HUDBAY

May 31, 2023

Mr. Balaji Vaidyanathan
Facility Emission Control Value Stream Manager
Arizona Department of Environmental Quality
1110 W. Washington Street
Phoenix, Arizona 85007

RE: Copper World Project – Class II Air Quality Control Permit Application No. 96659 – Response to the Comprehensive Request for Additional Information dated May 2, 2023.

Dear Mr. Vaidyanathan

This letter transmits responses to the Comprehensive Request for Additional Information (RAIS) issued to Copper World, Inc. (Copper World) for the Copper World Project (Project). An application for a Class II Air Quality Control Permit was submitted to the Arizona Department of Environmental Quality (ADEQ) on October 21, 2022 for the Project.

ADEQ issued the RAIS letter to Copper World on May 2, 2023. This comprehensive letter included six (6) categorized requests. These requests are repeated below along with responses. Responses are either embedded in this letter or provided as a separate attachment, i.e., a single compiled document is not provided due to size.

As per the ADEQ RAIS letter, items are categorized as follows:

- Additional Modeling
- Metallic Mineral Processing Emission Factors
- Electrowinning Tankhouse Emission Factors
- Sulfuric Acid Plant Emission Factors
- Hazardous Air Pollutants (HAPs)
- Fugitive Emissions

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1. Additional Modeling

a. An ambient air impact assessment for Year 8 of the Copper World Project mining plan to account for the maximum mining rate.

Response: A detailed review of the Year 8 Mine Planning was completed to determine emissions generating processes and activity rates during Year 8. A subsequent emissions inventory and dispersion modeling analysis have been developed. This Year 8 ambient air impact assessment is being provided for ADEQ review. A detailed description of the Year 8 assessment is provided in the Revised Copper World Modeling Report attached to this letter (see Attachment 1, Sections 6 and 7 and Attachment 2).

b. Revised emission calculation methodology for 24-hour and 1-hour ambient air impact assessments to account for the maximum distance traveled by haul trucks over these periods rather than distances based on the annual weighted average.

Response: A review of mine plan activity rate modeling was completed for each impact assessment year of the Copper World Project mine plan. The mine plan provides detailed activity rates for 24-hr and 1-hr periods including maximum 24-hr and 1-hr activities, which are greater than activity rates based on an annual weighted average. Due to the continuous variability of the mine's vehicle fleet, both in terms of active operating fleet and fleet utilization for multiple processes during a single day and hour, the mine plan provides the most accurate activity rates (hauled tons/vehicle miles traveled, etc.) for all periods. As a result, these mine plan activity rates and emissions input variables have been relied upon for all NAAQS impact periods. Detailed information regarding activity rates and emissions inventory variables are found in the Emissions Inventories included as appendices to the Revised Copper World Modeling Report attached to this letter (see Attachment 1, Appendix F)

c. Ambient air impact assessments for Years 8 and 14 using on-site meteorological data collected for the Rosemont Copper Project to evaluate the impact of the subset operations east of the ridgeline of the Santa Rita Mountains.

Response: For proposed mine activities and emissions generating processes that occur east of the ridgeline of the Santa Rita Mountains in Year 8 and Year 14, separate ambient air impact assessments have been generated. For these assessments, meteorological data acquired through previous onsite monitoring on the east side of the Santa Rita Mountains was utilized for the determination of impacts. Additionally, the background values for PM_{10} for these assessments make use of the particulate monitoring data also acquired through previous onsite monitoring on the east side of the Santa Rita Mountains. These ambient air impact assessments are being provided for ADEQ review. A detailed description of the Years 8 and 14 east side assessments is provided in the Revised Copper World Modeling Report attached to this letter (see Attachment 1, Sections 5.3.2 [meteorological data] and Section 4.1.1.1 [background data]).

d. Sensitivity analyses evaluating the impact of the following meteorological variables on model results: ambient air temperature, cloud cover, and surface characteristics (albedo, bowen ratio and surface roughness).

Response: In order to validate the use of Meteorological data from the Tucson International Airport, sensitivity analyses have been completed that test the influence of meteorological variables that may differ between the Tucson International Airport and the proposed project location. The sensitivity analyses review the impact of changes to Ambient Air Temperature, Cloud Cover, Surface Roughness, Surface Albedo, and Heat Loss Fluxes (Bowen Ratio). These ambient air impact sensitivities are being provided for ADEQ review. A detailed description of the sensitivities is provided in the Revised Copper World Modeling Report attached to this letter (see Attachment 1, Section 5.3.1 and Table 5-1).

e. Revised modeling methodologies for tailings storage facilities and waste rock facilities, taking into account the volume source exclusion zones.

