controlled by baghouses were estimated to operate at 95% capture efficiency and 99% control efficiency. The bin vent for the product storage silos is also assumed to operate at 95% capture efficiency and 99% control efficiency. Emissions of particulate matter from the fluidized bed dryer were evaluated using emission factors from Table 11.19.2-4 for Pulverized Mineral Processing Operations. Particulate matter emissions resulting from product loading, feed hoppers, and conveying to stockpiles were evaluated using Expression 1 from AP-42 Chapter 13.2.4 for Aggregate Handling and Storage Piles. Emissions of particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, and volatile organic compounds from combustion of natural gas in the fluidized bed dryer were evaluated using emission factors from AP-42 Chapter 1.4 for Natural Gas Combustion.

Fugitive emissions of particulate matter resulting from wind erosion from the primary crusher slag storage pile were evaluated using the methodologies in AP-42 Chapter 13.2.5 for Industrial Wind Erosion. Fugitive emissions of particulate matter from vehicle and equipment traffic were evaluated using Equation 1a in AP-42 Chapter 13.2.2 for Unpaved Roads assuming 5.1% silt content for plant roads and 10-ton average vehicle weight. Fugitive emissions of particulate matter from explosive blasting processes were evaluated using emissions factors from AP-42 Chapter 11.9 for Western Surface Coal Mining, while emissions of NO_x, SO₂, and CO were evaluated using emission factors from AP-42 Chapter 13.3.3 for Explosives Detonation.

Emissions for baghouses BH-600 and BH-601 are calculated using proposed emission limits (lb/ton) and maximum process rates (ton/hour, ton/day, and ton/year).

Table 2 summarizes the facility-wide potential-to-emit (PTE) for criteria pollutants as well as heavy metal hazardous air pollutants (HAPs).

Table 1: Potential to Emit (tpy)

Pollutant	PTE ¹	Permitting Exemption Threshold	Minor NSR Triggered?
NO _x	3	20	No
PM ₁₀	4.27	7.5	No
PM _{2.5}	1.64	5	No
CO	3.53	50	No

SO ₂	0.04	20	No
VOC	0.16	20	No
Pb	1.12E-03	0.3	No
Heavy Metal HAPs	5.33E-03	N/A	N/A

¹PTE includes both fugitive and non-fugitive emissions. Although only non-fugitive emissions are used to determine permit applicability, MRI includes both.

V. MINOR NEW SOURCE REVIEW (NSR)

Minor New Source Review (NSR) is required if a new source has a PTE of any regulated air pollutant at an amount greater than or equal to the permitting exemption thresholds identified in Table 2. Because the PTEs for all pollutants are below the applicable permitting exemption thresholds, the facility is not subject to minor NSR.

Facilities subject to minor NSR must either implement Reasonably Available Control Technology (RACT) or conduct air dispersion modeling. Although the Cottonwood plant is exempt from these requirements, MRI has voluntarily performed air dispersion modeling to demonstrate compliance with National Ambient Air Quality Standards (NAAQS). Because particulate matter (PM) is the main pollutant of concern due to crushing and screening operations, MRI conducted air dispersion modeling for PM₁₀ and PM_{2.5}. Section X provides a detailed discussion of the modeling analysis. No modeling was conducted for other criteria pollutants, as their PTE falls well below permitting exemption thresholds and the plant's ambient air impacts are expected to be negligible.

VI. VOLUNTARILY ACCEPTED EMISSION LIMITATIONS AND STANDARDS

A. Operation/Throughput Limits

The facility has voluntarily accepted the following operation/throughput limits. These limits are incorporated into Permit No. 100924.

1. Hours of Operations

MRI shall only operate the Cottonwood plant between the hours of 6:00 AM and 10:00 PM Local Time.

2. Primary Crushing and Screening Plant

The amount of total material processed by the primary crushing and screening plant shall be limited to no more than 2,200 tons per day.

The amount of total material processed by the primary crushing and screening plant shall be limited to no more than 150,000 tons over a rolling 12-month period.

3. Secondary Crushing and Screening Plant

The amount of total material processed by the secondary crushing and screening plant shall be limited to no more than 330 tons per day.

The amount of total material processed by the secondary crushing and screening plant shall be limited to no more than 87,600 tons over a rolling 12-month period.

4. Blasting

The blasting activity shall be limited to no more than one blast per day.

The blasting activity shall be limited to no more than 11 events in any rolling 12-month period.

The maximum ammonium nitrate-fuel oil (ANFO) usage during blasting shall be limited to no more than 1.741 tons per event.

The maximum horizontal area for blasting should be limited to no more than 6,412 square feet per event.

MRI shall not perform any blasting operations when sustained wind speed is 25 miles per hour (mph) or higher.

MRI shall only perform blasting operations between 9 AM and 4 PM local time.

B. Emission Limits

The facility has voluntarily accepted the following emission limits. These limits are incorporated into Permit No. 100924.

