TECHNICAL REVIEW AND EVALUATION OF APPLICATION FOR AIR QUALITY PERMIT No. 96659

I. INTRODUCTION

This Class II Air Quality Permit No. 96659 is issued to Copper World, Inc. (Copper World), the Permittee, for the construction and operation of the Copper World Project.

A Class II synthetic minor permit is required because the facility's potential to emit particulate matter (PM), particulate matter with aerodynamic diameter less than 10 microns (PM_{10}), particulate matter with aerodynamic diameter less than 2.5 micron ($PM_{2.5}$), and sulfuric acid mist (H_2SO_4) exceeds significant levels identified in the Arizona Administrative Code (A.A.C.) R18-2-101.131.a and -101.131.b. The facility has voluntarily accepted emission limitations in accordance with A.A.C. R18-2-306.01.A to limit the facility's potential to emit below the major source thresholds identified in A.A.C. R18-2-101.175.c and -401.13.b. Therefore, the Copper World Project is designated as a synthetic minor source in accordance A.A.C. R18-2-301.24.

New stationary sources with potential to emit regulated minor New Source Review (NSR) pollutants greater than the permitting exemption thresholds identified in A.A.C. R18-2-101.101 are required to undergo minor NSR prior to beginning actual construction of the new stationary source in accordance with A.A.C. R18-2-334.A. To satisfy the requirements of minor NSR, the source may elect to implement Reasonably Available Control Technology, or conduct an ambient air quality assessment to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) in accordance with A.A.C. R18-2-334.C. In this case, the Permittee elected to conduct an ambient air impact analysis to demonstrate that emissions from the Copper World Project will not interfere with attainment or maintenance of the NAAQS.

Pursuant to Arizona Revised Statutes (A.R.S.) § 49-402, the Arizona Department of Environmental Quality (ADEQ) asserted jurisdiction as the air quality permitting authority for the Copper World Project.

A. Company Information

Company Name:	Copper World, Inc.
Company Address:	5285 East Williams Circle, Suite 2010 Tucson, Arizona 85711
Facility Name:	Copper World Project
Facility Location:	9025 East Santa Rita Road Sahuarita, Arizona 85629

B. Attainment Classification

The Copper World Project is located approximately 28 miles southeast of Tucson, Arizona in Pima County. The location of the Copper World Project is designated attainment for all criteria air pollutants.

II. PROCESS DESCRIPTION

The Copper World Project is a proposed new copper mine and ore processing facility located approximately 28 miles southeast of Tucson, Arizona in the Santa Rita Mountains. It consists of open-pit mining of copper oxide and sulfide ore, including drilling, blasting, loading, hauling, and stockpiling of ore and waste rock; primary crushing and stockpiling of oxide and sulfide ore; milling and flotation of sulfide ore; heap leaching of oxide ore; vat leaching of sulfide ore concentrate and recovery of gold silver; solvent extraction and electrowinning of oxide and sulfide leach circuits; optional copper concentrate dewatering and shipping preparation; molybdenum concentrate drying and bagging; tailings storage and management; and a sulfuric acid plant. Supporting processes include emergency internal combustion engines, reagent systems, storage tanks, organic reagent use, an analytical metallurgical laboratory, and the use of mobile support vehicles. Descriptions of each operation are detailed below:

A. Open-Pit Mining

Open-pit mining operations are proposed to occur within the Peach, Elgin, Heavy Weight, Copper World, Broadtop Butte, and Rosemont pits located in the Santa Rita Mountains. Open-pit mining operations include drilling, blasting, loading, hauling, and unloading of ore and waste rock. Mining operations are supported by rotary blast hole drills, a hydraulic percussion track drill, hydraulic mining shovels, front end loaders, off-highway haul trucks, crawler dozers, rubber-tired dozers, motor graders, and off-highway water trucks. A peak mining rate of 200,000 tons per day is expected to be achieved during Years 6 through 10 of the mining schedule.

Drilling and blasting are performed within each of the open-pits. Rotary blast hole drills perform drilling to support blasting operations. Ammonium nitrate and fuel oil (ANFO) and ANFO emulsion are used to fragment the rock to allow for the excavation and loading of ore and waste rock into haul trucks by mining shovels/loaders.

Ore and waste rock are loaded into haul trucks by mining shovels and front ends loaders for transportation to the primary crushers, stockpile(s), leach pad, or waste rock storage facilities, as appropriate.

B. Primary Crushing, Coarse Ore Stockpiling, and Stockpile Reclaim

Sulfide ore is dumped directly into the primary sulfide crusher feed hopper or occasionally stockpiled near the primary crusher during crusher maintenance conditions or other operational considerations. Oxide ore is either directly placed onto the heap leach pad or fed into the primary oxide crusher feed hopper. Oxide ore may also be occasionally stockpiled near the primary crusher during crusher maintenance or other operational considerations. Each feed hopper will directly feed the associated primary crusher. Crushed ore is then conveyed to open sulfide and oxide coarse ore stockpiles, respectively. Reclaim tunnels are installed underneath the coarse ore stockpiles where the crushed ore is withdrawn from the stockpiles by apron feeders.

Crushed sulfide ore is conveyed from the coarse ore stockpile to the milling and flotation circuit to be processed into concentrate. Crushed oxide ore is conveyed to a secondary screen, where oversized material is conveyed to a secondary crusher for further processing.

Undersized oxide ore from the secondary screen, and oxide ore from the secondary crushing circuit, are conveyed to an agglomerator where the crushed ore is mixed with sulfuric acid solution prior to being conveyed to the heap leach pad.

C. Milling and Flotation

Crushed sulfide ore from the coarse ore stockpile is transferred to the milling and flotation circuit to produce copper and molybdenum concentrate. The crushed ore is first processed in a semi-autogenous (SAG) mill, where it is mixed with water and rotated with steel balls to be milled to specifications. A trommel is used to separate oversize from the SAG mill product, with oversize being conveyed to the pebble crusher for additional processing prior to being re-introduced to the SAG mill. SAG mill product is conveyed to the ball mill, where the ore is finely ground by steel balls before being conveyed to the flotation process.

Processed sulfide ore is introduced to the flotation process, where it is introduced to reagents that condition sulfide minerals to become hydrophobic. Air is injected into the flotation cell, agitating the finely ground sulfide ore and causing the hydrophilic sulfide minerals to attach to bubbles and float to the surface of the flotation cell. Froth formed by the flotation process overflows from the flotation cell, where copper concentrate froth is transferred to a copper concentrate thickener and molybdenum concentrate froth is transferred to the molybdenum filter feed tank. Minerals that were not separated by the flotation process, known as tailings, remain in the slurry to be thickened prior to being stored in conventional tailings impoundments.

D. Optional Copper Concentrate Dewatering and Shipment

While Copper World intends to eliminate the need for off-site shipping of concentrate by employing sulfide concentrate leach technology, Copper World included an evaluation of emissions from the shipment of copper concentrate in order to provide operational flexibility. Copper concentrate slurry is pumped to a copper concentrate thickener to be dewatered and thickened. Thickened copper concentrate is pumped to copper concentrate filters, producing copper concentrate filter cake. Filter cake is then transferred to the copper concentrate stockpile in the copper concentrate loadout building before being placed onto trucks or containers for shipment to market.

E. Molybdenum Concentrate Dewatering and Shipment

Molybdenum concentrate slurry is pumped to a molybdenum concentrate plate and filter, producing molybdenum filter cake. The resulting filter cake is transferred to a dryer, placed into a concentrate storage bin, transferred to the concentrate bag feeder, and loaded into supersacks for shipment to market.

F. Tailings Dewatering and Placement

Tailings slurry produced from the flotation process is pumped to thickeners to dewater and thicken the slurry. The thickened tailings slurry is then pumped to conventional tailings impoundments, where the slurry is cycloned at the crest of the embankment to separate heavy and fine materials. Heavy portions are used to construct embankments, while fine material flows to the inside of the impoundments.

G. Oxide Ore Heap Leaching

Oxide ore is placed onto a lined heap leach pad where an irrigation system delivers a mild sulfuric acid solution to the ore. The copper-laden solution, called pregnant leach solution (PLS), is collected from the heap leach pad through a series of drainpipes, where it flows by gravity to the PLS Pond for transfer to a solvent extraction and electrowinning (SX-EW) plant to extract copper from the solution.

H. Copper Concentrate Leaching and Precious Metal Refining

Dewatered copper concentrate is pumped from the copper concentrate storage tank to an IsaMill™, which achieves mechanical liberation of the copper concentrate through ultrafine grinding. The milled concentrate is pumped to a concentrate leach reactor circuit, where it is oxidized in an acidic oxidative leach solution to achieve copper extraction.

Discharge from the concentrate leach reactor circuit is pumped to two Jameson cells for recovery of sulfur, and the sulfur concentrate is pumped to a sulfur concentrate thickener. Underflow from the sulfur concentrate thickener is pumped to a belt filter, which discharges to a sulfur concentrate conveyor, with filtrate being returned to the thickener. Thickener overflow is pumped to an iron control circuit along with tailings from the sulfur flotation circuit.

Sulfur concentrate is conveyed to the melting tank, where it is melted prior to being filtered. Molten sulfur filtrate is conveyed to the molten sulfur storage tanks, with residue from this process reporting to the precious metal recovery circuit.

Tailings from the sulfur flotation circuit and sulfur concentrate thickener overflow are pumped to the iron control/neutralization circuit. Limestone is added, resulting in the precipitation of iron, arsenic, and other elements dissolved in the slurry. Oxygen is injected into the neutralization reactors to convert ferrous iron into ferric iron to precipitate as goethite. The oxidized residue is pumped to a thickener. Underflow from this thickener is pumped to a belt filter which discharges to an oxidized residue conveyer. Filtrate is combined with the thickener overflow and pumped to the PLS Pond, where it is combined with PLS from the oxide heap and transferred to the solvent extraction circuit.

Oxidized residue from the neutralization circuit is combined with residue from the sulfur filter and re-pulped prior to being fed to a lime boil to decompose any silver-jarosite that formed during oxidation. The slurry then reports to a cyanidation circuit to leach gold and silver. The pregnant liquor containing gold, silver, and leach residue flow to a solid-liquid separation and washing phase carried out in a countercurrent decantation circuit. Residue is sent for cyanide destruction prior to being sent to the tailings storage facility, and pregnant liquor reports to the Merrill-Crowe zinc cementation process. The solution is clarified using leaf filters coated with diatomaceous earth, and dissolved oxygen is removed from the clarified solution by passing through a vacuum de-aeration column. Zinc dust is added to the solution to precipitate gold and silver, which is filtered and smelted into a doré bar using an electric induction furnace.

I. Solvent Extraction and Electrowinning

PLS is pumped from the concentrate leach circuit and PLS Pond to the solvent extraction circuit to extract copper from the solution. The PLS solution is contacted with an organic reagent to extract copper ions from the PLS. The copper-laden organic, known as loaded organic, and depleted PLS, known as raffinate, flow to extraction settlers, where the solutions separate by gravity. Raffinate is recycled to the leaching processes, while loaded organic is directed to the stripping process, where it is contacted with strong acid lean electrolyte from the electrowinning circuit to strip copper from the loaded organic. The resulting barren organic and loaded electrolyte are recycled to the solvent extraction cells, where the organic phase and loaded electrolyte are separated by gravity. Barren organic reports to the solvent extraction circuit to facilitate extraction of copper ions from PLS. The loaded electrolyte reports to the electrowinning tankhouse for extraction of copper.

The loaded electrolyte solution is pumped to electrowinning cells where current is introduced in the presence of stainless-steel cathodes to plate copper onto the surface of the cathode. The final product, copper cathode, is removed from the electrowinning cells, stripped from the stainless-steel cathode blank, and bundled and stacked for shipping, while lean electrolyte is pumped back to the solvent extraction circuit to facilitate stripping of copper from the loaded organic.