Response: AERMOD is not able to calculate source impact contributions at receptors located near volume sources, which is the basis for volume source exclusion zones. The distance of an exclusion zone is directly related

to the initial horizontal plume dimensions of each volume source. Volume source exclusion zones are further described in EPA modeling guidance.[1] The horizontal dimensions of the volume source exclusion zones have been reviewed for all modeled volume sources to ensure no model receptors occur within volume source exclusion zones. For large volume sources, like the tailings and waste rock facilities, the impact assessments have been updated to distribute the source emissions into multiple smaller volume sources to alleviate overlap of model receptors and volume source exclusion zones.

General Modeling Comments/Responses: As a result of ADEQ's request to review the ambient impact modeling for Year 8 and the potential impacts of emissions sources east of the Santa Rita Mountain ridgeline, Copper World completed an intensive review of mine planning and emissions controls strategies for all modeled operational years. As a result, the emissions inventories and ambient impact analyses being resubmitted to ADEQ for all modeled years have been revised and should be considered a full replacement of the information submitted on October 21, 2022. The revised analyses do not result in any change to the maximum process rates presented in Table 1-1 of the October 21, 2022 Permit Application. The revised analyses did result in changes to the proposed process descriptions and emissions calculations. As a result, updated versions of Section 2.0 and 4.0 and the "Equipment List" in Appendix A of the October 21, 2022 Permit Application have been provided as an attachment and are considered a direct replacement to those application components. In addition, the Process Flow Diagrams located in Appendix C and the Emissions Inventory located in Appendix F of the October 21, 2022 Permit Application have been updated, and the Modeling Report included in Appendix B of the October 21, 2022 Permit Application has been fully replaced. See Attachment 2 of this letter for the updated Permit Application sections and appendices.

2. Metallic Mineral Processing Emission Factors

a. Justification for the use of emission factors for High-Moisture Content Ore rather than Low-Moisture Content Ore from AP-42 Ch. 11.24 "Metallic Minerals Processing".

Response: The Copper World Project water balance has been conservatively assessed based on a material moisture content of 3.5%, a value below the threshold of "High-Moisture Content Ore" from AP-42 Ch. 11.24, which is set at 4%. Project-wide, the ore mining emissions controls proposed for the Copper World Project include significant watering of mined ore, beginning at the point that material is first contacted by shovels within the pit, which precedes hauling and processing. In practice, this would result in material being crushed that would contain a moisture content above 4% because it has already been watered during upstream processes; however, in order to ensure a conservative assessment of ambient impacts, the emission factor for Low-Moisture Content Ore from AP-42 Ch. 11.24 "Metallic Minerals Processing has been used for the assessment of Project emissions. The updated emissions inventories for all modeled operational years include this factor and are being provided for ADEQ review. The use of the emission factor for Low-Moisture Content Ore did not result in any changes to NAAQS compliance for the facility.

b. Justification for the use of the drop equation in AP-42 Ch. 13.2.4 "Aggregate Handling and Storage Piles" for material transfer points rather than the emission factor for material transfer from AP-42 Ch. 11.24 "Metallic Minerals Processing".

Response: Based on USEPA testing data and the published emissions factor rating, the "drop equation" in AP-42 Ch. 13.2.4 "Aggregate Handling and Storage Piles" is rated "with a rating of A" as long as the equation is utilized for materials that are "within the ranges of source conditions that were tested in developing the equation". The material at the Copper World Project has moisture and silt contents "within the source conditions that were tested in developing the drop equation". Further, the wind speed conditions occur "within the source

[1] March 2, 2012 *Haul Road Workgroup Final Report Submission to EPA-OAQPS* from Tyler Fox

conditions that were tested in developing the drop equation". As a result, and as applied for the Copper World Project, the emissions quantification using the drop equation in AP-42 Ch. 13.2.4 for material transfer points is rated as an "A" rated factor. In contrast, the emission factor for material transfer from AP-42 Ch. 11.24 "Metallic Minerals Processing" is rated as a "C" rated factor. For these reasons, the drop equation in AP-42 Ch. 13.2.4 was selected to quantify emissions for material transfer points.

c. Justification for the rock breakers and associated material transfer points controlled by fogging systems being evaluated as non-fugitive emissions for potential to emit and permit applicability purposes.