1. Emissions of PM₁₀ discharged into the atmosphere from BH-600 shall not exceed 0.013 pounds per ton of material processed in the secondary crushing and screening plant.
2. Emissions of PM₁₀ discharged into the atmosphere from BH-601 shall not exceed 0.033 pounds per ton of material processed in the secondary crushing and screening plant.
3. Despite being higher than the emission limits in Consent Order No. A-12-23, these new emission limits still demonstrate NAAQS compliance through the modeling analysis as discussed in Section X.

VII. APPLICABLE REGULATIONS

Table 2 identifies applicable regulations and verification as to why that standard applies. The table also contains a discussion of any regulations the emission unit is exempt from.

Table 2: Applicable Regulations

Emissions Unit	Control Device	Rule	Discussion
Crushing and Screening	Water Suppression, Baghouse	40 CFR 60 Subpart LL	40 CFR 60 Subpart LL for Metallic Mineral Processing Plants applies to any combination of equipment that produces mineral concentrates

Emissions Unit	Control Device	Rule	Discussion
			from ore. The MRI Cottonwood does not process ore, nor does it produce mineral concentrates, therefore the facility is not subject to 40 CFR 60 Subpart LL.
Crushing and Screening	Water Suppression, Baghouse	40 CFR 60 Subpart OOO	40 CFR 60 Subpart OOO for Nonmetallic Mineral Processing Plants applies to plants processing nonmetallic minerals, as defined in 40 CFR 60.671. Slag is not included in this definition; therefore, the MRI Cottonwood plant is not subject to 40 CFR 60 Subpart OOO.
Crushing and Screening	Water Suppression, Baghouse	A.A.C. R18-2-721	A.A.C. R18-2-721 for Existing Nonferrous Metals Industry Sources applies to equipment processing nonferrous metals. Copper slag is a mixture of metal oxides, primarily consisting of ferrous oxides, and silicate; therefore, the MRI Cottonwood Crushing and Screening Plants are not subject to A.A.C. R18-2-721.
Crushing and Screening	Water Suppression, Baghouse	A.A.C. R18-2-722	A.A.C. R18-2-722 for Existing Gravel or Crushed Stone Processing Plants applies to equipment processing gravel or crushed stone. Slag is not considered to be gravel or stone; therefore, the MRI Cottonwood Crushing and Screening Plants are not subject to A.A.C. R18-2-722.
Crushing and Screening	Water Suppression, Baghouse	A.A.C. R18-2-730	A.A.C. R18-2-730 for Unclassified Sources applies to sources that are not subject to standards of performance under Articles 7, 9, or 11 of Title 18, Chapter 2 of the A.A.C. The MRI Cottonwood Crushing and Screening Plants are not subject to standards under Article 7 of the A.A.C.,

Emissions Unit	Control Device	Rule	Discussion
			the New Source Performance Standards, and the National Emissions Standards for Hazardous Air Pollutants; therefore, the MRI Cottonwood Plant is subject to A.A.C. R18-2-730.
Fluidized Bed Dryer	Baghouse	40 CFR 60 Subpart LL	40 CFR 60 Subpart LL for Metallic Mineral Processing Plants applies to any combination of equipment that produces mineral concentrates from ore. The MRI Cottonwood fluidized bed dryer does not process ore, nor does it produce mineral concentrates, therefore the facility is not subject to 40 CFR 60 Subpart LL.
Fluidized Bed Dryer	Baghouse	40 CFR 60 Subpart UUU	40 CFR 60 Subpart UUU for Calciners and Dryers in Mineral Industries applies to calciners and dryers that process or produce materials, concentrates, or mixtures of materials of which the majority is any of the minerals identified in the definition of “mineral processing plant” in 40 CFR 60.731. Less than 50% of processed minerals are used as roofing granules, therefore 40 CFR 60 Subpart UUU does not apply.
Fluidized Bed Dryer	Baghouse	A.A.C. R18-2-730	A.A.C. R18-2-730 for Unclassified Sources applies to sources that are not subject to standards of performance under Articles 7, 9, or 11 of Title 18, Chapter 2 of the A.A.C. The MRI Cottonwood Plant fluidized bed dryer is not subject to standards under Article 7 of the A.A.C., the New Source Performance Standards, and the National Emissions Standards for