J. Sulfuric Acid Plant

Sulfur recovered from leaching of sulfide ore or delivered by truck to the facility is pumped from the molten sulfur storage tanks to the sulfur furnace, where it is combusted in the presence of high-pressure oxygen to produce sulfur dioxide gas. The resulting sulfur dioxide off-gas is diverted to a waste-heat boiler, before being converted to sulfur trioxide in the presence of four (4) vanadium pentoxide catalyst beds. The sulfur dioxide gas passes through three catalyst beds before being introduced to the absorption tower, where it is contacted with water to produce strong sulfuric acid. Outlet gas from the absorption tower is diverted to the fourth catalyst bed to convert any remaining sulfur dioxide to sulfur trioxide before it is fed to the final absorption tower to produce additional sulfuric acid.

K. Supporting Processes

Supporting processes at the Copper World Project include: fuel burning equipment, reagent systems, storage tanks, organic reagent use, acid leach, an analytical metallurgical laboratory, mobile vehicle usage, and open burning.

Fuel burning equipment at the Copper World Project consists of three (3) emergency generators and one (1) emergency fire pump. Each emergency generator is diesel-fired with maximum capacity of 1,345 kilowatts (kW) each. The fire pump is diesel-fired with a maximum capacity of 400 horsepower (hp).

Processes at the Copper World Project also include the delivery and storage of reagents, mixing and preparation of reagents, and distribution of the regents to the process stream. Systems include reagent storage and distribution tanks, lime storage bins, a lime slaking mill, and the flocculant feed bins. Reagents used at Copper World include frothers, promoters, flocculants, xanthates, and antiscalants. Frothers, promoters, flocculants, and xanthates are introduced during the flotation process. Antiscalants and flocculants are added during the dewatering processes. Multiple on-site storage tanks will contain volatile liquids, such as gasoline and diesel fuel.

An analytical metallurgical laboratory will consist of a sample preparation area, metallurgical laboratory, reagent storage area, and balance rooms to support ore processing operations. Sample preparation operations include sample crushers, pulverizers, splitters, sieve shakers, and blenders.

L. Control Devices

The Copper World Project will primarily utilize cartridge filter dust collectors and wet scrubbers to capture and control emissions of particulate matter from metallic mineral processing operations, storage bins, precious metals refining operations, and other supporting processes. Emissions from the Molybdenum Dryer are controlled by a scrubber and electrostatic precipitator in series. Emissions of sulfuric acid mist from the Electrowinning Tankhouse are controlled by wet scrubbers. The Sulfuric Acid Plant will operate a wet scrubber to control emissions of sulfuric acid mist and sulfur dioxide.

III. POTENTIAL TO EMIT

Emissions from the Copper World Project were evaluated using emission factors from AP-42, *Compilation of Air Emissions Factors from Stationary Sources*, manufacturer's specifications for air pollution control equipment, performance test data from similar facilities, and scientific journal publications assuming continuous operation of processing equipment. Process rates and vehicle travel distances are based on the Copper World Project mining plan. Meteorological data required for emissions calculation equations and procedures utilized meteorological data collected from the on-site meteorological station and from meteorological data previously collected for the Rosemont Copper Project, as appropriate. The relevant pollutants and methodology for evaluating each source of emissions are discussed below:

A. Open-Pit Mining, Hauling, and Stockpiling

Fugitive emissions of particulate matter from drilling, blasting, unpaved road traffic, loading and unloading of trucks, and wind erosion were estimated using emissions factors, equations, and calculation procedures from AP-42 Chapter 11.9 "Western Surface Coal Mining" for drilling overburden, Chapter 11.9.1 "Western Surface Coal Mining" for emissions from blasting operations, Chapter 13.2.2 "Unpaved Roads" for haul truck and support vehicle traffic emissions, Chapter 13.2.4 "Aggregate Handling and Storage Piles" for truck loading and unloading, and Chapter 13.2.5 "Industrial Wind Erosion" for wind erosion, as applicable. Particulate matter emissions from bulldozing and grading operations were evaluated using emission factors from AP-42 Chapter 11.9 "Western Surface Coal Mining."

Fugitive emissions of combustion products resulting from blasting operations were evaluated using the following methodologies: nitrogen oxide emissions from blasting were evaluated using results from "NO_X Emissions from Blasting Operations in Open-Cut Coal Mining", carbon monoxide (CO) emissions were evaluated using emission factors from AP-42 Chapter 13.3 "Explosive Detonation", and sulfur dioxide (SO_2) emissions were evaluated by material balance using the diesel fuel sulfur content, percentage of fuel oil in ANFO, diesel fuel density, and the permitted operating limitations for blasting operations.

Fugitive emissions of hazardous air pollutants (HAPs) resulting from open-pit mining, hauling, and stockpiling operations are evaluated based on the emissions of total particulate matter, concentration of each metal in ore samples, and the gravimetric factor to convert elemental weight of the pollutant to the weight of the equivalent oxide.

B. Ore Processing, Precious Metal Refining, and Supporting Processes

Fugitive emissions of particulate matter from ore processing operations were evaluated using emission factors from AP-42 Chapter 11.24 “Metallic Mineral Processing” for low-moisture content ore assuming 99% capture efficiency for control devices and 93% control efficiency by the fogging wet suppression systems. Fugitive emissions from material transfer points for processed materials, concentrates, and reagent materials were evaluated using the predictive emission factor equation from AP-42 Chapter 13.2.4 “Aggregate Handling and Storage Piles.” Emissions from lime loading were evaluated using emission factors from AP-42 Chapter 11.17 “Lime Manufacturing” for product lime loading. Milling processes where materials are thoroughly saturated are assumed to have no emissions of fugitive particulate matter.

Particulate matter emissions from cartridge filter dust collectors and scrubbers used to control emissions from ore processing, precious metal refining, material storage, and other supporting processes were evaluated using manufacturer’s guarantees for maximum ventilation rate and grain loading associated with each control device.

Emissions of HAPs resulting from ore processing, precious metal refining, and other supporting processes are evaluated based on the emissions of total particulate matter, concentration of each metal in ore samples, and the gravimetric factor to convert elemental weight of the pollutant to the weight of the equivalent oxide.

C. Solvent Extraction/Electrowinning (SX/EW)

Emissions of HAPs and volatile organic compounds (VOCs) from the solvent extraction process were evaluated using the methodology and equations from “Hydrometallurgy of Copper.” Particulate matter emissions from the electrowinning tankhouse were evaluated based on manufacturer’s guarantees for maximum ventilation rate and grain loading for with the Electrowinning Tankhouse Scrubbers. Sulfuric acid mist emissions from the electrowinning tank house were evaluated based on total electrowinning cell area and performance testing conducted at a similar electrowinning tankhouse operation assuming 99% capture and control efficiency from the Electrowinning Tankhouse Scrubbers.

D. Sulfuric Acid Plant

Emissions of SO_2, NO_X, and CO were based on permitted emissions standards based on emissions data from a similarly designed sulfuric acid plant. Emissions of particulate matter and sulfuric acid mist were evaluated based on the manufacturer’s guarantees for the maximum ventilation rate and grain loading for the acid plant scrubber.

E. Internal Combustion Engines

Emissions from internal combustion engines associated with the Copper World Project were evaluated using the applicable emissions standards from New Source Performance Standards (NSPS) Subpart IIII for Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. SO_2 emissions were evaluated assuming complete conversation of the fuel sulfur content to SO_2. Emissions of HAPs were evaluated using emission factors from AP-42 Chapters 3.3 and 3.4 for diesel engines. Emergency engines are assumed to operate 500 hours per year for the purposes of evaluating potential to emit.

F. Storage Tanks

HAP and VOC emissions from storage tanks were developed using the TankESP storage tank emission calculation software, which incorporates the calculation procedures from AP-42 Chapter 7.1 "Organic Liquid Storage Tanks" to evaluate emissions based on the organic liquid being stored.

The Copper World Project has potential to emit greater than the significant thresholds of PM, PM_{10}, and $PM_{2.5}$, and H_2SO_4, and greater than the permitting exemption thresholds for PM_{10}, $PM_{2.5}$, and NO_X. The facility's potential to emit in tons per year (tpy) is detailed in Table 1 below:

Table 1: Potential to Emit (tpy)

Pollutant	Potential to Emit[1]	Fugitive Emissions[1,2]	Permitting Exemption Threshold	Significant Thresholds	Minor NSR Triggered?
PM	62.18	3,991.36	Not Applicable	25	Not Applicable
PM_{10}	35.60	1,112.31	7.5	15	Yes
$PM_{2.5}$	23.86	120.02	5	10	Yes
CO	10.51	603.00	50	100	No
NO_X	33.18	16.20	20	40	Yes
SO_2	13.70	0.03	20	40	No
VOCs	13.46	0.00	20	40	No
Pb	0.01	0.46	0.3	0.6	No
H_2SO_4	16.97	0.00	Not Applicable	7	Not Applicable
Maximum Single HAP (Manganese Compounds)	5.12	5.12	Not Applicable	10	Not Applicable
Total HAPs	15.84	6.05	Not Applicable	25	Not Applicable

Pollutant	Potential to Emit[1]	Fugitive Emissions[1,2]	Permitting Exemption Threshold	Significant Thresholds	Minor NSR Triggered?
GHG (CO_2e)	1,664.88	3,427.01	Not Applicable	75,000	Not Applicable

[1]In accordance with A.A.C. R18-2-101.75.c and -401.13.e, fugitive emissions of regulated pollutants are not considered in the evaluation of potential to emit for major source applicability unless the source belongs to a Section 302(j) source category. Sources belonging to a Section 302(j) source category at the Copper World Project are limited to the sulfuric acid plant, therefore only fugitive emissions from the sulfuric acid plant are considered when evaluating the potential to emit for the Copper World Project for major source applicability.
[2]In accordance with A.A.C. R18-2-101.75.b.i, fugitive emissions of HAPs are considered in the evaluation of potential to emit for major source applicability regardless of source category.

IV. MINOR NEW SOURCE REVIEW

New stationary sources with potential to emit regulated minor NSR pollutants greater than the permitting exemption thresholds identified in A.A.C. R18-2-101.101 are required to undergo minor NSR for the applicable pollutants prior to beginning actual construction of the source in accordance with A.A.C. R18-2-334.A.2. In this case, the Copper World Project's potential to emit exceeds the permitting exemption thresholds for PM_{10}, $PM_{2.5}$, and NO_X. Therefore, Copper World is required to satisfy the requirements of minor NSR prior to commencing construction.

To satisfy the requirements of minor NSR, the Permittee may elect to implement reasonably available control technology (RACT) for emissions units that have potential to emit greater than twenty percent (20%) of the permitting exemption threshold of the applicable minor NSR pollutant, or conduct an ambient air quality assessment to demonstrate that emissions resulting from operation of the source will not interfere with attainment of the NAAQS in areas accessible to the public for the applicable minor NSR pollutants. In this case, Copper World elected to accept enforceable operational requirements and conduct an ambient air quality assessment in order to demonstrate that the construction and operation of the Copper World Project would not interfere with attainment of the NAAQS for PM_{10}, $PM_{2.5}$, nitrogen dioxide (NO_2), and ozone (O_3). Operational limitations accepted by Copper World are detailed in Table 2 below. A detailed discussion of the ambient air impact assessment can be found in Section X.

Table 2: Minor NSR Operational Limitations

Emissions Unit	Operational Limitations
Mining Rate	Limit to 200,000 tons of waste rock and ore mined per day.
Explosive Blasting	Utilize ultra-low sulfur diesel (ULSD) in ANFO.
	Limit the horizontal surface area blasted, blast frequency, and ANFO usage as required by Condition II.B.2.b(3) of the permit.
	Limit blasting operations to within the hours of 12 p.m. and 4 p.m., except 12 p.m. to 2 p.m. for Broadtop Butte.
Drilling	Limit the maximum daily holes drilled and the maximum annual holes drilled as required by Condition II.B.2.b(2) of the permit.

Emissions Unit	Operational Limitations
	Utilize shrouds and pre-watering techniques during drilling operations.
Fugitive Dust	Submit a fugitive dust control plan for approval.
Tailings Management	Submit a tailings dust management plan for approval.

V. VOLUNTARILY ACCEPTED EMISSION LIMITATIONS AND STANDARDS

Voluntary emission limitations and standards, accepted in accordance with A.A.C. R18-2-306.01.A in order to avoid classification as a major source, are detailed in Table 3 below.

