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ENVIRONMENTAL QUALITY

Rosemont Copper Company
Application for a Class II Permit
Rosemont Copper Project
Southeastern Arizona

Submitted to:
Pima County Department of Environmental Quality
150 West Congress Street
Tucson, Arizona 85701

Submitted by:
Rosemont Copper Company
3031 West Ina Road
Tucson, Arizona 85741
Contact: 520.297.7723

Prepared by:
Applied Environmental Consultants, a JBR company
1553 W. Elna Rae, Ste. 101
Tempe, Arizona 85281
Contact: 480.829.0457

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APPLIED ENVIRONMENTAL CONSULTANTS | a JBR company

www.aecinc.org

TABLE OF CONTENTS

LIST OF TABLES

Page

1. INTRODUCTION

Rosemont Copper Company (RCC), a wholly owned subsidiary of Augusta Resource Corporation, plans to construct and operate an open-pit mining, milling, leaching, and solvent extraction/electrowinning facility, known as the Rosemont Copper Project (RCP). The RCP is located approximately 30 miles southeast of Tucson, west of State Highway 83, within Pima County in southeastern Arizona.

The proven and probable mineral reserves of the RCP include an estimated 546 million tons of sulfide ore and an additional 70 million tons of oxide ore. The production schedule developed from mining sequence plans indicates a project operating life of over 20 years with peak mining rates of up to 376,000 tons per day (tpd) of total material (ore and waste). The proposed Rosemont mine is expected to produce annually 221 million pounds of copper, 4.7 million pounds of molybdenum, 2.4 million ounces of silver and approximately 15,000 ounces of gold as a by-product credit for the over 20 year life of the mine.

This document presents the information necessary for the Pima County Department of Environmental Quality (PDEQ) to process the RCP application and issue a Class II Air Quality Permit. The information provided in this document includes all applicable information required by Title 17, Air Quality Control, of the Pima County Code (P.C.C.), Section 17.12.165.B. A completeness checklist listing all information required by PDEQ and where it can be located in the application is presented in Table 1.1. A completed Standard Permit Application Form is provided in Appendix A of this application and includes a compliance certification, signed by the responsible official of the RCC.

Table 1.1 Pima County Department of Environmental Quality Air Quality Permit Application Completeness Checklist for Class II Sources

Pima County Regulation / Reference	Requirement	Meets Requirement			Section in Application	Table in Application	Remark
		Yes	No	N/A			
Section 17.12.165.B	Has the standard permit application form been completed?	X			Appendix A	--	--
Application Form	Has the responsible official signed the standard permit application form?	X			Appendix A	--	--
Section 17.12.165.H	Has a certification of truth, accuracy, and completeness been included?	X			Appendix A	--	--
Filing 7.	Have the potential to emit calculations been provided and do they include potential emissions of all regulated air pollutants (including fugitives)?	X			Appendix E	Tables E.1 - E.9	
Filing 10.g	Have the operating schedules (hours/day, days/year, days/week) been included?	X			Section 5.4	--	--
Section 17.12.165.B.1	Have all applicable NSPS requirements been identified?	X			Section 4	Table 4.1	--
Section 17.12.165.B.1	Have all applicable NESHAP requirements been identified?	X			Section 4	Table 4.1	--
Filing 11.	Does the application include an equipment list with the type, name, make, model, serial or equipment number, and date of manufacturer?	X			Section 6 and Appendix A	Table 6.1	--
Filing 17.a, 7a.i	Has a statement of compliance with all applicable conditions signed by a responsible official been included?	X			Appendix A	--	--
Section 17.12.165.B.1	Does the application include a list of applicable requirements to which the applicant has stated compliance with?	X			Section 4	Table 4.1	--

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		Yes	No	N/A			
Filing 19.	Have the calculations on which all information is based been included in the application?	X			Appendix D	--	--
Filing 1.	Has a description of each process or emission unit been included?	X			Section 2	--	--
Filing 2.	Has a product and raw material description been included?	X			Section 2.2 and Section 5.3	Table 5.3	--
Filing 3.	Has a complete description of alternate operating scenarios been included?	X			Section 2.3	--	--
Filing 5.	Has a flow diagram of all processes been provided?	X			Appendix B	--	--
Filing 6.	Has a material balance been included?	X			Section 2.5	--	--
Filing 9.	Have any proposed exemptions and insignificant activities been included? If so, has the applicant provided sufficient evidence?	X			Section 3.2 and Appendix C	--	--
Filing 10.e	Has calculations on the fuel type and calculations for the maximum usage (hourly and annual) been included?	X			Section 5.2	Table 5.2	--
Filing 10.f	Has the information and calculations on maximum raw material hourly and annual usage been included?	X			Section 5.3	Table 5.3	--
Filing 10.h	Have any limitations on operations and work practice standards affecting emissions been included?	X			Section 5.4	--	--

Table 1.1 Pima County Department of Environmental Quality Air Quality Permit Application Completeness Checklist for Class II Sources

Pima County Regulation / Reference	Requirement	Meets Requirement			Section in Application	Table in Application	Remark
		Yes	No	N/A			
Filing 13.	Does the application include a site diagram which provides: property boundaries, adjacent streets/roads, a directional arrow, elevation, equipment layout, location of emission points, emission areas, and air pollution control equipment, and the closest distance between emissions and property boundaries?	X			Appendix F	--	--
Filing 14.a	Have the applicable test or monitoring methods for determining compliance been included?	X			Section 4 and Section 8.1	Table 4.1	--
Filing 14.b, 14.c, 14.d	Does the application include identification, location, and description of pollution controls, including data establishing their rated and operating efficiency?	X			Section 8.2	Table 8.1	--
Section 17.12.165.B.1	Does the applicant state compliance with all of the applicable requirements identified in the application?	X			Section 9	--	--
Section 17.12.110.E	If not, does the application include a compliance schedule that contains remedial measures, including an enforceable sequence of actions with milestones leading to compliance with the noncompliant requirements?			X	--	--	--

2. PROCESS AND PRODUCT DESCRIPTION

The RCP is primarily a copper mining project with appreciable amounts of molybdenum and silver by-products and lesser quantities of other by-products. The copper mineralization of the Rosemont deposit is primarily sulfide with a cap of oxide copper close to the surface. The sulfide and oxide ore will be mined through conventional open pit mining techniques. Concentrate ore (mostly comprised of sulfide ore) will be processed by crushing, grinding, and flotation to produce a copper concentrate product, which contains copper, silver, and possibly small amounts of gold and a molybdenum concentrate product. Leach ore (mostly comprised of oxide ore) will be leached and the resulting leach solution processed through a solvent extraction and electrowinning facility to produce a copper cathode product for market.