Emissions Unit	Control Device	Rule	Discussion
			Hazardous Air Pollutants; therefore, the MRI Cottonwood Plant fluidized bed dryer is subject to A.A.C. R18-2-730.
Product Storage and Loading	Bin Vent	A.A.C. R18-2-730	A.A.C. R18-2-730 for Unclassified Sources applies to sources that are not subject to standards of performance under Articles 7, 9, or 11 of Title 18, Chapter 2 of the A.A.C. The MRI Cottonwood Plant is not subject to standards under Article 7 of the A.A.C., the New Source Performance Standards, and the National Emissions Standards for Hazardous Air Pollutants; therefore, the MRI Cottonwood Plant is subject to A.A.C. R18-2-730.
Fugitive Dust Sources	Water Trucks, Dust Suppressants	A.A.C. R18-2 Article 6	These standards are applicable to all fugitive dust sources at the facility.
Abrasive Blasting	Wet blasting; Dust collecting equipment; Other approved methods	A.A.C. R18-2-702 A.A.C. R18-2-726	These standards are applicable to any abrasive blasting operation.
Spray Painting	Enclosures	A.A.C. R18-2-702 A.A.C. R18-2-727	These standards are applicable to any spray painting operation.
Demolition/Renovation Operations	N/A	A.A.C. R18-2-1101.A.12	This standard is applicable to any asbestos related demolition or renovation operations.

VIII. MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

Table 3 contains an inclusive but not an exhaustive list of the monitoring, recordkeeping and reporting requirements prescribed by the air quality permit. The table below is intended to provide insight to the public for how the Permittee is required to demonstrate compliance with the emission limits in the permit. Records are required be kept for a minimum of 5 years as outlined in Section XII of Attachment “A” of the permit.

Table 3: Permit No. 1000924

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Primary Crushing and Screening Plant			Do not process greater than 2,200 tons of material per day and 150,000 tons of material over a rolling 12-month period	Record the total weight of the material processed for each operating day; record the sum of the total weight of material processed for each month; maintain a log of the rolling 12-month total throughput	Semiannual report of tons processed
Primary Crushing and Screening Plant	Opacity	20%	Conduct a survey of visible emissions for each operating day and perform monthly periodic inspections to check that water is properly flowing to discharge spray nozzles in the wet suppression system		Semiannual report of days exceeding 20% opacity and weekly nozzles corrected
Secondary Crushing and Screening Plant			Do not process greater than 330 tons of material per day and 87,600 tons of material over a rolling 12-month period	Record the total weight of the material processed for each operating day; record the sum of the total weight of material processed for each month; maintain a log of	Semiannual report of tons processed.

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
				the rolling 12-month total throughput	
Secondary Crushing and Screening Plant	Opacity	20%	Conduct a survey of visible emissions for each operating day and perform monthly periodic inspections to check that water is properly flowing to discharge spray nozzles in the wet suppression system		Semiannual report of days exceeding 20% and weekly nozzles corrected
Baghouse BH-600	PM ₁₀	0.013 pounds per ton of material processed in the secondary crushing and screening plant	During each production shift, record the pressure differential and inspect ducting to the baghouses to ensure proper capture and control of the associated processes; semiannual black light inspection Within 180 days of issuance of the permit, conduct performance tests in accordance with EPA Reference Method 5 or EPA Reference Method 201A to demonstrate compliance with the emissions standards; conduct subsequent performance tests on an annual basis.	Maintain a log of each inspection of the baghouse pressure differential, and baghouse ducting	Semiannual report of times when baghouses operating out of range

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Baghouse BH-601	PM ₁₀	0.033 pound per ton of material processed in the secondary crushing and screening plant	During each production shift, record the pressure differential and inspect ducting to the baghouses to ensure proper capture and control of the associated processes; Within 180 days of issuance of the permit, conduct performance tests in accordance with EPA Reference Method 5 or EPA Reference Method 201A to demonstrate compliance with the emissions standards; conduct subsequent performance tests on an annual basis.		Semiannual report when baghouse operating out of range
Blasting/Fugitive Dust	Opacity	40%	Conduct a daily survey of visible emissions. No blasting allowed during high wind events		Submit to the Director for approval a dust control plan for the control of fugitive dust emissions from fugitive dust producing activities (e.g. haul roads, storage piles, etc.); Conduct annual review of effectiveness of fugitive dust control plan.
Abrasive Blasting	Opacity	20%		Record the date, duration and pollution control measures of any abrasive blasting project.	

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Spray Painting	VOC	20% Opacity Control 96% of the overspray		Maintain records of the date, duration, quantity of paint used, any applicable MSDS, and pollution control measures of any spray painting project.	
Demolition/ Renovation	Asbestos			Maintain records of all asbestos related demolition or renovation projects including the "NESHAP Notification for Renovation and Demolition Activities" form and all supporting documents	

IX. LEARNING SITE EVALUATION

In accordance with ADEQ's Environmental Permits and Approvals near Learning Sites Policy, the Department is required to conduct an evaluation to determine if any nearby learning sites would be adversely impacted by the facility. Learning sites consist of all existing public schools, charter schools, and private schools K-12 level, and all planned sites for schools approved by the Arizona School Facilities Board. The learning sites policy was established to ensure that the protection of children at learning sites is considered before a permit approval is issued by ADEQ.

There are multiple learning sites within 2 miles of the Cottonwood plant and thus, it is subject to the Learning Sites Policy. As noted in Section X.I.1, the results of this analysis indicate that the Cottonwood facility is not expected to pose any significant health risks to children at learning sites.