Response: Although they are controlled by fogging systems, emissions from the rock breakers and associated material transfers are not emitted to the atmosphere through a "vent, stack or functionally equivalent opening". As a result, they are considered fugitive in nature and are accounted for as fugitive emissions sources for potential to emit and permit applicability purposes. The updated emissions inventories for all modeled operational years are being provided for ADEQ review.

3. Electrowinning Tankhouse Emission Factors

a. Revised emissions calculations accounting for sulfuric acid mist emissions from the electrowinning tankhouse as particulate matter for permit applicability purposes.

Response: The revised emissions inventories for all operational years were updated to reflect H_2SO_4 emissions as particulate for the purposes of permit applicability determination. The updated emissions inventories for all modeled operational years are being provided for ADEQ review.

b. Justification for the use of 99% capture and control efficiency with electrowinning tankhouse test data for the electrowinning tankhouse scrubbers to evaluate emissions rather than using the manufacturer's guarantee for grain loading and the exhaust rate.

Response: The particulate emissions for the electrowinning tankhouse scrubbers will utilize the manufacturer's guarantee for grain loading and the exhaust rate for the assessment of particulate emissions in all modeled operational years. Further, the use of the grain loading factor and exhaust flow rate generate more particulate emissions than the calculation of emissions derived from 99% capture and control efficiency. As a result, the method is considered conservative for the assessment of ambient impacts. The updated emissions inventories for all modeled operational years are being provided for ADEQ review.

c. Confirmation that the electrowinning tankhouse will not operate fuel burning equipment to facilitate the electrowinning process.

Response: This is confirmed. No fuel burning equipment is proposed for the electrowinning process. Heating is proposed to be electrical rather than fuel burning.

4. Sulfuric Acid Plant Emission Factors

a. Process information supporting the use of the provided emission rates for the sulfuric acid plant.

Response: For the development of the emissions rates for the sulfuric acid plant, Copper World completed a review of currently operating sulfuric acid plants. This information was reviewed by Copper World's design team and updated to account for process and emissions control improvements based on modern technologies. As a result, the emissions rates provided for the sulfuric acid plant are based on review of best available controls. Furthermore, the proposed emissions rates have been provided to the sulfuric acid plant design team as design criteria for the plant. The final plant design is ongoing. Should final design determine that revisions to the permitted emissions threshold be required, a permit modification will be completed prior to commencement of construction of the sulfuric acid plant.

b. Evaluation of fugitive emissions associated with the unpaved roadway emissions resulting from the delivery of molten sulfur to the sulfuric acid plant and/or sale of sulfuric acid.

Response: Truck traffic emissions on unpaved surfaces resulting from the shipment of sulfuric acid onsite (prior to operation of the sulfuric acid plant) or shipment onsite of molten sulfur and shipment of sulfuric acid offsite during operation of the sulfuric acid plant have been included in the updated emissions inventory for all modeled operational years. The emissions totals from this process have been included in the summary of nested source emissions for the regulatory applicability consideration of the sulfuric acid plant. The updated emissions are based on the worst-case annual truck vehicle miles traveled assuming full capacity production of the sulfuric acid plant is being shipped offsite rather than being used for leaching onsite. This represents a very conservative assessment of practical operations because actual operations will likely fluctuate below full capacity production and a portion of the sulfuric acid plant product will be used onsite which requires less vehicle travel than transporting offsite. The updated emissions inventories for all modeled operational years are being provided for ADEQ review.

c. Confirmation that flotation of sulfur recovered from the leaching of sulfide ore will produce sufficient sulfur to achieve necessary throughout for the sulfuric acid plant without the supplemental delivery of molten sulfur.

Response: At full capacity of the sulfuric acid plant, the flotation of sulfur recovered from the leaching of sulfide ore will provide the majority of the sulfur required for operation of the sulfuric acid plant. However, to ensure a conservative assessment, the updated emissions inventory accounts for onsite shipping (particulate on unpaved roads) of molten sulfur as well as emissions associated with tank storage of molten sulfur. These emissions calculations are included in the updated emissions inventory for all modeled operational years for ADEQ review. The emissions totals from these processes have been included in the summary of nested source emissions for the regulatory applicability consideration of the sulfuric acid plant.

d. Confirmation that the sulfuric acid plant will not operate fuel burning equipment for start-up or auxiliary heat.