2.1 PROCESS DESCRIPTION AND FLOW DIAGRAM

Major operations at the RCP include: (a) open-pit mining including drilling, blasting, loading, and hauling of ore and development rock; (b) primary crushing and stacking of crushed ore; (c) stockpile reclaim; (d) milling and flotation; (e) tailings dewatering and placement; (f) concentrate dewatering and preparation for shipment; (g) heap leaching; and (h) solvent extraction/electrowinning (SX/EW). An overall process flow diagram for these processes is presented in Figure B.1 of Appendix B. Descriptions of the major processes, related potential air pollutant emissions from the processes, and the methods that will be used to control emissions are discussed below. In addition, detailed process flow diagrams and a plan view map of the facility showing the process locations are presented in Appendix B and Appendix F, respectively.

Secondary processes that have the potential to emit regulated air pollutants include: (a) fuel burning equipment; (b) reagent systems; (c) storage tanks; (d) organic reagent use; (e) an analytical laboratory; (f) crud treatment and organic recovery; and (g) the use of mobile vehicles at the RCP. Several pieces of fuel burning equipment are integral parts of the major operations at the RCP and are therefore included in the description of the major processes below.

The processes at the RCP have the potential to produce air pollutant emissions including: particulate matter (PM), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), carbon monoxide (CO), nitrous oxides (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOCs), sulfuric acid (H_2SO_4), and hazardous air pollutants (HAPs).

2.1.1 Open-Pit Mining

Open pit mining will be conducted using large-scale equipment including rotary blasthole drills (diesel and electric powered), a hydraulic percussion track drill, electric mining shovels, front end loaders, off-highway haul trucks, crawler dozers, rubber-tired dozers, motor graders and off-highway water trucks.

Open pit mining is scheduled for 24 hours per day, 7 days per week, and 365 days per year. Peak mining rates are expected to reach 376,000 tpd of total material mined (ore and waste rock).

Individual peak mining rates for concentrate and leach ore can reach up to 90,000 tpd and 57,000 tpd, respectively, depending on the ore deposits in the mine, but will not occur simultaneously.

Peak mining rates are presented in this application to allow maximum production flexibility, although it is not anticipated that all peak rates can be achieved simultaneously and rates will naturally decrease with time. Emissions from mining operations are dependent primarily upon the mining rate and haul truck travel, with haul truck travel (vehicles miles traveled) representing over 70% of total particulate related emissions. The highest annual mining rates occur during Year 1 while the highest annual haul truck travel occurs in Year 5. The Year 5 mining rates are 5.1% less than the Year 1 mining rates, but the haul truck travel in Year 5 is 24.7% greater than the haul truck travel in Year 1. Consequently, operations during Year 5 in the life of the mine will produce the highest annual emission rates. The emission inventory presented in this permit application is based on operations during Year 5.

2.1.1.1 Drilling and Blasting

Drilling and blasting are performed within the open pit mine. The bulk of production blasthole drilling will be performed by rotary blasthole drills. Ammonium nitrate and fuel oil (ANFO) blasting agents will be used for nearly all rock breakage in dry ground, comprising an estimated 80% to 90% of the total explosive use. Ammonium nitrate emulsions will be employed in wet conditions. Based on an average of 365 blasts per year, blasting agent use will average about 18,980 tons per year (tpy), or 0.65 tons of ANFO per hole drilled and 80 holes drilled per blast.

Both drilling and blasting have the potential to emit regulated air pollutants. Drilling has the potential to emit PM, PM_{10}, and $PM_{2.5}$ emissions while blasting has the additional potential to emit CO, NO_x, and SO_2 emissions. Potential fugitive particulate emissions from drilling may be controlled by the addition of water and by shrouds on an as needed basis in order to inhibit the escape of particulate emissions from the top of the hole during the drilling process. However, when calculating worst case potential emissions from drilling and blasting, no emission controls are applied.

2.1.1.2 Loading and Hauling

Ore and waste rock are loaded into haul trucks by mobile shovels and hauled to their respective processing locations. Concentrate ore will be transported from the open pit and either dumped directly into the primary crusher dump hopper or unloaded to the run of mine stockpile located close to the primary crusher near the east pit rim. The concentrate ore will be crushed and stockpiled prior to being processed by the mill. Leach ore will be transported from the open pit to the leach pad. This material will not be crushed, but will be dumped in lifts atop a lined pad for subsequent leaching. Waste rock from the open pit will be transported to the waste rock storage areas located to the southeast, east, and northeast of the proposed open pit.

Loading concentrate ore, leach ore, and waste rock into the haul trucks from the open pit mine has the potential to emit PM, PM_{10}, and $PM_{2.5}$ emissions. Additionally, using the haul trucks to transport the ore and waste rock causes fugitive particulate emissions from the unpaved haul roads. Fugitive particulate emissions from haul roads and unpaved regularly traveled primary access roads will be controlled by the application of water from water trucks on an as needed basis. Chemical dust suppressants can provide a greater control of fugitive particulate emissions from unpaved roads and may be used where conditions warrant. Potential emissions are calculated assuming the fugitive particulate emissions from hauling are controlled by water application.

2.1.2 Primary Crushing and Coarse Ore Stockpile

A run of mine stockpile, located near the primary crusher, will be used throughout the life of the mine to provide flexibility in handling short-term operating disruptions in the crushing and conveying system. It is estimated that during operations a worst case quantity of 10% of the mined concentrate ore will need to be stockpiled prior to primary crushing. The majority of the ore will be dumped directly into the primary crusher dump hopper. For the ore that is stockpiled, a front end loader will be used to transport and dump it into the crusher dump hopper. At start up, a significant amount of material is expected to be stockpiled prior to crushing due to the mine development schedule.

The crusher dump hopper will directly feed the primary gyratory crusher. Primary crushed ore will be withdrawn from the crusher discharge hopper by a crusher discharge feeder. The feeder will discharge to the stockpile feed conveyor belt that will in turn feed the stockpile tripper conveyor that discharges to the coarse ore stockpile. The stockpile tripper conveyor and coarse ore stockpile are enclosed within the stockpile building. A process flow diagram of the primary crushing and coarse ore stockpiling process is presented in Figure B.2 of Appendix B.