X. AMBIENT AIR IMPACT ANALYSIS

As previously discussed, the Cottonwood plant is exempt from minor NSR requirements and as such, a modeling analysis is not required. However, MRI has voluntarily performed air dispersion modeling to demonstrate that the Cottonwood plant's operations comply with National Ambient Air Quality Standards (NAAQS) for PM₁₀ and PM_{2.5}. The NAAQS are health-based air quality standards developed by EPA and are measured in terms of the total concentration of the applicable pollutant in the atmosphere. For a new source, compliance with the NAAQS is based upon the maximum ambient concentrations, which are the sum of the background concentrations and the modeled ambient impacts of the Cottonwood plant's potential emissions.

Additionally, as discussed in Section IX, a learning site evaluation is also triggered for the Cottonwood plant as there are learning sites within 2 miles of the Cottonwood plant. Therefore, MRI conducted modeling to demonstrate that the project's impacts on learning sites would be below Acute/Chronic Ambient Air Concentrations (AAAC and CAAC) for hazardous air pollutants (HAPs). The Department further evaluated the HAPs impacts on nearby residential areas.

MRI submitted its initial modeling analysis and permit application in October 2023, followed by updates in May 2024, March 2025, June 2026 and July 2026. The Department reviewed these submissions and performed its own modeling analysis. Guidance for performing air quality dispersion modeling analyses is set forth in the EPA's Guideline on Air Quality Models (40 CFR Part 51 Appendix W) and the Air Dispersion Modeling Guidelines for Arizona Air Quality Permits, November 1, 2019 (ADEQ's Modeling Guidelines).

A. Model Selection

The American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) model is the EPA-preferred model for estimating impacts at receptors located in simple terrain and complex terrain (within 50 kilometers of a source) due to emissions from industrial sources. The AERMOD modeling system consists of three major components: AERMAP, used to process terrain data and develop elevations for receptors; AERMET, used to process the meteorological data;

and the AERMOD dispersion model, used to model the ambient pollutant concentrations.

MRI utilized AERMOD version 24142 for the Cottonwood plant's ambient air impact analysis. Although the EPA recently released a new version of AERMOD on July 9, 2026, the Department has reviewed the EPA's transmittal memorandum and determined that these updates will not affect the modeled concentrations for the facility.

B. Source Inputs

This section provides a discussion on source characterization to develop appropriate source inputs, including modeled emission rates, source configuration and source types.

1. Project Overview

The MRI's Cottonwood plant processes copper slag to produce loose abrasives, roofing sand, roofing granules, road aggregates, asphalt fillers, and cement additives. Primary operations at the plant include secondary slag crushing, drying, screening, product storage, and product bagging and loading. Explosive blasting, primary slag crushing, and crushed slag stockpiling are conducted intermittently to replenish the crushed slag stockpile.

2. Modeled Emission Rates

a. Modeled Emission Rates for PM₁₀ and PM_{2.5}

MRI calculated the maximum 24-hour average emission rates based on the maximum daily process rates for primary and secondary crushing and screening plants as stipulated in the permit conditions. The maximum 24-hour average emission rates were modeled to demonstrate compliance with 24-hour PM₁₀ and PM_{2.5} standards.

MRI calculated the annual average emission rates using maximum annual process rates for primary and secondary crushing and screening plants as stipulated in the permit conditions. The annual average emission rates were modeled to demonstrate compliance with the annual standards for PM_{2.5}.

b. Modeled Emission Rates for Heavy Metal HAPs

MRI calculated the maximum hourly and annual average emission rates for particulate matter (PM) using the respective maximum hourly and annual process rates for the primary and secondary crushing and screening plants. The modeled maximum hourly average concentrations for heavy metal HAPs were estimated by multiplying the modeled maximum hourly average concentration of PM by the highest heavy metal fractions found in the slag samples. Similarly, the modeled annual average concentrations for heavy metal HAPs were estimated by multiplying the modeled annual average concentration of PM by the average heavy metal fractions found in the slag samples.

Table 4 summarizes the maximum process rates used in emission inventories.

Table 4: Maximum Process Rates Used in Emission Inventories

Units	Maximum Hourly Process Rate (tons per hour)	Maximum Daily Process Rate (tons per day)	Maximum Annual Process Rate (tons per year)
Primary Crushing and Screening Plant	250	2,200	150,000
Secondary Crushing and Screening Plant	30	330	87,600

3. Source Characterization

a. Point Sources

Dust collectors (baghouses BH-600 and BH-601) were modeled as individual point sources. Release parameters (stack height, stack diameter, gas temperature, and volumetric flow rate) for these point sources were derived from a combination of testing data and vendor specifications. The bin vent used to control particulate matter emissions during product silo loading was also modeled as a point source.

b. Volume Sources

MRI characterized the emissions from crushing and screening operations, batch drop operations, material transfer operation, blasting, trucks traveling on unpaved roads as volume sources. The volume source parameters, including initial lateral dimension (σ_{y0}), initial vertical dimension (σ_{z0}) and release height, were estimated based on the horizontal and vertical dimensions of the volume source, following the guidance from ADEQ and the AERMOD User's Guide.