Table 3: Voluntarily Accepted Emission Limitations and Standards

Control Device	Processes Controlled	Emissions Standards
Oxide Ore Primary Crusher Cartridge Dust Collector (AE-002)	Process Equipment: • Oxide Primary Crusher Material Handling Emission Points: • Oxide Primary Crusher to the crusher discharge vault • Crusher discharge vault to crusher discharge conveyor • Crusher discharge conveyor to stockpile feed conveyor belt	PM: 0.005 grains per dry standard cubic foot (gr/dscf) PM_{10}: 0.0005 gr/dscf $PM_{2.5}$: 0.00009 gr/dscf
Oxide Secondary Crusher Cartridge Dust Collector (AE-003)	Process Equipment: • Oxide Secondary Crusher Material Handling Emission Points: • Oxide Coarse Ore Stockpile to Oxide Stockpile Reclaim Feeders • Oxide Stockpile Reclaim Feeders to Reclaim Feeder Discharge Chute • Reclaim Feeder Discharge Chute to Oxide Stockpile Reclaim Conveyor • Oxide Stockpile Reclaim Conveyor to Oxide Stockpile Reclaim Conveyor Discharge Chute • Oxide Stockpile Reclaim Conveyor Discharge Chute to Oxide Secondary Feeder Screen	PM: 0.005 gr/dscf PM_{10}: 0.00225 gr/dscf $PM_{2.5}$: 0.00042 gr/dscf

Control Device	Processes Controlled	Emissions Standards
	• Oxide Secondary Feeder Screen to Oxide Secondary Crusher Feed Bin • Oxide Secondary Crusher Feed Bin to Oxide Secondary Crusher Belt Feeder • Oxide Secondary Crusher Belt Feeder to Oxide Secondary Crusher • Oxide Secondary Crusher to Oxide Secondary Crusher Discharge Conveyor	
Sulfide Ore Primary Crusher Cartridge Dust Collector (AE-005)	Process Equipment: • Sulfide Primary Crusher Material Handling Emission Points: • Primary crushed sulfide ore to crusher discharge vault • Crusher discharge vault to crusher discharge conveyor • Crusher discharge conveyor to stockpile feed conveyor belt	PM: 0.005 gr/dscf PM_{10}: 0.0005 gr/dscf $PM_{2.5}$: 0.00009 gr/dscf
Sulfide Ore Reclaim Tunnel & Pebble Crusher Cartridge Dust Collector (AE-006)	Process Equipment: • Sulfide Pebble Crusher Material Handling Emission Points: • Sulfide SAG Mill Screen Oversize from Sulfide Pebble Conveyor to Sulfide Pebble Crusher Feed Bin • Sulfide Pebble Crusher Feed Bin to Sulfide Pebble Crusher Belt Feeder • Sulfide Pebble Crusher Belt Feeder to Sulfide Pebble Crusher Belt Feeder Discharge Chute • Sulfide Pebble Crusher Belt Feeder Discharge Chute to Sulfide Pebble Crusher • Sulfide Pebble Crusher to Sulfide Pebble Crusher Discharge Chute • Sulfide Pebble Crusher Discharge Chute to Sulfide Pebble Crusher Product Conveyor • Sulfide Pebble Crusher Product Conveyor to Sulfide Pebble Crusher Product Conveyor Discharge Chute • Sulfide Pebble Crusher Product Conveyor Discharge Chute to Sulfide SAG Mill Feed Conveyor • Sulfide SAG Mill Feed Conveyor to Crusher • Ore to Sulfide SAG Mill	PM: 0.005 gr/dscf PM_{10}: 0.0003 gr/dscf $PM_{2.5}$: 0.00005 gr/dscf
Copper Concentrate Building Dust Collector (AE-007)	Process Equipment: • Copper Concentrate Material Handling Emission Points: • Copper Concentrate to Copper Concentrate Filters • Copper Concentrate Filters to Copper Concentrate loadout Stockpile	PM: 0.005 gr/dscf PM_{10}: 0.00236 gr/dscf

Control Device	Processes Controlled	Emissions Standards
	• Copper Concentrate loadout Stockpile to Shipment Trucks/Container by Front-end Loaders	$PM_{2.5}$: 0.00036 gr/dscf
Molybdenum Flotation Scrubber (AE-008)	Material Handling Emission Points: • Molybdenum Flotation Scrubber System	PM: 0.02 gr/dscf PM_{10}: 0.02 gr/dscf $PM_{2.5}$: 0.02 gr/dscf
Molybdenum Concentrate Storage Bin Dust Collector (AE-009)	Material Handling Emission Points: • Molybdenum Concentrate from Molybdenum Dryer Screw Feeder • Molybdenum Concentrate to Molybdenum Dryer • Molybdenum Dryer to Molybdenum Concentrate Storage Bin • Molybdenum Concentrate Storage Bin to Molybdenum Concentrate Bag Feeder/Conveyor	PM: 0.005 gr/dscf PM_{10}: 0.00236 gr/dscf $PM_{2.5}$: 0.00036 gr/dscf
Molybdenum Bag Loader Dust Collector (AE-010)	Material Handling Emission Points: • Molybdenum Concentrate Bag Feeder/Conveyor to Molybdenum Concentrate Bag Loader • Molybdenum Concentrate Bag Loader to Molybdenum Concentrate to Shipment Trucks	PM: 0.005 gr/dscf PM_{10}: 0.00236 gr/dscf $PM_{2.5}$: 0.00036 gr/dscf
Molybdenum Dryer and Scrubber (AE-011)	Molybdenum Dryer	PM: 0.005 gr/dscf PM_{10}: 0.01218 gr/dscf $PM_{2.5}$: 0.006 gr/dscf
Quicklime Dust Collector (AE-012)	Process Equipment: • Quicklime Slaking Mill Material Handling Emission Points: • Quicklime to Quicklime Storage Bin	PM: 0.005 gr/dscf PM_{10}: 0.00236 gr/dscf

Control Device	Processes Controlled	Emissions Standards
		$PM_{2.5}$: 0.00036 gr/dscf
Lime Scrubber (AE-013)	Material Handling Emission Points: • Lime Slaking Mill	PM: 0.02 gr/dscf PM_{10}: 0.02 gr/dscf $PM_{2.5}$: 0.02 gr/dscf
Flocculant Feed Bin Cartridge Dust Collector (AE-014)	Material Handling Emission Points: • Flocculant Bulk Bags to Flocculant Feed Bin	PM: 0.005 gr/dscf PM_{10}: 0.00236 gr/dscf $PM_{2.5}$: 0.00036 gr/dscf
Electrowinning Oxide Plant Scrubber (AE-015)	Electrowinning Tankhouse Cells	PM: 0.005 gr/dscf PM_{10}: 0.00236 gr/dscf $PM_{2.5}$: 0.00036 gr/dscf
Electrowinning Albion Plant Scrubber (AE-016)	Electrowinning Tankhouse Cells	PM: 0.005 gr/dscf PM_{10}: 0.00236 gr/dscf $PM_{2.5}$ 0.00036 gr/dscf
Laboratory Dust Collector (AE-017)	Analytical Metallurgical Laboratory	PM: 0.005 gr/dscf PM_{10}:

Control Device	Processes Controlled	Emissions Standards
		0.00313 gr/dscf $PM_{2.5}$: 0.00125 gr/dscf
Laboratory Scrubber (AE-018)	Analytical Metallurgical Laboratory	PM: 0.005 gr/dscf PM_{10}: 0.0313 gr/dscf $PM_{2.5}$: 0.00125 gr/dscf
Flocculant Feed Bin Cartridge Dust Collector (AE-019)	Material Handling Emission Points: • Concentrate Leach Flocculant Bulk Bags to Flocculant Feed Bin • Mill Tailings Flocculant Bulk Bags to Flocculant Feed Bin	PM: 0.005 gr/dscf PM_{10}: 0.00236 gr/dscf $PM_{2.5}$: 0.00036 gr/dscf
Acid Plant Scrubber (AE-022)	Sulfuric Acid Plant	SO_2: 3.12 pounds per hour (lb/hr) on rolling 24-hour average basis. PM/H_2SO_4: 3.82 lb/hr NO_X: 4.15 lb/hr
Precious Metals Refinery Dust Collector (AE027)	Precious Metal Refinery Electric Induction Furnace	PM: 0.005 gr/dscf PM_{10}: 0.005 gr/dscf $PM_{2.5}$:

Control Device	Processes Controlled	Emissions Standards
		0.005 gr/dscf
Metallurgy Laboratory Dust Collector (AE-028)	Analytical Metallurgical Laboratory	PM: 0.005 gr/dscf PM_{10}: 0.00313 gr/dscf $PM_{2.5}$: 0.00125 gr/dscf

VI. APPLICABLE REGULATIONS

Table 4 identifies applicable regulations and provides a discussion as to why that standard applies.

Table 4: Applicable Regulations

Emissions Unit	Control Device	Rule	Discussion
Metallic Mineral Processing	Dust Collectors, Scrubbers, and Electrostatic Precipitator	40 CFR 60 Subpart LL	"Standards of Performance for Metallic Mineral Processing Plants" applies to each crusher and screen in open-pit mines, and each crusher, each crusher, screen, bucket elevator, conveyor belt transfer point, thermal dryer, product packaging station, storage bin, enclosed storage area, truck loading station, truck unloading station, railcar loading station, and railcar unloading station at the mill or concentrator that commenced construction or modification after August 24, 1982.
		Pima County Code (P.C.C.) § 17.16.360	"Standards of Performance for Existing Nonferrous Metals Industry Sources" applies to mines, mills, concentrators, crushers, screens, material handling facilities, fine ore storage, dryers, roasters, and loaders that are not affected facilities subject to 40 CFR 60 Subpart LL "Standards of Performance for Metallic Mineral Processing Plants."

Emissions Unit	Control Device	Rule	Discussion
Tailings and Concentrate Dewatering, Tailings Placement, and Storage	Water, Dust Suppressants	P.C.C. § 17.16.430	"Standards of Performance for Existing Nonferrous Metals Industry Sources" applies to mines, mills, concentrators, crushers, screens, material handling facilities, fine ore storage, dryers, roasters, and loaders that are not affected facilities subject to 40 CFR 60 Subpart LL "Standards of Performance for Metallic Mineral Processing Plants."
Precious Metals Refinery Analytical Laboratory Silos, Storage Bins, Reagent Systems	Dust Collectors	P.C.C. § 17.16.430	"Standards of Performance for Unclassified Sources" applies to any source which does not have an otherwise applicable standard under Articles IV, VI, and VII of Chapter 17.16 of the Pima County Code.
Solvent Extraction and Electrowinning Plant	Scrubbers	P.C.C. § 17.16.430	"Standards of Performance for Unclassified Sources" applies to any source which does not have an otherwise applicable standard under Articles IV, VI, and VII of Chapter 17.17 of the Pima County Code.
Sulfuric Acid Plant	Scrubber	40 CFR 60 Subpart H	"Standards of Performance for Sulfuric Acid Plants" applies to each sulfuric acid production unit that commences construction or modification after August 17, 1971.
Internal Combustion Engines		40 CFR 60 Subpart IIII 40 CFR 63 Subpart ZZZZ	"Standards of Performance for Stationary Reciprocating Compression Ignition Internal Combustion Engines" apply to internal combustion engines constructed after July 11, 2005, where the stationary CI ICE are manufactured after April 1, 2006. "National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines" applies to new internal combustion engines constructed after June 12, 2006. The engines demonstrate compliance with 40 CFR 63 Subpart ZZZZ by meeting the requirements of 40 CFR 60 Subpart IIII.