The run of mine stockpile, material transfer to the primary crusher, primary crushing, and material transfers from the primary crusher to the coarse ore stockpile have the potential to emit PM, PM_{10}, and $PM_{2.5}$ emissions. The crushing area scrubber and stockpile area scrubber will control the particulate matter emissions from the material transfer points between the primary crusher and the coarse ore stockpile. Since emissions from primary crushing are emitted through the exit of the crusher, the crushing area scrubber will also indirectly control primary crushing emissions at the material transfer point from the primary crusher. Water sprays will be used to control particulate matter emissions from the material transfer to the primary crusher at the dump hopper. Water sprays will also be used at the material transfer points to control fugitive emissions not captured by the scrubbers.

2.1.3 Stockpile Reclaim

Primary crushed ore will be stockpiled in a coarse ore stockpile enclosed in the stockpile building. The stockpile will sit directly on the ground and a reclaim tunnel will be installed beneath the stockpile. Ore will be withdrawn from the coarse ore stockpile by apron feeders installed in the reclaim tunnel. The feeders will discharge to two conveyor belts installed in series which will in turn discharge to the semi-autogenous (SAG) grinding mill. A process flow diagram of the stockpile reclaim and transfer to the SAG mill process is presented in Figure B.2 of Appendix B.

The material transfer points from the coarse ore stockpile to the reclaim feeders are located underground and will not produce emissions into the atmosphere. The material transfer points from the reclaim feeders to the SAG have the potential to emit PM, PM_{10}, and $PM_{2.5}$ emissions. Particulate matter emissions due to the material transfers from the reclaim feeders to the SAG mill feed conveyor will be controlled by the reclaim tunnel scrubber, the pebble crusher area scrubber, and a water spray. The material transfer point to the SAG mill is controlled by the addition of process water.

2.1.4 Milling and Flotation

Ore will be ground in water to the final product size in a SAG mill primary grinding circuit and a ball mill secondary grinding circuit. The primary grinding SAG mill will operate in closed circuit with a trommel screen, pebble wash screen, and a pebble crusher. Trommel undersize will be the final product from the SAG mill grinding circuit. Trommel and pebble wash screen oversize (hard rock pebbles) will be transported by belt conveyors to the pebble crusher where it will be processed and returned by belt conveyors to the SAG mill.

Secondary grinding and flotation follows processing by the SAG mill to produce the copper and molybdenum mineral concentrate slurries, which are transported to the copper and molybdenum dewatering circuits, respectively. Process flow diagrams of the milling and flotation processes are presented in Figures B.3, B.4, B.5, B.6, and B.7 of Appendix B.

Except for the pebble crushing process, all material processed by the SAG mill primary grinding circuit, the secondary grinding circuit, and the flotation plant contains a sufficient amount of moisture such that no potential particulate emissions are formed. In the SAG mill, the added moisture causes fine particles in the crushed ore to agglomerate and the process water sprays at the screens wash away and control any other fine particles. Therefore, there will be no emissions due to milling, screening, or material transfer points prior to the SAG oversize surge bin.

Pebble conveyor No. 2, which discharges to the SAG oversize surge bin is a long conveyor, such that during the conveying process, the ore may start to dry out. Therefore, the material transfer points from pebble conveyor No. 2 to the pebble crusher feeder, the pebble crushing process, and the material transfer points after pebble crushing have the potential to emit PM, PM_{10}, and $PM_{2.5}$ emissions. These emissions will be controlled by the pebble crusher area scrubber. The material transfer point from the pebble crusher feeder to the pebble crusher is sealed and enclosed.

Following the SAG mill primary grinding circuit, the process material is in slurry form and will not produce any particulate matter emissions. Hydrogen sulfide formed from the sodium hydrosulfide solution used during molybdenum flotation will be controlled by the molybdenum cleaner area scrubber.

2.1.5 Copper Concentrate and Molybdenum Concentrate Dewatering and Preparation for Shipment

Copper concentrate slurry will be dewatered and thickened in a copper concentrate thickener. Thickener underflow (thickened mineral slurry) will be pumped to copper concentrate filters. Filter cake will discharge to the copper concentrate conveyor and then discharge to a copper concentrate stockpile located in the copper concentrate loadout building. Copper concentrate will be reclaimed by front-end loaders and placed in trucks for shipment to market. A process flow diagram of the copper concentrate dewatering process is presented in Figure B.8 of Appendix B.

The copper concentrate dewatering operation will produce a final product with an approximate moisture content of 10%. PM, PM_{10}, and $PM_{2.5}$ emissions have the potential to be released during material transfer points following processing by the filters where the moisture content is reduced. The copper concentrate stockpile is enclosed in a building to prevent the release of wind blown fugitives.

Molybdenum concentrate slurry stored in the molybdenum filter feed tank will be pumped to a molybdenum concentrate plate and frame filter. Molybdenum filter cake will then discharge to a dryer heated by the electric hot oil heater. The dried concentrate will be placed in a concentrate storage bin and then conveyed to the molybdenum packaging and weigh system where molybdenum concentrate is placed into supersacks or drums. The molybdenum concentrate supersacks or drums will be loaded onto trucks for shipment to market. A process flow diagram of the molybdenum concentrate dewatering process is presented in Figure B.9 of Appendix B.

The molybdenum concentrate dewatering operation will produce molybdenum concentrate with an approximate moisture content of 10% to 12%. Material transfer points subsequent to processing by the plate and frame filter have the potential to emit PM, PM_{10}, and $PM_{2.5}$ emissions. The dried molybdenum concentrate material transfers to the molybdenum concentrate bin and the supersacks or drums will be controlled by the molybdenum dust collector. Additionally, the molybdenum drying operation has the potential to produce PM, PM_{10}, and $PM_{2.5}$ emissions. These emissions will be controlled by the molybdenum scrubber and electrostatic precipitator designed to operate in series.

2.1.6 Tailings Dewatering and Placement

Tailings slurry will be dewatered and thickened in tailings thickeners. Thickener underflow (thickened tailings slurry) will be pumped to tailings plate and frame filters. The filtered tailings cake will be transferred to tailings belt feeders and three fixed tailings conveyors in series before being discharged to the tailings placement system.

The tailings placement system consists of movable and shiftable conveyors and a stacking conveyor system that will be used to deposit the filtered tailings behind large pre-formed containment buttresses constructed from waste rock in the two tailings storage areas. A dozer will be used to spread the filtered tailings in close proximity to the containment buttresses and as needed provide sufficient compaction for the conveyors and stackers. Process flow diagrams of the tailings dewatering and placement processes are presented in Figures B.10 and B.11 of Appendix B.