To model blasting, MRI used OBODM (Open Burn/Open Detonation Model) to estimate the horizontal dimension and the release height of plume and then modeled the blasting emissions as a volume source.

c. Area Sources

The stockpiles were modeled as area sources. Road segments that were within the exclusion zone of a defined volume source were modeled as an area source. Emissions for the area source segment were calculated as the total of the emissions from the volume source segments within that area source zone. In accordance with the ADEQ's recommendation, receptors situated within 1

meter of an area source were relocated to a distance of 1 meter away from the area source.

A. Meteorological Data

1. Meteorological Data Selection

Cottonwood Airport is located approximately 0.85 miles west of the facility, and its meteorological data is considered the most representative of the area. However, the Department found that a significant portion of the data is missing, failing to meet regulatory completeness requirements. Additionally, the station does not report wind speeds below 1.5 m/s (categorizing them as “calm hours”), resulting in an absence of low-wind conditions. Therefore, using Cottonwood Airport data for regulatory modeling poses a significant challenge.

To address this challenge, the Department explored a hybrid dataset combining observations from the Cottonwood and Prescott Regional Airports. To address the missing values and frequent calm hours in the Cottonwood records, the Department substituted those gaps with surface data from Prescott Regional Airport. As an Automated Surface Observing System (ASOS) station, the Prescott site provides the most comprehensive meteorological data in the region. This substitution is appropriate because southern winds dominate the Prescott dataset and represent a significant component of Cottonwood’s wind profile. Furthermore, the Prescott data effectively captures the low-wind conditions necessary for a complete analysis.

As an alternative, the Department also recommended MRI to evaluate five years of meteorological data collected from the Phoenix Cement Company (PCC) facility, located approximately 5 miles northwest of the Cottonwood plant. Data collection from the PCC’s monitor was consistent with EPA recommendations for instrumentation and completeness.

Both the hybrid airport dataset and the PCC dataset were used in the Cottonwood plant’s ambient air impact analysis.

1. Meteorological Data Processing

a. PCC Meteorological Data Processing

MRI used AERMET meteorological preprocessor to process 5-years of PCC surface data (2018-2022) along with cloud cover data from the U.S. National Climatic Data Center (NCDC) for Prescott Municipal Airport, and upper air radiosonde data from the Flagstaff station within the National Weather Service (NWS) Rawinsonde Network. MRI also used the EPA’s AERSURFACE tool (v20060) to calculate surface characteristic parameters (albedo, Bowen ration and surface roughness) required by AERMET. MRI implemented the adjusted surface friction (ADJ_U*) option when processing meteorological data.

b. Hybrid Meteorological Data Processing

The Department used AERMET to process 2023-2024 Cottonwood Airport data in conjunction with concurrent surface data from Prescott Regional Airport and Flagstaff upper-air data. In this configuration, AERMET treated the Cottonwood Airport observations as “site-specific” data, substituting missing values with Prescott Regional Airport data. The ADJ_U* option was also applied during this processing.

B. Ambient Air Boundary and Receptor Network

The applicants are required to demonstrate modeled compliance with the NAAQS at receptors spaced along and outside the ambient air boundary (AAB). For modeling purposes, the atmosphere over land owned or controlled by the stationary source may be excluded from ambient air “where the source employs measures, which may include physical barriers, that are effective in precluding access to the land by the general public”.¹

MRI used the Cottonwood operations boundary as the ambient air boundary for modeling purposes. MRI is required to use fencing, signage, security patrols, and/or other measures to effectively preclude the public access.

Following ADEQ Guidelines, MRI set up a receptor network to determine areas of maximum predicted concentrations. The grid spacing utilized for the receptors are as follows: ambient area boundary set at 25 m intervals; fine receptor grid of 100 m, extending from AAB to 1 kilometers (km); medium receptor grid of 350 m, extending from 1 km to 5 km; coarse grid receptor grid of 750 m, extending from 5 km to 20 km. MRI used the AERMAP terrain processor (version AERMAP - Version 18081) to process the National Elevation Data (NED) 1/3 arc second data to generate the receptor elevations and hill heights.

C. Land Use Classification

The rural/urban classification of an area is determined by either the dominance of a specific land use or by population data in the study area. The land-use procedure specifies that the land-use within a three-kilometer radius of the source should be determined using the typing scheme developed by Auer.² Although the project site could be specified as “Urban” based on the land use method, MRI utilized the default, rural dispersion coefficient for the modeling analysis. The Department conducted the modeling analysis using the “Urban” option and found that the resulting concentrations

¹ EPA. 2019. Revised Policy on Exclusions from “Ambient Air”.
https://www.epa.gov/sites/production/files/2019-12/documents/revised_policy_on_exclusions_from_ambient_air.pdf

² Auer, A.H. 1978. Correlation of Land Use and Cover with Meteorological Anomalies, *Journal of Applied Meteorology*, 17:636-643.

were lower than those using the “Rural” option. Therefore, using the “Rural” option is conservative; therefore, the TSD only reports results based on the “Rural” option.