Emissions Unit	Control Device	Rule	Discussion
Gasoline Storage and Dispensing		40 CFR 63 Subpart CCCCCC P.C.C. § 17.16.230	"National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities" applies to each gasoline dispensing facility (GDF) located at an area source, including each gasoline cargo tank during the delivery of product to a GDF and each storage tank. "Standards of Performance for Existing Storage Vessels for Petroleum Liquids" applies to gasoline storage tanks.
Storage Tanks		P.C.C. § 17.16.430	"Standards of Performance for Unclassified Sources" applies to any source which does not have an otherwise applicable standard under Articles IV, VI, and VII of Chapter 17.16 of the P.C.C.
Fugitive Dust	Water Trucks, Dust Suppressants	P.C.C. § 17.16.050 Article III of Title 17, Chapter 16 of the P.C.C.	"Visibility Limiting Standards" standards apply to all sources of particulate matter emissions. Article III of Title 17, Chapter 16 "Emissions from Existing and New Nonpoint Sources" applies to fugitive dust producing activities, motor vehicle operations, vacant lots and open spaces, roads and streets, particulate materials, storage piles, and mineral tailings.
Abrasive Blasting	Wet blasting; Dust collecting equipment; Other approved methods	A.A.C. R-18-2-702 A.A.C. R-18-2-726	These standards are applicable to any abrasive blasting operation.
Spray Painting	Enclosures	A.A.C. R18-2-702 A.A.C. R-18-2-727	These standards are applicable to any spray painting operation.
Demolition/Renovation		A.A.C. R18-2-1101.A.12	This standard is applicable to any asbestos related demolition or renovation operations.

VII. MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

Table 5 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 on how the facility is required to demonstrate compliance with the emission limits in the permit.

Table 5: Permit No. 96659

Emissions Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
General Requirements for Metallic Mineral Processing and Supporting Operations	PM	*See Section V above.*	Install, operate, and maintain instrumentation to measure the change in pressure of the gas stream across the air pollution control equipment. Install, operate, and maintain instrumentation to measure the inlet flow rate of scrubber solution across the wet scrubbers. Conduct weekly inspections of the change in pressure of the gas stream and scrubber inlet flow rate. Conduct weekly periodic inspections of the dust suppression fogging system to ensure that water is flowing to	Record each weekly inspection of pressure change, scrubber inlet flow, and spray nozzles, including date and time of inspection, pressure drop reading, and any corrective actions taken.	

Emissions Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
			discharge from the spray nozzles while not causing excessive water discharge and mud formation/clogging of system. Conduct weekly surveys of visible emissions emanating from all fugitive sources and stacks. Conduct initial performance test demonstrating compliance with the applicable emissions standards. Conduct subsequent testing on an annual basis.		
Metallic Mineral Processing Operations Subject to NSPS Subpart LL	PM	Stack PM Emissions: 0.05 grams per dry standard cubic meters (g/dscm) 7% Opacity	Install, calibrate, maintain, and operate a monitoring device for the continuous measurement of the change in pressure of the gas stream through the scrubber for any affected facility using a wet scrubbing emission control device.	Record the measurements of both the change in pressure of the gas stream across the scrubber and the scrubbing liquid flow rate during the initial performance test of a wet scrubber, and at least weekly thereafter.	After the initial performance test of a wet scrubber, submit semiannual reports to the Director of occurrences when the measurements of the scrubber pressure loss (or gain) or liquid flow rate differ by more than ±30 percent from the average obtained during the most recent performance test.

Emissions Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
		Fugitive Emissions: 10% Opacity	Install, calibrate, maintain, and operate a monitoring device for the continuous measurement of the scrubbing liquid flow rate to a wet scrubber for any affected facility using any type of wet scrubbing emission control device. Conduct initial performance test to demonstrate compliance with the applicable particulate matter standards.		
Metallic Mineral Processing Operations Not Subject to NSPS Subpart LL	PM	20% Opacity		Record the daily process rates and hours of operation of all material handling facilities	
Precious Metals Refinery and Analytical Laboratory	PM	20% Opacity		Records of daily process rates and hours of operation for equipment associated with the precious metals refinery.	
Solvent Extraction and Electrowinning	PM H_2SO_4	Stack PM_{10} Emissions:	Conduct weekly observations of visible emissions emanating from	Maintain records of the method(s) used to control emissions from the	Submit to the Director an Operations and Maintenance Plan for the Electrowinning Tankhouse Scrubbers.

Emissions Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
		0.00236 gr/dscf Stack $PM_{2.5}$ Emissions: 0.00036 gr/dscf 20% Opacity	the Electrowinning Tankhouse Scrubbers. Install, operate, maintain, and calibrate continuous monitoring systems for scrubber motor amperage and damper position for each of the Electrowinning Tankhouse Scrubber. Install, operate, maintain, and calibrate continuous monitoring systems measuring pressure drop across each of the Electrowinning Tankhouse Scrubbers. Conduct initial performance test to demonstrate compliance with the sulfuric acid mist and particulate emissions standard. Conduct subsequent testing within 11-13 months if previous results are greater than 75% of the applicable emissions	Electrowinning Tankhouse Cells.	

Emissions Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
			standards, or 23-25 months if less than 75% of the applicable emissions standard.		
Sulfuric Acid Plant	SO_2	3.12 pounds per hour (lb/hr) on rolling 24-hour average basis. 2 kilograms (kg) per metric ton of acid produced (4 pounds (lb) per ton)	Install, calibrate, maintain, and operate a continuous monitoring system for the measurement of sulfur dioxide and nitrogen oxides. Install, calibrate, maintain, and operate a continuous monitoring system to measure volumetric flow rate of gases from the acid plant stack. Conduct initial performance test to demonstrate compliance with sulfur dioxide and nitrogen oxides emissions standards. Conduct initial performance test to demonstrate compliance with sulfuric acid mist and opacity emissions standards.	Maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility; any malfunction of the air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device is inoperative. Maintain operating logs containing total quantity of sulfuric acid produced, total quantity of sulfur burned, total quantity of molten sulfur delivered to the facility, and total quantity of sulfur recovered from the flotation process.	Submit excess emissions and monitoring systems performance report and/or a summary report form to the Director semiannually.
	PM H_2SO_4	PM/H_2SO_4: 3.82 lb/hr 0.075 kg per metric ton of acid produced (0.15 lb per ton) 10% Opacity			
	NO_X	4.15 lb/hr			

Emissions Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Internal Combustion Engines (ICEs)			Install a non-resettable hour meter prior to startup of the engine.	If the emergency engine does not meet the standards applicable to non-emergency engines in the applicable model year, keep records of the operation of the engine in emergency and non-emergency service that are recorded through the non-resettable hour meter. Record the time of operation of the engine and the reason the engine was in operation during that time.	Submit annual report for emergency ICE that operate for non-emergency situations to supply power as part of a financial arrangement with another entity.
Gasoline Storage and Dispensing				Maintain monthly records of the gasoline throughput of each gasoline dispensing facility (GDF). Have records documenting gasoline throughput available upon request. For gasoline storage tanks, maintain a file of the typical Reid vapor pressure of gasoline stored and of dates of storage. Dates on which the storage vessel is empty shall be shown.	

Emissions Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
				If the gasoline stored has a true vapor pressure greater than 470 mm Hg (9.1 psia), record the average monthly temperature, and true vapor pressure of gasoline at such temperature.	
Storage Tanks					Maintain logs of date of each material delivery, type of material delivered, and quantity of material delivered.
Fugitive Dust	PM	40% Opacity	Conduct a daily survey of visible emissions.	Maintain on-site records of the date of each application of dust suppressant, the location(s) where dust suppressant is applied, and the quantity of dust suppressant applied at each location. Record of the dates and types of dust control measures employed, and if applicable, the results of any Method 9 observations, and any corrective action taken to lower the opacity of any excess emissions.	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.) associated with the Copper World Project Submit to the Director for approval a tailings management plan for the control of fugitive dust emissions from tailings storage facilities associated with the Copper World Project.
Abrasive Blasting	PM	20% Opacity		Record the date, duration and pollution control	

Emissions Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
				measures of any abrasive blasting project.	
Spray Painting	VOC	20% Opacity Control 96% of the overspray		Maintain records of the date, duration, quantity of paint used, any applicable SDS, and pollution control measures of any applicable 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	

VIII. ENVIRONMENTAL JUSTICE ANALYSIS

The Environmental Protection Agency (EPA) defines Environmental Justice (EJ) as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and polices. The goal of completing an EJ assessment in permitting is to identify and provide overburdened populations or communities with an additional opportunity for meaningful participation in the permitting process. Overburdened is used to describe minority, low-income, tribal, and indigenous populations or communities that experience disproportionate environmental harms and risks due to increased exposure, cumulative impacts, or greater vulnerability to environmental hazards.

The EPA developed EJScreen, a publicly available application that uses nationally consistent data to produce maps and reports detailing environmental justice indexes, which quantify the existing impacts of pollution and sources such as $PM_{2.5}$, Ozone, Diesel Particulate Matter, Air Toxics Cancer Risk, Air Toxics Respiratory Health Index, and Traffic Proximity against socioeconomic indicators such as demographic of People of Color, Low Income, Under the Age of 5 Years Old, or Over the Age of 64 Years Old. The EPA has identified the 90th percentile for each EJ index action as the threshold requiring further evaluation and outreach regarding the potential for EJ concerns in a community resulting from the construction and operation of a new stationary source.

ADEQ mapped the location of the Copper World Project and reviewed a 5-mile radius around the facility for potential environmental justice concerns (see Figure 1 below). Due to the remote location and limited population within the 5-mile radius of the Copper World Project, an additional review of the 2-mile radius surrounding the travel path from the location of the Copper World Project to Interstate 19 was conducted in order to further capture the communities that will be impacted as a result of the operation of the Copper World Project (see Figure 2 below).