The tailings dewatering operation will produce tailings cake with an approximate moisture content of 15% to 18%. Following processing by the tailings plate and frame filters, the filter cake placement process has limited potential to emit particulate emissions from the non-enclosed material transfer points and the tailings storage area. The design of the containment buttresses will break up air flow and reduce exposure of large areas of tailings to windy conditions. Additionally, the tailings will be stacked in such a way as to create an irregular shape to break up air flow patters so particulate matter from the tailings does not become entrained. There are two tailings conveying and placement systems. The primary system (System #1) has one more conveyor than alternate system (System #2). Therefore, emission calculations in this permit application assume all tailings are processed through System #1 as a worst case emission estimate.

2.1.7 Heap Leaching

Leach ore will be transported from the open pit to the lined leach pad by mine haul trucks via a haul road running along the south and east edges of the pad area. The ore will be stacked on the lined leach pad area and irrigated with an acidified leach solution (raffinate). Crawler dozers will be used to spread the leach ore and cross rip the material to promote leach solution infiltration. Drip emitters located close to the ground will distribute the leach solution to the surface of the ore to minimize evaporation losses.

The leach solution will percolate through the leach pile and put copper ions into solution from the ore before being directed along the impermeable leach pad liner to the solution collection system above the pad liner. The copper-bearing leach solution, or PLS, will flow by gravity from the leach pad to a double-lined collection pond, or PLS pond. A process flow diagram of the heap leaching process is presented in Figure B.12 of Appendix B.

Mining of ore to be leached and placement on the leach pad will be concentrated in the early years of operation, peaking at 57,000 tpd. Unloading the ore onto the leach pads has the potential to emit fugitive PM, PM_{10}, and $PM_{2.5}$ emissions. Other heap leaching processes do not produce emissions of regulated air pollutants.

2.1.8 Solvent Extraction and Electrowinning (SX/EW)

Copper contained in the aqueous phase PLS will be extracted from the solution with reagents carried in an organic phase solution in the SX circuit. The resulting copper-depleted aqueous solution, or raffinate, will be transferred to a storage pond (raffinate pond) before being reused in the heap leaching process.

Copper transferred to the organic phase will be stripped by an acidic aqueous solution, or lean electrolyte, that will have traveled through the EW circuit. This transfer of copper enriches the electrolyte solution to produce a rich electrolyte. The rich electrolyte will be returned to the EW cells for copper plating onto stainless steel blanks. Prior to transferring to the EW process, the rich electrolyte produced from the PLS is heated using a diesel fired hot water generator and two electrolyte heat exchangers.

The copper plated stainless steel blanks will be harvested from the 30 EW cells. The copper will first be washed in water and then removed from the stainless steel by a cathode stripping machine. Copper plates will be weighed and bundled into 2 to 3 ton packages for shipment by truck to market. Process flow diagrams of the solvent extraction and electrowinning processes are presented in Figures B.12, B.13, and B.14 of Appendix B.

The organic phase solution that will be utilized in the SX process has the potential to emit VOCs and HAPs. The mixers, settlers, and various other tanks used in the SX process that may contain the organic solution will be covered to minimize the evaporative losses. The EW process has the potential to emit H_2SO_4 mist emissions and cobalt compounds entrained in the acid mist. The emissions will be controlled by the use of an acid mist suppressing agent and six electrowinning cell ventilation scrubbers with a 99% control efficiency.

2.1.9 Secondary Processes

The following secondary processes are necessary to support the major operations at the RCP and are capable of producing emissions: (a) fuel burning equipment; (b) reagent systems; (c) storage tanks; (d) organic reagent use; (e) an analytical laboratory; (f) crud treatment and organic recovery; (g) the use of mobile vehicles, and (h) open burning.

There are eight stationary fuel burning equipment that will be used at the RCP, a hot water generator used to heat the electrolyte prior to the EW process (see Section 2.1.8), five emergency generators used during commercial power outages, and two fire water pumps used in emergency situations. Additionally, the RCP uses multiple nonroad engines on-road vehicles. The EW hot water generator burns diesel fuel and has a heat input rate of 6.0 MMBtu/hr. The emergency generators also use diesel fuel and have outlet capacities ranging from 50 to 1,000 kW. The fire water pumps are both diesel fired with outlet capacities of 400 hp. Regulated air pollutants emitted from the diesel fuel burning equipment include PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs, and HAPs. The nonroad engines and on-road vehicles are not regulated by PDEQ.

Reagent systems at the RCP include delivery of reagents to the facility, possible mixing and/or preparation of reagents, storage, and distribution to a process stream. Some of the reagents delivered to the facility are in solid form and will be mixed with water at the facility. Other reagents may be delivered in liquid form or may remain in solid form prior to use in a process. The material transfer points of the solid phase reagents have the potential to emit PM, PM_{10}, and $PM_{2.5}$ emissions. The liquid phase reagents stored in tanks prior to use may produce VOC and HAP emissions from breathing and working losses depending on the properties of the reagent. The lime and sodium metasilicate systems utilize passive bin vents to control particulate emissions from filling the storage vessels. Hydrogen sulfide formed during the sodium hydrosulfide delivery process and storage will be controlled by the molybdenum cleaner area scrubber. Process flow diagrams of the reagent systems are presented in Figures B.16, B.17, and B.18 of Appendix B.

The RCP will include multiple storage tanks containing volatile organic liquids that are either greater than 10,000 gallons with a vapor pressure equal to or greater than gasoline, or greater than 40,000 gallons with a vapor pressure equal to or greater than diesel fuel. Emissions from such tanks will result in the form or breathing and working losses. The RCP will have four tanks that meet these criteria. All other tanks that do not meet these criteria are considered insignificant activities.

Organic reagents are used in various processes at the RCP. Frothers, promoters, flocculants, and xanthates for copper and molybdenum promotion and collection are added during the bulk flotation and molybdenum flotation processes. Antiscalants and flocculants are added to the dewatering processes. The types of reagents and the quantities used are frequently modified to address the changes in ore and processing conditions. All VOC emissions from organic reagent use in the flotation and dewatering processes are fugitives and are negligible due to the dilution of the organic reagents in large quantities of water and the comparatively low vapor pressures of the organics when compared to water.