D. Building Downwash Effects

MRI evaluated building downwash effects based on building and stack location and dimensions, and the EPA's Building Profile Input Program Plume Rise Model Enhancements (BPIP-PRME).

E. Background Concentration

Background concentrations should be representative of regional air quality in the vicinity of a facility. Typically, background concentrations should be determined based on the air quality data collected in the vicinity of the proposed project site. However, if there are no monitors located in the vicinity of the project, a “regional site” may be used to determine background concentrations. Per Appendix W Section 8.3.2 b, a regional site is *“one that is located away from the area of interest but is impacted by similar or adequately representative sources.”*

Because no active monitors are in the immediate vicinity of the Cottonwood facility, a regional site was required.

1. Background Concentration for 24-hour PM₁₀

In Arizona, the PM₁₀ monitoring data are strongly influenced by the climate, elevation and precipitation of the area where a monitoring station is located.

MRI selected the Payson Well monitor in Payson as a representative site for determining PM₁₀ background concentrations. As the closest active PM₁₀ monitor to the facility, the Payson Well site is located within the same climate zone and shares a similar city setting - including surrounding land cover and localized emission sources. Therefore, the Department determined that the Payson Well monitor is a representative site for establishing PM₁₀ background concentrations at the Cottonwood area. Based on the three-year average of the second-highest 24-hour PM₁₀ concentrations from 2023 through 2025, MRI calculated a background value of 74 µg/m³.

Additionally, the Department reviewed historical data (2011-2013) from the Prescott Valley monitor. Although this monitor was deactivated in 2014, the data is considered representative of current air quality in the Cottonwood area. For this monitor, the average of the annual highest 24-hour values was 60 µg/m³, while the average of the annual second-highest 24-hour values was 29 µg/m³.

To address community concerns regarding potential health impacts from nearby dust sources including the Cottonwood slag pile, the Department conducted ambient monitoring for PM₁₀ in the Cottonwood area between February 15, 2024, and June 9, 2024. Two monitoring sites were established: VFW Post and Kids Park. Because PM₁₀ levels at the VFW Post were significantly influenced by MRI's Cottonwood operations, they were deemed unsuitable for determining background concentration. However, the Kids Park data is considered a valid representation of

background levels for the area, yielding the highest concentration of 37 $\mu\text{g}/\text{m}^3$ and the second highest of 27 $\mu\text{g}/\text{m}^3$.

Despite the lower local readings, the Department selected 74 $\mu\text{g}/\text{m}^3$ for NAAQS compliance demonstration. While this may overestimate Cottonwood's background levels, it provides a conservative and defensible approach.

2. Background Concentration for 24-hour and Annual $\text{PM}_{2.5}$

The spatial variations of $\text{PM}_{2.5}$ are typically smaller compared to PM_{10} because the long atmospheric residence time of fine particles allows long-range transport and leads to more uniform mass concentrations.

MRI selected the Alamo Lake monitor, an ADEQ-operated regional-scale site, for determining $\text{PM}_{2.5}$ background concentrations. While it is the closest active $\text{PM}_{2.5}$ monitor, its remote setting differs from the city environment of Cottonwood. To ensure this site is defensible, the Department also examined historical data from Prescott Valley.

MRI calculated $\text{PM}_{2.5}$ background values using Alamo Lake monitoring data from 2022, 2024, and 2025. Data from 2023 was excluded because its annual average concentration was significantly lower than in other years. The resulting 24-hour average and annual average background concentrations are 11 $\mu\text{g}/\text{m}^3$ and 4.2 $\mu\text{g}/\text{m}^3$, respectively. Historical data from the Prescott Valley monitor (2011- 2013) showed similar results: an annual average of 4.1 $\mu\text{g}/\text{m}^3$ and a 24-hour average of 9.7 $\mu\text{g}/\text{m}^3$.

Based on these findings, the Department selected 11 $\mu\text{g}/\text{m}^3$ (24-hour) and 4.2 $\mu\text{g}/\text{m}^3$ (annual) as the background concentrations for the NAAQS compliance analysis.

F. NAAQS Model Results

Tables 5 and 6 summarize the NAAQS model results using PCC meteorological data and hybrid airport data, respectively. Representative background concentrations were added to modeled concentration, and the total concentrations were then compared to the NAAQS. As shown in the tables, emissions from the proposed project will not cause or contribute to a violation of the NAAQS, provided the facility operates within the limitations and conditions specified in the permit.