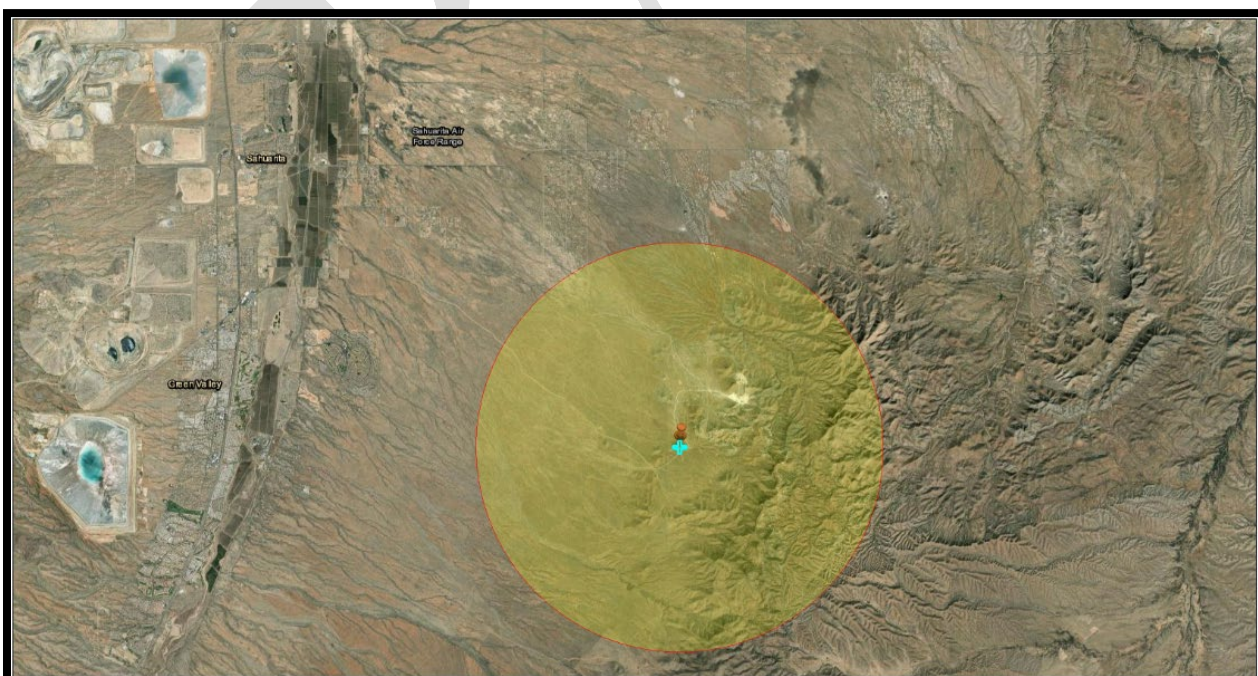

Figure 1: 5-mile radius around the Copper World Project

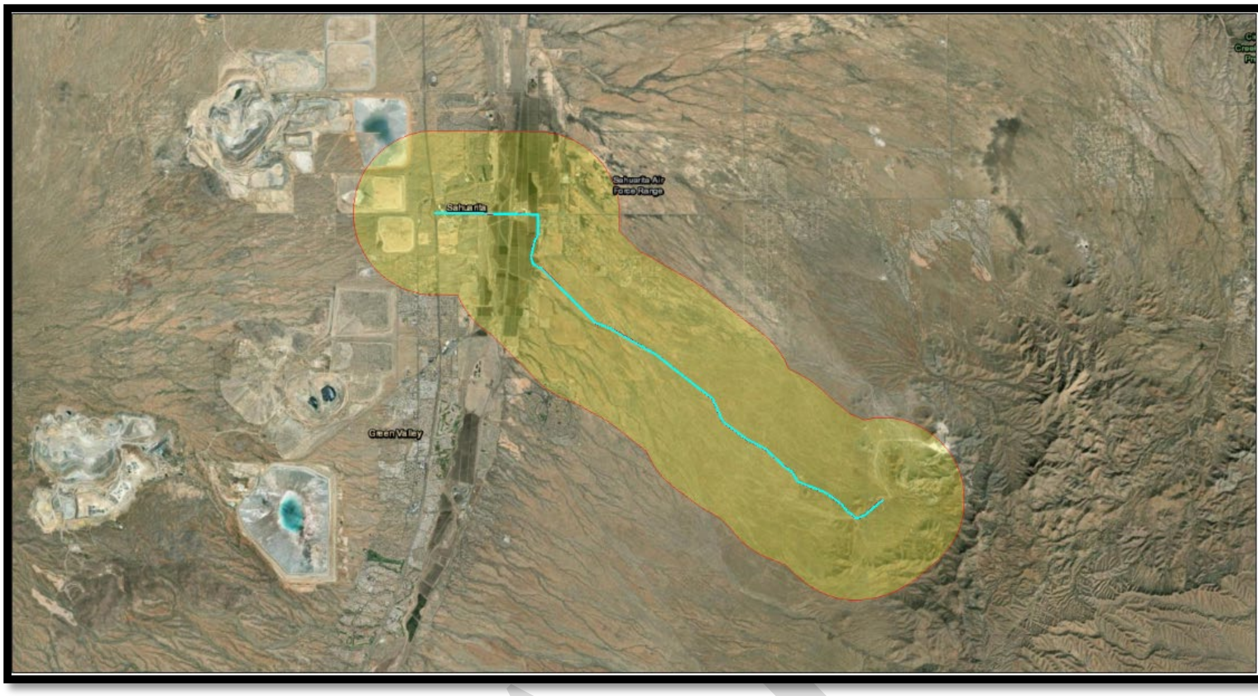

Figure 2: 2-mile radius around Travel Route from the Copper World Project to Interstate 19

Based on the analysis conducted utilizing data obtained through EJScreen, ADEQ has concluded that permitting of the Copper World Project would not result in potential EJ concerns for affected communities as demonstrated in accordance with guidance provided by EPA. Results from the EJScreen report for each scenario are detailed in Table 6 below.

Table 6: EJScreen Community Report Results

Environmental Justice Index	5-Mile Radius – Copper World		2-Mile Radius – Travel Route	
	State Percentile	USA Percentile	State Percentile	USA Percentile
Total Population	189		9,294	
$PM_{2.5}$	22	4	39	10
Ozone	10	72	13	81
Diesel Particulate Matter	3	2	25	26
Air Toxics Cancer Risk	19	26	28	35
Air Toxics Respiratory Health Index	14	15	22	20
Traffic Proximity	2	4	17	24
Lead Paint	60	31	0	15
Superfund Proximity	31	42	60	62
RMP Facility Proximity	18	12	52	47

Environmental Justice Index	5-Mile Radius – Copper World		2-Mile Radius – Travel Route	
	State Percentile	USA Percentile	State Percentile	USA Percentile
Hazardous Waste Proximity	10	16	29	41
Underground Storage Tanks	0	0	36	36
Wastewater Discharge	0	0	70	74

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 the 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 no learning sites within 2 miles of the Copper World Project and thus, it is exempt from the Learning Sites Policy.

X. AMBIENT AIR IMPACT ANALYSIS

ADEQ reviewed the ambient air quality assessment submitted in support of its application for a Class II Air Quality Permit for the Copper World Project. In accordance with the minor NSR program under A.A.C. R18-2-334, ADEQ required Copper World to conduct an ambient air quality assessment via air dispersion modeling to demonstrate that potential impacts from the Copper World Project will not interfere with attainment or maintenance of any NAAQS. 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 or modified source, compliance with the NAAQS is based upon the maximum ambient concentrations, which is the sum of the background concentrations and the modeled ambient impacts of the Copper World Project's potential emissions.

For the Copper World Project, the pollutants subject to the minor NSR program are PM_{10}, $PM_{2.5}$, NO_X, and ozone (O_3). Therefore, a modeling analysis for these pollutants is required. Copper World also voluntarily conducted an additional modeling analysis for CO and SO_2.

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)[1] and the Air Dispersion Modeling Guidelines for Arizona Air Quality Permits, November 1, 2019 (ADEQ's Modeling Guidelines).[2]

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1 US. EPA. 2017. Guidelines on Air Quality Models. https://www.epa.gov/sites/default/files/2020-09/documents/appw_17.pdf

2 Arizona Department of Environmental Quality. 2019. Air Quality Modeling Guidelines for Arizona Air Quality Permits. http://static.azdeq.gov/aqd/modeling_guidance.pdf

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. Copper World used AERMOD for the ambient air impact analysis.

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. Copper World used AERMOD version 23132, which is the latest version of AERMOD published by the EPA.

B. Source Inputs

This section provides a discussion on source characterization to develop appropriate source inputs, including modeling scenarios, modeled emission rates, source configuration and source types, and off-site sources.

1. Project Overview

The Copper World Project involves a range of operations, including open-pit mining in six designated areas with activities such as drilling, blasting, loading, stockpiling, and hauling of ore and waste rock. Additionally, the project includes primary crushing, stockpiling of crushed ore, stockpile reclaim, milling, flotation of sulfide ore, heap leaching of oxide ore, tailings thickening, and placement of tailings in a conventional storage facility. Further processes involve concentrate leaching, precious metals recovery, optional copper concentrate dewatering and preparation for shipment, molybdenum concentrate drying and bagging, an SX/EW plant, and copper cathode production. The project also includes the operation of a sulfuric acid plant.

In addition, secondary operations include fuel burning equipment, reagent systems, storage tanks, organic reagent use, an analytical metallurgical laboratory, and the utilization of mobile support vehicles.

2. Sources of Emissions

Emissions are produced throughout mining activities, including drilling, blasting, loading, and hauling, as well as during ore processing operations, which involve crushing, milling, flotation, concentrate and tailings filtration/management. Additional sources of emissions include dust collectors, vehicles traveling on unpaved roads, wind erosion from tailings storage facilities and stockpiles, loading/unloading of ore and waste rock, material transfer points, the SX/EW plant, emergency generators, and firewater pumps, and the sulfuric acid plant.

a. Tailpipe Emissions

ADEQ's air quality permit program is designed to satisfy the requirements of various federal Clean Air Act (CAA) permit programs for "stationary sources" of air pollution, including major and minor NSR and Title V. See CAA §§ 110(a)(2)(C), 165, 173, 502. Under Section 302(z) of the CAA, a stationary source does not include "emissions resulting directly from an internal combustion engine for transportation purposes or from a nonroad engine or nonroad vehicle as defined in section 7550 of" the Act. EPA, the courts, and environmental organizations have recognized that under § 302(z), "NNSR permit programs generally do not regulate emissions from 'nonroad engines." Center for Biological Diversity v. United States, No. 22-9546, 2023 U.S. App. LEXIS 24725, *23 (10^{th} Cir. Sep. 18, 2023).

A.R.S. § 49-104(A)(16) annotated provides that:

> *Unless specifically authorized by the legislature, [ADEQ shall] ensure that state laws, rules, standards, permits, variances and orders are adopted and construed to be consistent with and no more stringent than the corresponding federal law that addresses the same subject matter.*

The legislature has not specifically authorized ADEQ to apply the state air quality permit program to nonroad engines and vehicles. ADEQ is therefore precluded from modeling or otherwise subjecting direct nonroad engine or vehicle emissions to the requirements of air quality permits.

3. Modeled Scenarios

The production schedule for the mining project, outlined up to Year 15, is based on detailed mining sequence plans. Sulfide ore mining peaks at 21.9 million (M) tpy from Year 5 to the end of Year 14. Oxide ore mining peaks in Years 6 through 8 at 16.425M tpy. Waste rock placement reaches its maximum rate at 51.1M tpy in Year 10.

For a mining operation, the primary pollutants of concern are PM_{10} and $PM_{2.5}$. The potential ambient impacts for the two pollutants are primarily influenced by the travel distances of the mine vehicle fleets, measured as Vehicle Miles Traveled (VMT). Considering these factors, ADEQ required Copper World to model the operations for Year 14 and Year 8 for the following reasons:

- Year 14 has the maximum rate of VMT for heavy haul truck travel, including both in-pit and out-of-pit, throughout the mine's lifespan; and
- Year 8 has the maximum rate of out-of-pit VMT for heavy haul truck travel throughout years that achieve the maximum throughput rate.

Despite Years 14 and 8 representing the maximum potential for overall ambient impacts, they also involve large operational development areas. To address these concerns, an additional assessment was conducted with a specific focus on the initial five years, owing to their considerably smaller operational footprint. In evaluating the emissions during the early mine life, it was found that the highest projected annual mining impacts and the greatest haul truck travel in close proximity to the ambient boundary occur in Year 2. Therefore, ADEQ required Copper World to model operations for Year 2 as well.

4. Modeled Emission Rates

Copper World calculated the maximum potential short-term emission rates in lb/hr and lb/day based on either the maximum equipment design rates or the highest short-term throughput or operational limitations as specified in the permit. Generally, maximum potential short-term emission rates were modeled to ensure compliance with short-term NAAQs. Specifically, the maximum hourly average emission rates were modeled to demonstrate compliance with 1-hour NO_2, 1-hour CO, and 8-hour CO standards, while the maximum 24-hour average emission rates were modeled to demonstrate compliance with 24-hour PM_{10} and $PM_{2.5}$ standards.

Copper World calculated the maximum potential long-term average emission rates using the annual throughput limitation as stipulated in the permit. The annual average emission rates were modeled to demonstrate compliance with the annual standards for NO_2 and $PM_{2.5}$.

5. Source Characterization

a. Point Sources

Dust collectors, scrubbers, emergency generators, and water pumps 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, vendor specifications, or engineering estimations.

b. Volume Sources

Fugitive emissions from roadways, waste rock facilities (WRF), tailings storage facilities (TSF), stockpiles, truck unloading, material transfer points, and rock breakers were modeled as volume sources. Additionally, the emissions due to blasting in the pits were modeled as volume sources. The volume source parameters, including initial lateral dimension (σy_0), initial vertical dimension (σz_0) and release height, were estimated in accordance with ADEQ's Modeling Guidelines Sections 3.3.5 for road sources and 3.3.2 for the other volume sources. Additional considerations associated with the volume sources are discussed below.

(1) Road Sources

In the development of an emissions inventory for Year 2, Year 8, and Year 14 of the mining plan, a refined road network was developed to map out the projected routes for haul trucks and dumping locations. Emissions due to haul road and general plant traffic on the unpaved road network were modeled as a series of volume sources, with the exception of delivery and product shipment vehicle emissions along Santa Rita Road, which are discussed in Section X.B.5.d below.

The majority of emissions from the haul road network are due to large haul trucks. Therefore, the volume source parameters for haul roads were calculated based on the dimensions of a large haul truck (Caterpillar 793F Mining Truck).