The analytical laboratory will be a single story pre-engineered building and will consist of a sample preparation area, wet laboratory, metallurgical laboratory, environmental laboratory, reagent storage area, balance rooms, and a facility to collect and manage waste reagents from the laboratory. The sample preparation area will contain sample crushers, pulverizers, splitters, sieve shakers, blenders, and three dust collectors to capture and contain any particulate matter emissions generated from these operations. Fume hoods in the laboratories will be vented to a wet scrubber system where gaseous emissions will be controlled. After processing by the wet scrubber system, emissions are considered negligible. There are no other processes taking place in the analytical laboratory that will produce emissions.

The crud treatment and organic recovery process at the RCP recovers the diluent used in the solvent extraction process (see Figure B.15 of Appendix B). The tanks used for this process may contain organic material, although due to the nature of the process, any VOC or HAP emissions released are considered negligible. Other processes used for crud treatment and organic recovery do not produce regulated air pollutants.

The use of mobile vehicles is an integral part of operations at the RCP. The mobile vehicles include major mine equipment and mining support equipment. The mobile vehicles have the potential to produce particulate matter emissions from traveling on unpaved roads at the facility. The unpaved road emissions from the mobile vehicles are fugitive emissions and are controlled by road watering.

Open burning will periodically need to be performed at the RCP. The RCP will obtain the necessary open burn permits from PDEQ prior to any open burning activities and proper open burning procedures and requirements will be followed.

2.1.10 Additional Information about Pollution Control Equipment

As described in the individual process description sections, the current design of the RCP includes the use of six wet scrubbers, one cyclone scrubber, one baghouse, and one electrostatic precipitator for controlling particulate matter emissions from the metallic mineral processing equipment. The RCP is investigating the possible replacement of one or more scrubbers with cartridge filter dust collectors or baghouses. Replacement of the scrubbers with dust collectors or baghouses will reduce emissions further because of their better control efficiency.

The information in this application is presented on the basis that the RCP will use scrubbers. The application also includes all applicable information pertaining to baghouses should any scrubber be replaced by a baghouse, except exhaust flow rates. Such information will be provided in a timely manner should there be a change from a scrubber to a cartridge filter or baghouse control device.

2.2 PRODUCT DESCRIPTION

The RCP will produce copper and molybdenum concentrate using a milling and flotation process, and metallic copper in the form of high purity copper cathode plates using a SX/EW process. Some byproducts, such as silver and gold, may be produced based on market conditions. The average annual production rates for these products are presented in Table 2.1. Annual production may be greater or less than these values during an individual year, but over the life of the mine, it is anticipated that these average production rates will be achieved.

Table 2.1 Production Rate Over the Operating Life of the RCP

Product	Average Annual Production Rate
Copper Concentrate/Copper Cathodes	110,500 tons
Molybdenum Concentrate	2,350 tons
Silver	2.4 million ounces
Gold	15,000 ounces

2.3 *ALTERNATE OPERATING SCENARIO AND PRODUCTS*

There are no alternate operating scenarios or products proposed. Minor changes in process unit configuration and to process chemicals in order to respond to the evolving ore characteristics are a routine part of the mining process and not subject to alternate operating scenario treatment. These types of changes are encompassed within the estimated emission calculations presented in this application. Changes to the RCP requiring notification or revisions will be properly addressed through the permitting process.

2.4 *PROCESS FLOW DIAGRAMS*

Process flow diagrams are presented in Appendix B.

2.5 *MATERIAL BALANCE*

Material balance methods were used to calculate sulfur dioxide (SO_2) emissions from the combustion of diesel fuel by the emergency generators and fire water pumps. This method assumes that all of the sulfur contained in the fuel is converted to SO_2 and released to the atmosphere during combustion. Emission calculations are presented in Section 3.

3. EMISSIONS RELATED INFORMATION

3.1 IDENTIFICATION AND DESCRIPTION OF EMISSION UNITS

A list of the emission units associated with the RCP is presented in Table 3.1. The emission units are classified by a general process description and include the emission species, type of control device, if any, and a non-fugitive or fugitive emission designation. The emission units listed in Table 3.1 do not include processes that do not have the potential to emit any regulated air pollutants, insignificant units and activities, or trivial units or activities.

3.2 INSIGNIFICANT AND TRIVIAL ACTIVITIES

The equipment and activities listed in P.C.C. Section 17.04.340.A.114, Insignificant Activities, and P.C.C. Section 17.04.340.A.237, Trivial Activities, are considered to be applicable to the RCP. Consequently, emissions were not calculated for these activities or equipment. A list of insignificant and trivial activities is presented in Appendix C, including the specific insignificant and trivial activities that apply to the RCP.

3.3 CALCULATION OF EMISSIONS

The emission units presented in Table 3.1 will emit PM, PM_{10}, $PM_{2.5}$, SO_2, CO, NO_x, VOCs, H_2SO_4, and HAPs. Emissions from most of the emission units listed in Table 3.1 will depend upon the production rate. In order to ensure that this application is based upon the maximum potential emissions, the inventory is based upon design capacities or "worst case" process rates that result in maximum emissions. As discussed in Section 2.1.1, the "worst case" process rates occur in Year 5 of the life of the mine, as annual emissions are expected to be the greatest in this year.

The emission factors that were used to calculate emissions from the units listed in Table 3.1 are presented and described in Appendix D. Emission factors are primarily from the Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition (AP-42) and voluntarily accepted emission limits (see Table 4.1). Maximum hourly (lb/hr), maximum daily (tpd), and annual (tpy) emissions for Year 5 of the RCP are presented in Tables E.1 through E.9 of Appendix E.

A summary of the total annual emissions of regulated air pollutants for the RCP in Year 5 is presented in Table 3.2.