Table 5: NAAQS Model Results – PCC Meteorological Data

Pollutant	Averaging Period	Design Value	Modeled Concentration ($\mu\text{g}/\text{m}^3$)	Background Concentration ($\mu\text{g}/\text{m}^3$)	Total Concentration ($\mu\text{g}/\text{m}^3$)	NAAQS ($\mu\text{g}/\text{m}^3$)	Exceeds NAAQS?
PM_{10}	24-hour	H6H ^a	53.4	74	127.4	150	No
$\text{PM}_{2.5}$	Annual	H1H ^b	3.2	4.2	7.4	9	No
	24-hour	H8H ^c	8.9	11	19.9	35	No

^a The design concentration is dependent on the number of meteorological data years used in the analysis. The design concentration is the highest, sixth highest 24-hour modeled concentration across all receptors when five years of meteorological data are used.

^b The highest modeled concentration across all receptors.

^c The highest of the 8th-highest (98th percentile) modeled concentration across all receptors.

Table 6: NAAQS Model Results – Hybrid Airport Meteorological Data

Pollutant	Averaging Period	Design Value	Modeled Concentration ($\mu\text{g}/\text{m}^3$)	Background Concentration ($\mu\text{g}/\text{m}^3$)	Total Concentration ($\mu\text{g}/\text{m}^3$)	NAAQS ($\mu\text{g}/\text{m}^3$)	Exceeds NAAQS?
PM ₁₀	24-hour	H3H ^a	66.8	74	140.8	150	No
PM _{2.5}	Annual	H1H ^b	4.3	4.2	8.5	9	No
	24-hour	H8H ^c	12.6	11	23.6	35	No

^a The design concentration is dependent on the number of meteorological data years used in the analysis. The design concentration is the third highest 24-hour modeled concentration across all receptors when two years of meteorological data are used.

^b The highest modeled concentration across all receptors.

^c The highest of the 8th-highest (98th percentile) modeled concentration across all receptors.

B. HAPs Model Results

1. Impacts on Learning Sites

Tables 7 and 8 summarize the modeled impacts of HAPs at learning sites. The modeled maximum hourly concentrations are compared to the AAACs, while the modeled annual concentrations are compared to the CAACs, respectively. As shown in tables, the modeled impacts of HAPs at learning sites are well below the AAAC and CAAC thresholds. These results indicate that the Cottonwood facility is not expected to pose any significant health risks to children at learning sites.

Table 7: Modeled Impacts of HAPs at Learning Sites - PCC Meteorological Data

HAP	1-hour Average Modeled Concentrations	AAAC ($\mu\text{g}/\text{m}^3$)	Exceeding Acute Thresholds?	Annual Average Modeled Concentrations	CAAC ($\mu\text{g}/\text{m}^3$)	Exceeding Chronic Thresholds?
Antimony	2.35E-03	13,000	No	3.85E-06	1.46	No
Arsenic	5.71E-02	2500	No	1.12E-04	0.000441	No
Beryllium	7.61E-05	13	No	2.20E-07	0.00079	No
Cadmium	1.71E-03	250	No	3.85E-06	0.00105	No
Chromium	7.29E-03	100	No	1.16E-05	0.000158	No
Cobalt	1.78E-02	10000	No	2.40E-05	0.000686	No
Lead	0.0412	0.15 ¹	No	7.55E-05	0.15 ¹	No
Manganese	2.06E-02	2500	No	7.15E-05	0.0521	No
Nickel	2.82E-02	5000	No	5.17E-06	0.0079	No

Selenium	2.82E-03	500	No	5.06E-06	18.3	No
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¹No AAAC or CAAC available for lead; evaluated against the NAAQS of 0.15 µg/m³ (3-month average)

Table 8: Modeled Impacts of HAPs at Learning Sites - Hybrid Airport Meteorological Data

HAP	1-hour Average Modeled Concentrations	AAAC (µg/m ³)	Exceeding Acute Thresholds ?	Annual Average Modeled Concentrations	CAAC (µg/m ³)	Exceeding Chronic Thresholds ?
Antimony	2.42E-03	13,000	No	3.85E-06	1.46	No
Arsenic	5.88E-02	2500	No	1.12E-04	0.00044 ₁	No
Beryllium	7.84E-05	13	No	2.20E-07	0.00079	No
Cadmium	1.76E-03	250	No	3.85E-06	0.00105	No
Chromium	7.51E-03	100	No	1.16E-05	0.00015 ₈	No
Cobalt	1.83E-02	10000	No	2.40E-05	0.00068 ₆	No
Lead	0.0425	0.15 ¹	No	7.55E-05	0.15 ¹	No
Manganese	2.12E-02	2500	No	7.15E-05	0.0521	No
Nickel	2.91E-02	5000	No	5.17E-06	0.0079	No
Selenium	2.91E-03	500	No	5.06E-06	18.3	No

¹No AAAC or CAAC available for lead; evaluated against the NAAQS of 0.15 µg/m³ (3-month average)

2. Impacts on Residential Areas

The modeled HAP impacts for residential areas are detailed in Tables 9 and 10. Residences on the north side of the Cottonwood Plant experienced the highest modeled concentrations. Because these residences are located directly downwind, their concentrations are higher than those at learning sites; however, all modeled levels remain below the AAAC and CAAC thresholds.