The majority of the plant road emissions are due to smaller vehicles such as vehicles delivering miscellaneous consumables, reagents, fuels, and lubricants. Therefore, the volume source parameters for plant roads were calculated based on the dimension of a representative delivery vehicle (Getman A64 Service Fuel Vehicle).

(2) Waste Rock Facilities and Tailings Storage Facilities

The dimensions of WRF placement areas and the active tailings placement areas in TSFs were determined according to the mine plan. Given the substantial size of these placement areas, certain ambient air receptors may be located within the volume source exclusion zone, where the model does not calculate impacts from the volume source to these receptors. To address this issue, the WRF or TSF volume sources were subdivided into multiple smaller sources with equivalent dimensions. Emissions were then distributed among these smaller volume sources based on the number required.

(3) Explosive Blasting

As recommended by ADEQ, Copper World used a hybrid approach to model the emissions due to blasting in the pits. The Open Blast Open Detonation Model (OBODM) was used to calculate the blast dimensions for each pit for each model year based on the ANFO usage per blast. The blast dimensions were then used to calculate the initial vertical dimensions and release heights for blasting volume source in AERMOD.

The Copper World Project will confine routine daily blasting activities to the period between noon and 4 p.m., with the exception of the Broadtop Butte pit, which is scheduled for blasting between noon and 2 p.m. To simulate blasting emissions during these hours, the AERMOD variable emission rate option hour-of-day (HROFDY) was employed.

c. Open-Pit Sources

In Year 2 and Year 8, mining occurs in multiple pit locations, with Year 8 focusing on mining at the Broadtop Butte and Rosemont pits, and Year 2 encompassing the Peach, Elgin, Heavy Weight, and Copper World pits. However, mining is conducted exclusively in the Rosemont Pit in Year 14.

Copper World used AERMOD's open-pit algorithm to characterize the emissions generated within the open-pit mines. Emissions from drilling, loading, hauling, water truck use, and support vehicles inside each pit were combined and modeled as a single open-pit source. The open-pit source parameters for model inputs reflect the physical orientation and size (i.e., depth and horizontal dimensions) of the open-pits based on the mine plan.

d. Area Sources

In order to avoid the exclusion zones of defined volume sources, delivery and product shipment vehicle emissions along segments of Santa Rita Road that are considered accessible to the public within the Copper World Project boundary were modeled as an area source. Road area sources were limited to a 10:1 length to width ratio. Emissions for the area source segment were calculated as the total of the emissions from the volume source segments within that area source zone. Consistent with 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.

6. Off-Site Nearby Sources

The EPA recommends that all nearby sources that are not adequately represented by background ambient monitoring data be explicitly modeled as part of the NAAQS analysis. To determine which nearby sources should be explicitly modeled in the air quality analysis, the EPA has established "a significant concentration gradient in the vicinity of the source under consideration" as the sole criterion for this determination.

Cimbar Performance Materials, a non-metallic material processing facility, is located approximately 0.5 miles from the Copper World Project boundary. Given its relatively low emission rates (approximately 12 tpy for PM_{10}) and the low release heights of equipment operating at the facility, it is unlikely that Cimbar would cause a significant concentration gradient within the vicinity of the Copper World Project site. Therefore, there are no nearby sources that were explicitly modeled. The impact from distant off-site sources are represented by background ambient monitoring data, as discussed in Section X.G.

C. Meteorological Data

1. Meteorological Data Selection

For regulatory dispersion modeling analyses, 5 years of National Weather Station (NWS) meteorological data, or at least 1 year of site-specific meteorological data, or at least 3 years of prognostic meteorological data must be used.

The Copper World Project includes operations on both the east and west sides of the Santa Rita Mountains, with distinct wind patterns anticipated on each side. On the east side of the ridgeline, downslope winds dominate, and prevailing winds generally blow from the west to the east. Conversely, the prevailing winds are expected to blow from the east to the west and southeast to northwest on the west side of the ridgeline.

Multiple years of site-specific meteorological data (March 2007 through February 2009) were collected at the center of the Rosemont open-pit on the east side of the Santa Rita Mountains. The data (hereinafter "east site-specific meteorological data") were reviewed and approved for the previous permit actions associated with the former Rosemont Copper Project. However, site-specific meteorological data on the west-side of the Santa Rita Mountains were not available when Copper World submitted their initial permit application in 2022. At that time, Copper World proposed, and ADEQ approved, the use of 5 years of data collected at the Tucson International Airport, located approximately 20 miles northwest of the proposed project. ADEQ also required Copper World to conduct additional analyses for certain meteorological variables, considering the differences between Tucson and the project site. The results of the modeling analyses using the Tucson airport data indicate that the proposed project will comply with the NAAQS.

In January 2023, Copper World submitted a meteorological quality assurance project plan (QAPP) to ADEQ for conducting site-specific meteorological monitoring on the west side of the Santa Rita Mountains. The purpose of the monitoring program is to establish continuous and accurate meteorological measurements for the Copper World Project. Copper World has been collecting the site-specific meteorological data (hereinafter "west site-specific meteorological data") since April 2023, and now more than one year of data is available, meeting the one-year regulatory modeling requirement.

As discussed above, Copper World has collected on-site meteorological data on both the east and west sides of the ridgeline of the Santa Rita Mountains. Since the majority of the Copper World Project's footprint, as well as all of the Project's stationary emissions sources, are located on the west side of the Santa Rita Mountains, ADEQ determined that the west site-specific meteorological data are the most representative of the transport and dispersion conditions of pollutants at the project site and should be used as the primary meteorological dataset for modeling the potential ambient impacts from the Copper World Project. Therefore, ADEQ required Copper World to use the west on-site meteorological data for modeling the entire Copper World Project, including emission sources on both sides of the Santa Rita Mountains. This methodology is conservative, as the emission sources on the west and east sides are located in different airsheds and a cumulative impact from both sides is unlikely. Additionally, ADEQ required Copper World to use the east site-specific meteorological data for modeling the emission sources on the east side of the ridgeline of the Santa Rita Mountains.

In summary, two meteorological datasets were utilized for modeling the Copper World Project:

- One-year of west site-specific meteorological data (from May 2023 to April 2024) for modeling the entire Copper World Project, including emission sources on both sides of the Santa Rita Mountains.

- Two-years of east side-specific meteorological data (from March 2007 to February 2009) for modeling the emission sources on the east side of the ridgeline of the Santa Rita Mountains.

2. Meteorological Data Processing

a. West Site-Specific Meteorological Data

Copper World used the most recent version of AERMET meteorological preprocessor (v23132) to process one-year of site-specific data along with the upper air radiosonde data from the Tucson station within the NWS Rawinsonde Network. Copper World employed the Bulk Richardson scheme for estimating heat flux under stable conditions based on the measurements of temperature difference and insolation. Copper World also used the EPA's AERSURFACE tool (v20060) to calculate surface characteristic parameters (albedo, Bowen ration and surface roughness) required by AERMET.

AERSURFACE requires the users to specify whether the project site is in an arid region or a non-arid region. Considering precipitation and land cover at the project area, the designation "non-arid" was chosen. To assess moisture conditions (dry, wet, or normal), Copper World compared the annual precipitation for the modeled year to the 30-year climatological record of annual precipitation for the Tucson NWS station, and determined the regional moisture condition for the modeled year as "Average".

Copper World implemented the adjusted surface friction (ADJ_U*) option when processing meteorological data. Copper World provided justification for the use of the ADJ_U* option in AERMET. ADEQ reviewed this justification and found it sufficient, thus granting approval for the utilization of the ADJ_U* option. Because the Copper World site-specific dataset includes partial turbulence data (sigma-theta), and using both ADJ_U* and turbulence data may result in underprediction, the sigma-theta data were removed before processing the site-specific data with AERMET and the modeling analyses were conducted using meteorological data with ADJ_U* without sigma-theta data.

b. East Site-Specific Meteorological Data

ADEQ used the AERMET meteorological preprocessor (v21112) to process two-years of site-specific data along with cloud cover data from the U.S. National Climatic Data Center (NCDC) for the Tucson International Airport, and upper air radiosonde data from the Tucson station within the NWS Rawinsonde Network. Surface characteristics were processed using AERSURFACE (v20060).

ADEQ supplied Copper World with the AERMOD ready model input files at the outset of the modeling project. Since then, AERMET has undergone revisions by the EPA, including Versions 22112 and 23132. ADEQ reprocessed the meteorological data using the latest version of AERMET (v23132) and conducted a model test run. It was concluded that these revisions would not influence model results.

D. Ambient Air Boundary and Receptor Network

Applicants are required to demonstrate modeled compliance with NAAQS at receptors spaced along and outside the ambient air boundary (AAB) of the project site. According to the EPA's revised policy on exclusion from "Ambient Air", "*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*".[3] The general public may not include mail carriers, equipment and product suppliers, maintenance and repair persons, as well as persons who are permitted to enter restricted land for the business benefit of the person who has the power to control access to the land.[4]

The Copper World Project site is enclosed by ridges and hills, which pose limitations on access. The primary entry point is via Helvetia/Santa Rita Road, and the segment of this road passing through the Copper World property will be considered "ambient air". Additionally, the proposed Public Access Restriction Plan for the site would allow ongoing access to neighboring landowners and roadway users. This access would occur along roadway corridors, within a 50-75 ft setback along portions of the southwest boundary of the main mine boundary and within a 100 ft setback along portions of the southeast boundary along of the "F Block" tailings facility. A final 50 ft easement is also included for a driveway extending off Santa Rita Road. Apart from the Helvetia/Santa Rita Road segment and roadway corridors, the entire site will be restricted by fencing, topographical features, and/or "no trespassing" signs and security monitoring. These measures effectively prevent public access. Copper World will provide the Department with a Public Access Restriction Plan before commencing operations, as required in Condition IX of Attachment "B" of the permit.

Following the Department's recommendations, Copper World set up a receptor network encompassing a region extending up to 10 km from AAB. The grid spacing utilized for the receptors is as follows:

- AAB set at 25 m intervals;
- Fine receptor grid of 100 m extending from AAB to 1 km;

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3 U.S. EPA. 2019. Revised Policy on Exclusion from "Ambient Air" https://www.epa.gov/sites/default/files/2019-12/documents/ambient_air2019.pdf
4 U.S. EPA. 2007. Interpretation of "Ambient Air" In Situations Involving Leased Land Under the Regulations for Prevention of Significant Deterioration (PSD). Stephen D. Page Memorandum dated June 22, 2007. Research Triangle Park, North Carolina 27711.

- Medium receptor grid of 500 m, extending from 1 km to 5 km; and
- Coarse grid receptor grid of 1000 m, extending from 5 km to 10 km.

Discrete receptors were also placed along the Helvetia/Santa Rita Road segment and roadway corridors, as discussed above.

Copper World used the AERMAP terrain processor (V1808) to process the National Elevation Data (NED) 1/3 arc-second data to generate the receptor elevations and hill heights.

E. Downwash and Good Engineering Practice (GEP)

All the facility stacks are subject to downwash. All stacks are also below the minimum 65-meter allowable GEP height; therefore, all stack heights are fully creditable for air quality modeling. Copper World 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).

F. 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 procedure specifies that the land use within a three-kilometer radius of the source should be determined using the typing scheme developed by Auer.[5] Copper World determined that the Project site area was "Rural" based on the land use method.

G. Background Concentration

Background concentrations should be representative of regional air quality in the vicinity of a facility. Generally, 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 Section 8.3.2.b of Appendix W, a regional site is "*one that is located away from the area of interest but is impacted by similar or adequately representative sources*." There is not an explicit threshold for the distance between the project site and the regional monitor. The key criterion is that the project site and the regional monitor should have a similar source impact.

1. Background Concentration for PM_{10}

The PM_{10} monitoring data in Arizona are strongly influenced by climate conditions, elevation variations, precipitation patterns, and the degree of localized emissions of coarse particles at monitoring station sites. Due to the distinct airsheds on the east and west sides of the Santa Rita Mountains, with the west side being exposed to more local and regional emission sources, the PM_{10} background concentration was assessed separately for each side.