Table 3.1 Identification and Description of Emission Units

Emission Unit ID [a]	Description of Emission Unit / Process	Emission Species	Control Device / ID	Non-Fugitive or Fugitive Emissions [b]
Mining				
MN01	Drilling	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
MN02	Blasting including ANFO Detonation	PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2	--	Fugitive
MN03-MN05	Loading Ore and Waste Rock	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
MN06-MN08	Haul Road Emissions from Hauling Ore and Waste Rock	PM, PM_{10}, $PM_{2.5}$	Road Watering	Fugitive
MN09	Unloading Concentrate Ore to Run of Mine Stockpile	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
MN10	Unloading Leach Ore to Leach Pad	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
MN11	Unloading Waste Rock to Waste Rock Storage Area	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
MN12	Bulldozer Use	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
MN13	Water Truck Use	PM, PM_{10}, $PM_{2.5}$	Road Watering	Fugitive
MN14	Grader Use	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
MN15	Support Vehicle Use	PM, PM_{10}, $PM_{2.5}$	Road Watering	Fugitive

Table 3.1 Identification and Description of Emission Units

Emission Unit ID [a]	Description of Emission Unit / Process	Emission Species	Control Device / ID	Non-Fugitive or Fugitive Emissions [b]
Primary Crushing, Conveying, Coarse Ore Storage, and Reclaim Conveying				
PC01	Wind Erosion of the Run of Mine Stockpile	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
PC02	Unloading to Primary Crusher Dump Hopper (H-CDp) from Haul Trucks or Run of Mine Stockpile	PM, PM_{10}, $PM_{2.5}$	Water Sprays	Fugitive
PC03	Primary Crusher (PCr)	PM, PM_{10}, $PM_{2.5}$	Crushing Area Scrubber / PCL01	Non-Fugitive
PC04	Primary Crusher (PCr) to Crusher Discharge Hopper (H-CDs)	PM, PM_{10}, $PM_{2.5}$	Enclosed	Non-Fugitive
PC05	Crusher Discharge Hopper (H-CDs) to Crusher Discharge Feeder (F-CD)	PM, PM_{10}, $PM_{2.5}$	Crushing Area Scrubber / PCL01 [c]	Non-Fugitive
PC06	Crusher Discharge Feeder (F-CD) to Stockpile Feed Conveyor (CV-SF)	PM, PM_{10}, $PM_{2.5}$	Crushing Area Scrubber / PCL01 [c]	Non-Fugitive
PC07	Stockpile Feed Conveyor (CV-SF) to Stockpile Tripper Conveyor (CV-ST)	PM, PM_{10}, $PM_{2.5}$	Stockpile Area Scrubber / PCL02 [c,d]	Non-Fugitive
PC08	Stockpile Tripper Conveyor (CV-ST) to Covered Coarse Ore Stockpile	PM, PM_{10}, $PM_{2.5}$	Stockpile Area Scrubber / PCL02 [d]	Fugitive
PC09	Wind Erosion of the Coarse Ore Stockpile	PM, PM_{10}, $PM_{2.5}$	Enclosed	Fugitive
PC10	Coarse Ore Stockpile to Reclaim Feeders (F-R1/R4)	PM, PM_{10}, $PM_{2.5}$	Underground	Non-Fugitive
PC11	Reclaim Feeders (F-R1/R4) to Reclaim Conveyor (CV-R)	PM, PM_{10}, $PM_{2.5}$	Reclaim Tunnel Scrubber / PCL03	Non-Fugitive
PC12	Reclaim Conveyor (CV-R) to SAG Mill Feed Conveyor (CV-SMF)	PM, PM_{10}, $PM_{2.5}$	Pebble Crusher Area Scrubber / PCL04 [c]	Non-Fugitive

Table 3.1 Identification and Description of Emission Units

Emission Unit ID [a]	Description of Emission Unit / Process	Emission Species	Control Device / ID	Non-Fugitive or Fugitive Emissions [b]
PC13	Pebble Conveyor No. 3 (CV-Pb3) to SAG Mill Feed Conveyor (CV-SMF)	PM, PM_{10}, $PM_{2.5}$	Pebble Crusher Area Scrubber / PCL04	Non-Fugitive
PC14	SAG Mill Feed Conveyor (CV-SMF) to SAG Mill (M-SAG)	PM, PM_{10}, $PM_{2.5}$	Addition of Process Water	Non-Fugitive
Grinding Mill and Flotation				
M01	SAG Mill (M-SAG)	PM, PM_{10}, $PM_{2.5}$	Wet Process	Non-Fugitive
M02	SAG Mill (M-SAG) to Trommel Screen (Sn-T)	PM, PM_{10}, $PM_{2.5}$	Enclosed	Non-Fugitive
M03	Trommel Screen (Sn-T)	PM, PM_{10}, $PM_{2.5}$	Wet Process	Non-Fugitive
M04	Trommel Screen (Sn-T) to Pebble Conveyor No. 1 (CV-Pb1)	PM, PM_{10}, $PM_{2.5}$	Clean, Wet Ore	Non-Fugitive
M05	Pebble Conveyor No. 1 (CV-Pb1) to Pebble Wash Screen (Sn-PbW)	PM, PM_{10}, $PM_{2.5}$	Clean, Wet Ore	Non-Fugitive
M06	Pebble Wash Screen (Sn-PbW)	PM, PM_{10}, $PM_{2.5}$	Wet Process	Non-Fugitive
M07	Pebble Wash Screen (Sn-PbW) to Pebble Conveyor No. 2	PM, PM_{10}, $PM_{2.5}$	Clean, Wet Ore	Non-Fugitive
M08	Pebble Conveyor No. 2 (CV-Pb2) to SAG Oversize Surge Bin (B-SAGOS)	PM, PM_{10}, $PM_{2.5}$	Pebble Crusher Area Scrubber / PCL04	Non-Fugitive
M09	SAG Oversize Surge Bin (B-SAGOS) to Pebble Crusher Feeder (F-PbC)	PM, PM_{10}, $PM_{2.5}$	Pebble Crusher Area Scrubber / PCL04	Non-Fugitive
M10	Pebble Crusher Feeder (F-PbC) to Pebble Crusher (PbC)	PM, PM_{10}, $PM_{2.5}$	Enclosed	Non-Fugitive