Table 9: Modeled Impacts of HAPs at Residential Areas - PCC Meteorological Data

HAP	1-hour Average Modeled Concentrations	AAAC (µg/m ³)	Exceeding Acute Thresholds ?	Annual Average Modeled Concentrations	CAAC (µg/m ³)	Exceeding Chronic Thresholds ?
Antimony	4.88E-03	13,000	No	8.24E-06	1.46	No
Arsenic	1.19E-01	2500	No	2.40E-04	0.00044 ₁	No
Beryllium	1.58E-04	13	No	4.71E-07	0.00079	No
Cadmium	3.56E-03	250	No	8.24E-06	0.00105	No
Chromium	1.52E-02	100	No	2.47E-05	0.00015 ₈	No
Cobalt	3.69E-02	10000	No	5.13E-05	0.00068 ₆	No
Lead	0.0857	0.15 ¹	No	1.61E-04	0.15 ¹	No

Manganese	4.29E-02	2500	No	1.53E-04	0.0521	No
Nickel	5.87E-02	5000	No	1.11E-05	0.0079	No
Selenium	5.87E-03	500	No	1.08E-05	18.3	No

¹No AAAC or CAAC available for lead; evaluated against the NAAQS of 0.15 µg/m³ (3-month average)

Table 10: Modeled Impacts of HAPs at Residential Area - Hybrid Airport Meteorological Data

HAP	1-hour Average Modeled Concentrations	AAAC (µg/m ³)	Exceeding Acute Thresholds ?	Annual Average Modeled Concentrations	CAAC (µg/m ³)	Exceeding Chronic Thresholds ?
Antimony	4.61E-03	13,000	No	1.28E-05	1.46	No
Arsenic	1.12E-01	2500	No	3.72E-04	0.000441	No
Beryllium	1.49E-04	13	No	7.29E-07	0.00079	No
Cadmium	3.36E-03	250	No	1.28E-05	0.00105	No
Chromium	1.43E-02	100	No	3.83E-05	0.000158	No
Cobalt	3.49E-02	10000	No	7.94E-05	0.000686	No
Lead	0.0809	0.15 ¹	No	2.50E-04	0.15 ¹	No
Manganese	4.05E-02	2500	No	2.37E-04	0.0521	No
Nickel	5.54E-02	5000	No	1.71E-05	0.0079	No
Selenium	5.54E-03	500	No	1.68E-05	18.3	No

¹No AAAC or CAAC available for lead; evaluated against the NAAQS of 0.15 µg/m³ (3-month average)

XI. LIST OF ABBREVIATIONS

A.A.C.	Arizona Administrative Code
AAAC	Acute Ambient Air Concentrations
AAB	Ambient Air Boundary
ADEQ	Arizona Department of Environmental Quality
AERMOD	AMS/EPA Regulatory Model
AERMET	AERMOD Meteorological Preprocessor
AERMAP	AERMOD Terrain Preprocessor
AERSURFACE	Surface Characteristics Preprocessor for AERMET
AMS	American Meteorological Society
ANFO	Ammonium Nitrate and Fuel Oil
ASOS	Automated Surface Observing System
BPIP-PRME	Building Profile Input Program Plume Rise Model Enhancements
CAAC	Chronic Ambient Air Concentrations
CFR	Code of Federal Regulations
CO	Carbon Monoxide
EPA	Environmental Protection Agency
GP	General Permit
HAP	Hazardous Air Pollutant
lb/ton	Pounds Per Ton
MPH	Miles Per Hour
MRI	Mineral Research Inc
MSDS	Material Safety Data Sheet
NAAQS	National Ambient Air Quality Standard
NCDC	National Climatic Data Center
NED	National Elevation Data
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO _x	Nitrogen Oxides
NO ₂	Nitrogen Dioxide
NOC	Notice of Opportunity to Correct
NOV	Notice of Violation
NSPS	New Source Performance Standards
NSR	New Source Review
NWS	National Weather Service
OBODM	Open Burn/Open Detonation Model
Pb	Lead
PCC	Phoenix Cement Company
PM	Particulate Matter
PM ₁₀	Particulate Matter less than 10 µm nominal aerodynamic diameter
PM _{2.5}	Particulate Matter less than 2.5 µm nominal aerodynamic diameter
PTE	Potential to Emit
RACT	Reasonably Available Control Technology
SO ₂	Sulfur Dioxide Significant Impact Levels
TPY	Tons per Year
TRO	Temporary Restraining Order
VSI	Vertical Shaft Impact
VOC	Volatile Organic Compound