Response: This is confirmed. No fuel burning equipment is proposed for the sulfuric acid plant. Heating is proposed to be electrical rather than fuel burning.

5. Hazardous Air Pollutants (HAPs)

a. Justification for the use of PM_{10} rather than total particulate matter for evaluating HAP emissions in the "Emissions Summary" tab.

Response: PM_{10} represents the particulate size fraction with the ability to be transported offsite rather than being redeposited onto the surface in a short time period. As a result, PM_{10} would best represent the HAPs emissions emitted from the facility into ambient air. However, to ensure a conservative assessment, the updated emissions inventories for each operational year were revised to utilize total PM for the assessment of fugitive HAPS on the Emissions Summary tab.

b. Confirmation as to whether HAP emissions from the solvent extraction process are being double counted in the "Emissions Summary" tab.

Response: An erroneous double counting was occurring for HAPs emissions associated with the solvent extraction process within the Emissions Summary emissions workbook tab. This error has been resolved in the updated emissions inventory provided for ADEQ review.

6. Fugitive Emissions

a. Justification for the use of the emission rate for nitrogen oxides from the study titled "NO_x emissions from blasting operations in open-cut coal mining" rather than the use of emission factors from AP-42 Ch. 13.3 "Explosives Detonation."

Response: In order to provide further justification of the use of the NOx emissions factor proposed for use for blasting during all operational phases of the Project, a memorandum has been developed that details the methods by which the emissions factors included in the study "NOx emissions from blasting operations in open-cut coal mining" were developed. The memorandum further details a recent example of the emissions factor being reviewed and approved for Clean Air Act (CAA) New Source Review for a CAA Title V Major Source located in New Mexico. The memorandum is being provided as an attachment to this letter for ADEQ review (see Attachment 3). Additionally, based on ADEQ's requested review of the emissions factor for blasting processes, Copper World has updated the emissions calculation methods associated with SO_2 generated by blasting. This update accounts for the use of ultra-low sulfur diesel (ULSD) highway fuel within the Project ammonium nitrate-fuel oil (ANFO) blasting mixture. The revised methodology is included in the updated emissions inventories for all modeled operational years and assumes the ANFO is comprised of diesel fuel with a sulfur content of 0.0015% by weight (15 ppm ULSD) and a diesel fuel to ANFO ratio of 6%.

b. Justification for the use of two approaches for evaluation of emissions from wind erosion: (1) FDEMI for stockpiles, and (2) AP-42 Ch 13.2.5 "Industrial Wind Erosion" for tailings storage facilities.

Response: In order to resolve uncertainty, all wind erosion emissions have been updated to utilize a single emissions calculation methodology. All revised wind erosion emissions are being quantified using AP-42 Ch 13.2.5 "Industrial Wind Erosion. The updated emissions inventories for all modeled operational years are being provided for ADEQ review.

c. Comprehensive dust control plan to justify the proposed haul road emission control efficiencies.

Response: A dust control plan has been developed and is attached for ADEQ review and approval (see Attachment 4).

d. Comprehensive tailings management plan for the control of fugitive dust from tailings storage facilities.

Response: A tailings dust management plan has been developed and is attached for ADEQ review and approval (see Attachment 5).

Please do not hesitate to contact me at (520) 495-3527 (office), (520) 260-3490 (cell) or via e-mail at david.krizek@hudbayminerals.com if you have any questions regarding this response.

Sincerely,

David Krizek

David Krizek, P.E.

Senior Manager, Environmental & Permitting

Attachments:

Attachment 1: Revised AERMOD Modeling Report. Project Report. Copper World Project. May 2023.

Attachment 2: Revised Section 2, Section 4 and Appendix A, B, C and F of October 21, 2022 "ADEQ CLASS II PERMIT - Permit Application"

Attachment 3: Blasting NOx Emission Factor Determination and Documentation Memorandum. May 30, 2023.

Attachment 4: Dust Control Plan. May 2023.

Attachment 5: Tailings Dust Management Plan. May 2023.

Doc. No. 027/23-15.5.7.2