Table 3.1 Identification and Description of Emission Units

Emission Unit ID [a]	Description of Emission Unit / Process	Emission Species	Control Device / ID	Non-Fugitive or Fugitive Emissions [b]
M11	Pebble Crusher (PbC)	PM, PM_{10}, $PM_{2.5}$	Pebble Crusher Area Scrubber / PCL04	Non-Fugitive
M12	Pebble Crusher (PbC) to Pebble Conveyor No. 3 (CV-Pb3)	PM, PM_{10}, $PM_{2.5}$	Pebble Crusher Area Scrubber / PCL04	Non-Fugitive
Copper Concentrate Dewatering and Stacking				
CCD01	Copper Concentrate Filters (Ft-CC1/CC4) to Copper Concentrate Conveyor (CV-CC)	PM, PM_{10}, $PM_{2.5}$	Enclosed	Non-Fugitive
CCD02	Copper Concentrate Conveyor (CV-CC) to Copper Concentrate Loadout Stockpile	PM, PM_{10}, $PM_{2.5}$	Copper Concentrate Scrubbers / PCL05-06	Fugitive
CCD03	Wind Erosion of Copper Concentrate Loadout Stockpile	PM, PM_{10}, $PM_{2.5}$	Enclosed	Fugitive
CCD04	Copper Concentrate Loadout Stockpile to Shipment Truck via Front End Loaders	PM, PM_{10}, $PM_{2.5}$	Copper Concentrate Scrubbers / PCL05-06	Fugitive
Molybdenum Dewatering and Packaging				
MD01	Molybdenum Concentrate Filter (Ft-MC) to Molybdenum Concentrate Dryer (D-MC)	PM, PM_{10}, $PM_{2.5}$	Enclosed	Non-Fugitive
MD02	Molybdenum Concentrate Dryer	PM, PM_{10}, $PM_{2.5}$	Molybdenum Scrubber and Electrostatic Precipitator / PCL07	Non-Fugitive
MD03	Molybdenum Concentrate Dryer (D-MC) to Molybdenum Concentrate Bin (B-MC)	PM, PM_{10}, $PM_{2.5}$	Molybdenum Dust Collector / PCL08	Non-Fugitive
MD04	Molybdenum Concentrate Bin (B-MC) to Molybdenum Concentrate Hopper (H-MC)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive

Table 3.1 Identification and Description of Emission Units

Emission Unit ID [a]	Description of Emission Unit / Process	Emission Species	Control Device / ID	Non-Fugitive or Fugitive Emissions [b]
MD05	Molybdenum Concentrate Hopper (H-MC) to Molybdenum Concentrate Conveyor (CV-MC)	PM, PM_{10}, $PM_{2.5}$	Enclosed	Non-Fugitive
MD06	Molybdenum Concentrate Conveyor (CV-MC) to Molybdenum Packaging and Weigh System (MPS)	PM, PM_{10}, $PM_{2.5}$	Molybdenum Dust Collector / PCL08	Non-Fugitive
Tailings Dewatering and Placement				
TDS01	Tailings Filters (Ft-T1/T14) to Tailings Belt Feeders (F-T1/T14)	PM, PM_{10}, $PM_{2.5}$	Enclosed	Non-Fugitive
TDS02	Tailings Belt Feeders (F-T1/T14) to Fixed Tailings Conveyor No. 1 (CV-F1)	PM, PM_{10}, $PM_{2.5}$	Enclosed	Non-Fugitive
TDS03	Fixed Tailings Conveyor No. 1 (CV-F1) to Fixed Tailings Conveyor No. 2 (CV-F2)	PM, PM_{10}, $PM_{2.5}$	Enclosed	Non-Fugitive
TDS04	Fixed Tailings Conveyor No. 2 (CV-F2) to Fixed Tailings Conveyor No. 3 (CV-F3)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
TDS05	Fixed Tailings Conveyor No. 3 (CV-F3) to Relocatable Conveyor (CV-R1)	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
TDS06	Relocatable Conveyor (CV-R1) to Shiftable Conveyor (CV-S1)	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
TDS07	Shiftable Conveyor (CV-S1) to Belt Wagon Conveyor (CV-BW1)	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
TDS08	Belt Wagon Conveyor (CV-BW1) to Spreader Crawler Mounted Conveyor (CV-SP1)	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
TDS09	Spreader Crawler Mounted Conveyor (CV-SP1) to Tailings Storage	PM, PM_{10}, $PM_{2.5}$	--	Fugitive
TDS10	Wind Erosion of Tailings Storage	PM, PM_{10}, $PM_{2.5}$	--	Fugitive

Table 3.1 Identification and Description of Emission Units

Emission Unit ID [a]	Description of Emission Unit / Process	Emission Species	Control Device / ID	Non-Fugitive or Fugitive Emissions [b]
Solvent Extraction and Electrowinning				
SXE01	Solvent Extraction	VOCs, HAPs	--	Fugitive
SXE02	Electrowinning Commercial Cells (EWCC)	H_2SO_4, HAPs	Cell Ventilation Scrubbers	Non-Fugitive
Fuel Burning Equipment				
FB01	Diesel Electrowinning Hot Water Generator (HWG)	PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs, HAPs	--	Non-Fugitive
FB02	Thickener Area Emergency Generator (TEG)	PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs, HAPs	--	Non-Fugitive
FB03	PLS Pond Area Emergency Generator (PEG)	PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs, HAPs	--	Non-Fugitive
FB04	Main Substation Emergency Generator (MEG)	PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs, HAPs	--	Non-Fugitive
FB05	Administration Building Emergency Generator (AEG)	PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs, HAPs	--	Non-Fugitive
FB06	Electrowinning Building Emergency Generator (EWEG)	PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs, HAPs	--	Non-Fugitive
FB07	Primary Crusher Fire Water Pump (PCFWP)	PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs, HAPs	--	Non-Fugitive
FB08	SX/EW Fire Water Pump (SXFWP)	PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs, HAPs	--	Non-Fugitive

Emission Unit ID [a]	Description of Emission Unit / Process	Emission Species	Control Device / ID	Non-Fugitive or Fugitive Emissions [b]
Miscellaneous Sources				
MS01	Transfer of Bulk Pebble Lime to the Bulk Pebble Lime Silo (S-BPL)	PM, PM_{10}, $PM_{2.5}$	Bulk Pebble Lime Silo Bin Vent	Non-Fugitive
MS02	Bulk Pebble Lime Silo (S-BPL) to Bulk Pebble Lime Silo Screw Conveyor (CV-BPLS)	PM, PM_{10}, $PM_{2.5}$	Enclosed	Non-Fugitive
MS03	Bulk Pebble Lime Silo Screw Conveyor (CV-BPLS) to SAG Mill Feed Conveyor (CV-SMF)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
MS04	Transfer of Lime to the Lime Storage Bin (B-L)	PM, PM_{10}, $PM_{2.5}$	Lime Storage Bin Vent	Non-Fugitive
MS05	Transfer of Sodium Metasilicate to the Sodium Metasilicate Storage Bin (B-SM)	PM, PM_{10}, $PM_{2.5}$	Sodium Metasilicate Storage Bin Vent	Non-Fugitive
MS06	Transfer of Flocculant from Supersacks to Flocculant Storage Bins (B-F1/F2)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
MS07	Transfer of Guar from Bags to Guar Feeder (F-Gu)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
MS08	Transfer of Granular Cobalt Sulfate from Bags to Cobalt Sulfate Feeder (F-CoS)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
Tanks				
T01	C7 Distribution Tank (T-C7D)	VOCs	--	Non-Fugitive
T02	MIBC Storage Tank (T-MIBCS)	VOCs	--	Non-Fugitive
T03	Diesel Fuel Storage Tank - Heavy Vehicles 1 (T-DFS-HV1)	VOCs, HAPs	--	Non-Fugitive