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

a. PM_{10} Background – West Side of Santa Rita Mountains

For the assessment of impacts from the Copper World Project using the Tucson NWS meteorological data, the Corona De Tucson (CDT) monitor was selected. This monitor is located approximately 13 km from the Copper World Project's northern boundary and was chosen for determining background concentrations due to its proximity and designation as a "regional" monitor. To evaluate time-varying maximum background concentrations, maximum monthly 24-hour PM_{10} values were calculated for each month from January 2019 to December 2021.

Per the guidelines provided by both the EPA and ADEQ Modeling Guidelines, monitoring data resulting from unusual events or atypical conditions may be excluded when determining background concentrations. A thorough analysis of natural events in the CDT dataset revealed that seven data points should be removed from the background assessment due to the influence of natural high wind dust events resulting in short-term spikes in ambient concentrations at the CDT monitor. These values were replaced with the highest monthly values from unaffected years to ensure an accurate representation of background concentration.

ADEQ conducted a review of the most recent three years of the CDT monitor data (2021-2023) and utilized the same methodology to exclude four data points impacted by high wind dust events. Following this review, ADEQ recalculated the background concentrations and re-ran the model for PM_{10} in Year 8 (the worst-case scenario). It was determined that this adjustment does not impact NAAQS compliance for the maximum ambient concentration.

b. PM_{10} Background – East Side of Santa Rita Mountains

To evaluate particulate emission sources located east of the ridgeline of the Santa Rita Mountains using site-specific meteorological data, a separate PM_{10} background concentration was used. In support of the previous Rosemont Copper Project, the applicant conducted a three-year PM_{10} monitoring initiative spanning from June 2006 to June 2009. ADEQ determined that the monitoring data are still representative of the current air quality conditions. The 24-hour PM_{10} background concentration was calculated as the average of the highest 24-hour concentrations recorded for each year (treating July of one year to June of the following year as a complete annual cycle).

2. Background Concentration for $PM_{2.5}$

The spatial differences in $PM_{2.5}$ are generally less pronounced when compared to PM_{10}, primarily due to the extended atmospheric residence period of fine particles. This extended duration enables fine particles to be transported over long distances, resulting in a more uniform distribution of mass concentrations.

There are no monitoring sites in the immediate vicinity of the Copper World Project area. Therefore, a "regional site" must be selected to determine the background concentrations based on similar/representative source impacts. ADEQ reviewed the monitoring data collected from the State and Local Air Monitoring Stations (SLAMS). Most of the SLAMS are urban monitors, and their data are not representative of the Copper World Project area. The most representative monitor is Alamo Lake, with an average annual value of 3.4 μg/m³ over the most recent three years (2021-2023). ADEQ also reviewed data from the Saguaro National Park (SNP) East monitor within Interagency Monitoring of Protected Visual Environments (IMPROVE) program. ADEQ found that the annual average concentrations from the SNP East monitor were comparable to or slightly higher than those from Alamo Lake. Considering the relative conservativeness of the concentration data from the SNP East monitor, ADEQ recommended that Copper World utilize data from the SNP East monitor to assess background levels of PM2.5. Copper World derived the 24-hour and annual background concentrations based on the data spanning 2019 to 2021. The obtained annual concentration was 3.9 μg/m³.

ADEQ conducted a review of the most recent three years of the SNP East monitor data (2020-2022). By removing a single daily data point due to an exceptional event, the obtained annual background was 4.0 μg/m³. It was confirmed that the slight variation in background concentration would not impact the NAAQS compliance for the maximum ambient concentration.

3. Background Concentration for NO_2

There are no monitoring sites in the immediate vicinity of the Copper World Project area. Therefore, a "regional site" must be selected to determine the background concentrations based on similar/representative source impacts. There are very limited NO_2 monitoring sites in Arizona, with all monitoring sites currently located in the Phoenix/Tucson metropolitan area. These monitors are located in urban areas and are significantly influenced by emissions from heavy vehicular traffic and industrial sources that do not exist near the Copper World Project area.

ADEQ has collected two-year hourly NO_2 ambient air monitoring data at the Alamo Lake site from July 2014 to June 2016. As the Copper World site is similar to the Alamo Lake site in that the only sources of NO_2 are minor vehicle traffic, Copper World selected the Alamo Lake site as a representative site for the background determination. To calculate the background concentration, the EPA recommends using the 98th percentile (the 8th highest) of the annual distribution of daily maximum 1-hour values averaged across the most recent three years of monitoring. Copper World used the highest 1-hour concentration of the two-year monitoring data as the 1-hour background NO_2 concentration. This method was deemed to be conservative and acceptable.

4. Background Concentrations for CO and SO_2

All active CO monitors in Arizona are located in urban areas, while active SO_2 monitors are located either in urban areas or in proximity to copper smelters.

ADEQ recommended that Copper World utilize the EPA 2021 design values of Children's Park Ncore monitor in Tucson to establish the background concentrations for CO and SO_2. This methodology was considered conservative and deemed acceptable.

H. Incorporating Particle Deposition in AERMOD

AERMOD features dry deposition algorithms for particles. Typically, this process involves the removal of a portion of particles from the plume, resulting in lower modeled concentrations for particulate matter. In the Copper World Project modeling, dry deposition was not considered for $PM_{2.5}$ modeling. The option for dry deposition of PM_{10} was only utilized when necessary. Specifically, the model initially ran with the full receptor network without accounting for dry deposition. If the modeled impact combined with background concentration exceeded the NAAQS at specific receptors, the model was re-run with dry deposition implemented for those receptors.

The modeled results, presented in Table 9 through Table 13 below, were differentiated based on whether dry deposition was included or not.

I. 1-Hour NO_2 Modeling Methodology

Per Appendix W Section 4.2.3.4-d, the EPA recommends three-tiered approach for 1-hour NO_2 modeling. Plume Volume Molar Ratio Method (PVMRM) and Ozone Limiting Method (OLM) are available as regulatory options in AERMOD as preferred Tier 3 screening methods for NO_2 modeling. In general, the Department recommends using PVMRM for relatively isolated and elevated point sources and OLM for large groups of sources, area sources, and near-surface releases (including roadway sources). Since the vast majority of the NO_2 emissions at the Copper World Project are from mobile sources with low-level plumes, Copper World selected OLM for 1-hour NO_2 modeling. Copper World used the "OLMGROUP ALL" option following ADEQ's Modeling Guidelines. The two key model inputs for the OLM options, in-stack ratios of NO_2/NO_X emissions and background ozone concentrations, are discussed as follows.

1. In-Stack Ratio

The modeled sources of NO_X include stationary engines, blasting sources, and the sulfuric acid plant.

a. Stationary Engines

Copper World used an in-stack ratio of 0.065 for stationary engines based on the average of similar engines found in EPA's NO_2/NO_X In-Stack Ratio (ISR) Database.[6] The database was sorted by engine type, fuel and engine capacity. The average of the ratios for reciprocating IC diesel engines,

6 U.S. EPA. Nitrogen Dioxide/Nitrogen Oxide In-Stack Ratio (ISR) Database. https://www.epa.gov/scram/nitrogen-dioxidenitrogen-oxide-stack-ratio-isr-database

rating in size from 400 kW to approximately 1900 kW, was used to calculate the average for use in the model.

b. Explosive Blasting

Copper World used an in-stack ratio of 0.1 for blasting based on field testing data presented in a scientific paper published in Atmosphere Environment.[7] A maximum in-stack ratio of 0.08 (rounded to 0.10 for input in the model) was calculated based on blast plume measurement results from blasting with ANFO.

c. Sulfuric Acid Plant and Fire Water Pump

The review of the ISR database for the sulfuric acid plant and fire water pump did not reveal similar sources within the database. In accordance with EPA guidance issued on March 1, 2011, when specific source information is lacking, a default ISR of 0.5 can be used. Therefore, an ISR value of 0.5 was used for both the sulfuric acid plant and fire water pump.

2. Ozone Data

Hourly ozone data must align with the meteorological data period used for the modeling. Copper World used two hourly ozone datasets for the 1-hour NO_2 modeling analysis:

a. To evaluate the entire project using the west site-specific meteorological data, Copper World used May 2023-April 2024 hourly background ozone data obtained from the State and Local Air Monitoring Stations (SLAMS) Green Valley monitoring site. The Green Valley monitor is the nearest ozone monitor to the Copper World Project site, located approximately 10 miles east of the Copper World Project boundary.

b. To evaluate the emission sources on the east side of the Santa Rita Mountains with site-specific meteorological data, Copper World used the 2007-2009 hourly background ozone data obtained from the Clean Air Status and Trends Network (CASTNET) Chiricahua National Monument site. This data was utilized to ensure consistency with previous permitting actions, and to ensure the use of a dataset representative of the terrain and ambient conditions that occur east of the Santa Rita Mountains.

Following ADEQ's Guidance, for a single missing hour, Copper World used linear interpolations to fill in the missing concentrations based on the previous and subsequent hour concentrations. For multiple missing hours, Copper World calculated the maximum ozone concentration for each diurnal hour for each month

7 Attalla, et al, 2008. NOx emissions from blasting operations in open-cut coal mining. Atmosphere Environment, 42:7874–7883.

and used these hourly maximum concentrations to fill in their corresponding missing diurnal hours.

J. Methodology for Ozone and Secondary $PM_{2.5}$ Impacts Analysis

Per Appendix W Sections 5.3.2 and 5.4.2, EPA recommends a two-tiered demonstration approach for addressing single-source impacts on ozone and secondary $PM_{2.5}$. The first tier involves the use of technically credible relationships between precursor emissions and a source's impacts that may be published in the peer-reviewed literature; developed from modeling that was previously conducted for an area by a source, a governmental agency, or some other entity and that is deemed sufficient; or generated by a peer-reviewed reduced form model. The second tier involves the application of more sophisticated case-specific chemical transport models (e.g., photochemical grid models) to be determined in consultation with the EPA Regional Office and conducted consistent with new EPA single-source modeling guidance. It is anticipated that the case for using a full quantitative chemical transport model is rare.

One of the first-tier demonstration tools is Model Emissions Rates for Precursors (MERPs). The MERPs can be described as an emission rate of a precursor that is expected to result in a change in ambient O_3 or $PM_{2.5}$ that would be less than a specific air quality concentration threshold such as a significant impact level (SIL). Basically, if the emission rates of precursors for a proposed source are less than the corresponding MERPs, it is concluded that the proposed source will not cause or contribute to a violation of the NAAQS for ozone or the secondary formation of $PM_{2.5}$ from the proposed source will be insignificant. For $PM_{2.5}$, the SILs the EPA recommends are 0.2 $\mu g/m^3$ and 1.2 $\mu g/m^3$ for annual NAAQS and 24-hour NAAQS, respectively. For the 8-hour ozone NAAQS, the EPA recommends a SIL value of 1.0 parts per billion (ppb), which is based on the 4th highest daily maximum 8-hour concentration, averaged over 3 years.

The EPA has established empirical relationships between individual sources and their impacts on O_3 and $PM_{2.5}$ for hundreds of hypothetical sources, including three sources in Arizona and fifteen sources in the Southwest region (including Arizona, Colorado, New Mexico, and Utah)[8]. During their assessment, Copper World examined the three hypothetical sources in Arizona and concluded that Source 36 in Coconino County best represents the project site. ADEQ conducted a supplemental analysis utilizing the most conservative illustrative MERP values in Arizona, and conducted a subsequent analysis of ozone and secondary $PM_{2.5}$ impacts accordingly. Table 7 summarizes these MERP values.

Table 7: Most Conservative MERP Values in Arizona

Pollutants	Precursors	Most Conservative MERPs Values in Arizona
Annual $PM_{2.5}$	SO_2	31,245
Annual $PM_{2.5}$	NOx	105,871
Daily $PM_{2.5}$	SO_2	1,918

8 U.S. EPA. MERPs View Qlik. https://www.epa.gov/scram/merps-view-qlik

Pollutants	Precursors	Most Conservative MERPs Values in Arizona
Daily $PM_{2.5}$	NOx	15,260
O_3	VOCs	4,553
O_3	NOx	204

Table 8 below summarizes the annual emissions of precursors (NO_X, SO_2, and VOCs) for the Copper World Project. As discussed in Section X.B.2.a, the Arizona legislature has not authorized ADEQ to apply the state air quality permit program to nonroad engines and vehicles. Therefore, the tailpipe emissions were excluded from the MERPs analysis.

Table 8: Precursor Emissions for the Copper World Project

Precursors	Annual Emissions (tpy)
NOx	49.38
SO_2	13.74
VOCs	13.46

Copper World conducted ozone and secondary $PM_{2.5}$ impact analysis following the EPA July 2022 Guidance.[9] The methods are briefly discussed below.

1. Ozone Impact Analysis

The O_3 impacts for the source impact assessment are calculated as the sum of the ratio of precursor emissions to the MERPs. If the sum of the ratios is less than 1, then the O_3 impacts are below the O_3 SIL and no cumulative analysis is necessary. If the sum of the ratios is greater than 1, the combined O_3 impacts are above the SIL. Therefore, a cumulative O_3 analysis is needed. This incorporates background O_3 levels and compares the cumulative impacts to the NAAQS.

For the Copper World Project, the sum of the ratios is calculated as follows:

$= NO_X$ Emissions/NO_X MERP + VOC Emissions/VOC MERP

$= 49.38/204 + 13.46/4{,}553$

$= 0.25 < 1$

Therefore, the O_3 impacts from the Copper World Project are below the O_3 SIL of 1 ppb and no cumulative analysis is required.

2. Secondary $PM_{2.5}$ Impact Analysis

9 U.S. EPA. 2022. Guidance for Ozone and Fine Particulate Matter Permit Modeling. https://www.epa.gov/system/files/documents/2022-07/Guidance_for_O3_PM25_Permit_Modeling.pdf

The combined primary and secondary impacts of $PM_{2.5}$ for the source impact analysis are assessed using the highest modeled primary $PM_{2.5}$ concentration (HMC) using AERMOD, the Class II SIL, precursor emissions, and the MERPs. If the sum of the ratios is less than 1, then the combined $PM_{2.5}$ impacts are below the $PM_{2.5}$ SIL and no additional analyses are necessary. However, if the ratio is greater than 1, a cumulative analysis is needed. This incorporates background $PM_{2.5}$ levels and compares the cumulative impacts to the NAAQS.

Because the sum of the ratios is above 1 for the Copper World Project, Copper World performed a cumulative impact analysis. The secondary impact for 24-hour $PM_{2.5}$ and annual $PM_{2.5}$ are calculated as follows.

Secondary Impact for 24-hour $PM_{2.5}$:
*= (NO_X Emissions/NO_X MERP + SO_2 Emissions/SO_2 MERP) * SIL*
*= (49.38/15,260 + 13.74/1,918)*1.2*
= 0.01 $\mu g/m^3$

Secondary Impact for Annual $PM_{2.5}$:
*= (NO_X Emissions/NO_X MERP + SO_2 Emissions/SO_2 MERP) * SIL*
*= (49.38/105,871 + 13.74/31,245)*0.2*
= 0.0002 $\mu g/m^3$

The secondary impacts above were incorporated with the primary impacts from AERMOD and the background concentrations. The resulting total concentrations were subsequently assessed against the NAAQS. For more model results, refer to Section X.K below.

K. Model Results

Table 9 through Table 13 below summarize the modeled results for PM_{10}, $PM_{2.5}$, NO_2, CO and SO_2. Representative background concentrations were added to modeled impacts and the total concentrations were then compared to the NAAQS. The modeled impacts for $PM_{2.5}$ included the primary modeled concentrations from AERMOD, and the secondary impacts, as discussed in Section X.J above. As shown in the tables below, emissions from the Copper World Project will not cause or contribute to a violation of the NAAQS under the operation limits/conditions as proposed in the draft permit. The AERMOD modeling analysis also revealed that the modeled impacts from the project were limited to near-field areas. Indeed, all modeled maximum concentrations for all pollutants occurred on or near the ambient air boundary. Because PM_{10} and $PM_{2.5}$ are the primary pollutant of concern, ADEQ will require Copper World to install and operate PM_{10} and $PM_{2.5}$ monitors in the area of concern, providing additional assurance that the mine's operations are protective of the health of local communities.

Table 9: Year 14 – West Site-Specific Meteorological Data (Sources on Both Sides of Santa Rita Mountains)

Pollutant	Averaging Period	Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Maximum Ambient Concentration [b] (µg/m³)	NAAQS (µg/m³)
PM_{10}	24-hour	110.7[a]	Monthly	110.7	150
$PM_{2.5}$	24-hour	8.11	9.1	17.2	35
	Annual	4.21	3.9	8.11	9
NO_2	1-hour	107.8	26.3	134.1	188.6
	Annual	1.02	2.6	3.62	100
SO_2	1-hour	68.3	2.6	70.9	196
	3-hour	27.9	3.4	31.3	1,300
CO	1-hour	3,999	920	4,919	40,000
	8-hour	731	575	1,306	10,000

[a] Monthly background concentration have been included in the model runs. Therefore, the reported concentrations reflect the total concentrations of modeled concentrations plus background concentrations.
[b] PM_{10} and $PM_{2.5}$ model runs were completed without dry depletion.

Table 10: Year 14 – East Site-Specific Meteorological Data (Sources on East Side of Santa Rita Mountains)

Pollutant	Averaging Period	Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Maximum Ambient Concentration [a] (µg/m³)	NAAQS (µg/m³)
PM_{10}	24-hour	101.4	47.7	149.1	150
$PM_{2.5}$	24-hour	8.54	9.1	17.6	35
	Annual	3.29	3.9	7.19	9
NO_2	1-hour	39.66	26.3	65.96	188.6
	Annual	0.011	2.6	2.61	100
SO_2	1-hour	0.16	2.6	2.76	196
	3-hour	0.08	3.4	3.48	1,300
CO	1-hour	2,636	920	3,556	40,000
	8-hour	778	575	1.353	10,000

[a] PM_{10} and $PM_{2.5}$ model runs were completed without dry depletion.

Table 11: Year 8 – West Site-Specific Meteorological Data (Sources on Both Sides of Santa Rita Mountains)

Pollutant	Averaging Period	Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Maximum Ambient Concentration [b] (µg/m³)	NAAQS (µg/m³)
PM_{10}	24-hour	148.1[a]	Monthly	148.1	150
$PM_{2.5}$	24-hour	10.0	9.1	19.1	35

Pollutant	Averaging Period	Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Maximum Ambient Concentration [b] (µg/m³)	NAAQS (µg/m³)
	Annual	4.97	3.9	8.87	9
NO_2	1-hour	107.8	26.3	134.1	188.6
	Annual	1.02	2.6	3.62	100
SO_2	1-hour	68.3	2.6	70.9	196
	3-hour	27.9	3.4	31.3	1,300
CO	1-hour	7,842	920	8,762	40,000
	8-hour	1,796	575	2,371	10,000

[a] *Monthly background concentration have been included in the model runs. Therefore, the reported concentrations reflect the total concentrations of modeled concentrations plus background concentrations.*
[b] *PM_{10} and $PM_{2.5}$ model runs were completed without dry depletion.*

Table 12: Year 8 – East Site-Specific Meteorological Data (Sources on East Side of Santa Rita Mountains)

Pollutant	Averaging Period	Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Maximum Ambient Concentration [a] (µg/m³)	NAAQS (µg/m³)
PM_{10}	24-hour	92.5	47.7	140.2	150
$PM_{2.5}$	24-hour	11.1	9.1	20.2	35
	Annual	4.10	3.9	8.00	9
NO_2	1-hour	88.49	26.3	114.79	188.6
	Annual	0.015	2.6	2.62	100
SO_2	1-hour	0.25	2.6	2.85	196
	3-hour	0.19	3.4	3.59	1,300
CO	1-hour	5,249	920	6,169	40,000
	8-hour	1,773	575	2,348	10,000

[a] *PM_{10} model runs were completed with dry depletion, while $PM_{2.5}$ model runs were completed without dry depletion.*

Table 13: Year 2 – West Site-Specific Meteorological Data (Sources on West Side of Santa Rita Mountains)

Pollutant	Averaging Period	Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Maximum Ambient Concentration [b] (µg/m³)	NAAQS (µg/m³)
PM_{10}	24-hour	107.4[a]	Monthly	107.4	150
$PM_{2.5}$	24-hour	7.80	9.1	17.0	35
	Annual	4.05	3.9	7.95	9
NO_2	1-hour	110.2	26.3	136.5	188.6
	Annual	1.03	2.6	3.63	100
SO_2	1-hour	68.3	2.6	70.9	196
	3-hour	27.9	3.4	31.3	1,300

Pollutant	Averaging Period	Modeled Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Maximum Ambient Concentration [b] ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
CO	1-hour	12,278	920	13,198	40,000
	8-hour	2,587	575	3,162	10,000

[a] Monthly background concentration have been included in the model runs. Therefore, the reported concentrations reflect the total concentrations of modeled concentrations plus background concentrations.
[b] PM_{10} and $PM_{2.5}$ model runs were completed without dry depletion.

XI. LIST OF ABBREVIATIONS

AAB	Ambient Air Boundary
A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
AERMAP	AERMOD Terrain Data Preprocessor
AERMET	AERMOD Meteorological Preprocessor
AERMOD	AMS/EPA Regulatory Model
AERSURFACE	AERMOD Surface Characteristics Preprocessor
AMS	American Meteorological Society
ANFO	Ammonium Nitrate and Fuel Oil
AP-42	Compilation of Air Pollution Emissions Factors
AQD	Air Quality Division
AQRV	Air Quality Related Values
ARM	Ambient Ratio Method
A.R.S.	Arizona Revised Statutes
BPIP	Building Profile Improvement Program
CAA	Clean Air Act
CASTNET	Clean Air Status and Trends Network
CDT	Corona De Tucson
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2e	CO_2 equivalent basis
EJ	Environmental Justice
EPA	Environmental Protection Agency
EW	Electrowinning
g/dscm	Gram Per Dry Standard Cubic Meter
GDF	Gasoline Dispensing Facility
GHG	Greenhouse Gases
gr/dscf	Grains Per Dry Standard Cubic Foot
H_2SO_4	Sulfuric Acid Mist
HAPs	Hazardous Air Pollutants
HMC	Highest Modeled Concentration
hp	Horsepower
hr	Hour
ICE	Internal Combustion Engine
IMPROVE	Interagency Monitoring of Protected Visual Elements
ISR	In-Stack Ratio
kW	Kilowatt
MERPs	Model Emission Rates for Precursors
M	Million

mm HG .... Millimeter of Mercury
Minor NSR .... Minor New Source Review
NAAQS .... National Ambient Air Quality Standard
NCDC .... National Climactic Data Center
NED .... National Elevation Dataset
NESHAP .... National Emissions Standard for Hazardous Air Pollutants
NNSR .... Nonattainment New Source Review
NO_2 .... Nitrogen Dioxides
NO_X .... Nitrogen Oxides
NSPS .... New Source Performance Standards
NWS .... National Weather Service
O_3 .... Ozone
OBODM .... Open Blast Open Detonation Model
OLM .... Ozone Limiting Method
Pb .... Lead
P.C.C. .... Pima County Code
PLS .... Pregnant Leach Solution
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
ppb .... Parts Per Billion
PRIME .... Plume Rise Model Enhancements
Psia .... Pounds per Square Inch (Absolute)
PTE .... Potential to Emit
PVMRM .... Plume Volume Molar Ratio Method
QAPP .... Quality Assurance Project Plan
RACT .... Reasonably Available Control Technology
RMP .... Risk Management Program
SAG .... Semi-Autogenous
SE .... Solvent Extraction
SIL .... Significant Impact Levels
SLAMS .... State and Local Air Monitoring Stations
SNP .... Saguaro National Park
SO_2 .... Sulfur Dioxide
tpy .... Tons per Year
TSF .... Tailings Storage Facility
$\mu g/m^3$ .... Micrograms per Cubic Meter
VMT .... Vehicle Miles Traveled
VOCs .... Volatile Organic Compounds
WRF .... Waste Rock Facility