Table 3.1 Identification and Description of Emission Units

Emission Unit ID [a]	Description of Emission Unit / Process	Emission Species	Control Device / ID	Non-Fugitive or Fugitive Emissions [b]
T04	Diesel Fuel Storage Tank - Heavy Vehicles 2 (T-DFS-HV2)	VOCs, HAPs	--	Non-Fugitive
Particulate Matter Pollution Control Equipment with Limits				
PCL01	Crushing Area Scrubber (PC-CAS)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
PCL02	Stockpile Area Scrubber (PC-SAS)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
PCL03	Reclaim Tunnel Scrubber (PC-RTS)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
PCL04	Pebble Crusher Area Scrubber (PC-PCAS)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
PCL05	Copper Concentrate Scrubber 1 (PC-CCS1)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
PCL06	Copper Concentrate Scrubber 2 (PC-CCS2)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
PCL07	Molybdenum Scrubber (PC-MS) / Electrostatic Precipitator (PC-EP)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
PCL08	Molybdenum Dust Collector (PC-MDC)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
PCL09	Laboratory Dust Collector 1 (PC-L1)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
PCL10	Laboratory Dust Collector 2 (PC-L2)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive
PCL11	Laboratory Dust Collector 3 (PC-L3)	PM, PM_{10}, $PM_{2.5}$	--	Non-Fugitive

Table 3.1 Identification and Description of Emission Units

Emission Unit ID [a]	Description of Emission Unit / Process	Emission Species	Control Device / ID	Non-Fugitive or Fugitive Emissions [b]

[a] If the emission unit is controlled, the control device is listed. If the control device has an emission limit, it is listed as a separate emission unit.

[b] Fugitive emission units for non-HAP species do not contribute to the facility-wide potential to emit.

[c] These emission units have water spray control for fugitive particulate emissions not captured by the scrubbers. Emission calculations in this permit application are based on 100% capture efficiency of the scrubbers.

[d] These emission units are located within the coarse ore stockpile building in addition to being controlled by the scrubbers. Emission calculations in this permit application are based on 100% capture efficiency of the scrubbers.

Table 3.2 Maximum Annual Emission Summary for the RCP

Emission Type	Category	Annual Emissions (tons)
PM	Non-Fugitive	85.72
	Fugitive	3,094.31
	Total	3,180.03
PM_{10}	Non-Fugitive	66.02
	Fugitive	842.00
	Total	908.02
$PM_{2.5}$	Non-Fugitive	28.02
	Fugitive	93.48
	Total	121.51
CO	Non-Fugitive	9.00
	Fugitive	606.22
	Total	615.22
NO_x	Non-Fugitive	16.76
	Fugitive	153.82
	Total	170.58
SO_2	Non-Fugitive	0.06
	Fugitive	18.10
	Total	18.15
VOCs	Non-Fugitive	1.51
	Fugitive	3.77
	Total	5.28
H_2SO_4	Non-Fugitive	0.02
	Fugitive	0.00
	Total	0.02
HAPs	Non-Fugitive	3.37
	Fugitive	0.00
	Total	3.37

4. APPLICABLE REQUIREMENTS AND PROPOSED EXEMPTIONS

4.1 APPLICABLE REQUIREMENTS

Regulatory requirements applicable to the RCP and affected emission units are presented in Table 4.1. This table identifies those requirements of Chapter 17.16 Articles III, IV, V, VI, VII, and IX of the P.C.C., 40 CFR Part 60, and 40 CFR 63, which apply to the RCP. All requirements of Chapter 17 Articles III, IV, V, VI, VII, and IX of the P.C.C., 40 CFR Part 60, and 40 CFR 63 which are not identified in Table 4.1 do not apply to the RCP.

The current design of the RCP includes the use of six wet scrubbers, one cyclone scrubber, one baghouse, and one electrostatic precipitator for particulate matter control. Three of the wet scrubbers, the cyclone scrubber, the baghouse, and the electrostatic precipitator are subject to 40 CFR 60, Subpart LL. The RCP is investigating the use of cartridge filter dust collectors or baghouses as possible replacements for one or more scrubbers. If a cartridge filter dust collector or baghouse replaced a scrubber subject to 40 CFR 60, Subpart LL, it would also be subject to 40 CFR 60, Subpart LL. Therefore, for completeness, the requirements for cartridge filter dust collectors or baghouses are included in Table 4.1 and will become regulatory permit requirements should the RCP decide to switch pollution control devices.

4.2 REQUIREMENTS THAT DO NOT APPLY

The portable generators at the RCP are considered nonroad engines, per 40 CRF Section 89. Therefore, Section 17.16.340 of the P.C.C. and 40 CFR Part 60, Subpart IIII for stationary internal combustion engines do not apply. However, the portable generators will comply with the emission standards in 40 CFR 89.112.

4.3 PERMIT SHIELD

By this application, the RCC requests that the permit shield be extended to the RCP to the extent allowed under P.C.C. Section 17.12.310. Additionally, the RCC requests that the requirements identified as not applicable in Section 4.2 be specifically identified as not applicable to the RCP as allowed under P.C.C. Section 17.12.310.

4.4 PROPOSED EXEMPTIONS

RCC is not requesting exemptions to any otherwise applicable requirement.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

	Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
1.	RCP	P.C.C. Section 17.12.040	Requirements for reporting excess emissions including but not limited to: (a) telephone or fax notification within 24 hours of first learning of excess emissions, and (b) submittal of a written report within 72 hours of the telephone or fax notification.	Maintenance of records; submittal of timely notifications and reports.
		P.C.C. Section 17.12.080	Posting of permit or certificate of permit issuance at the equipment site in such a manner as to be clearly visible and accessible, and maintaining a complete copy of the permit on the site.	Posting of permit and maintenance of records.
		P.C.C. Section 17.12.220	Submittal of annual compliance certification.	Submittal of certification.
		P.C.C. Section 17.12.320	Submittal of annual emission inventory survey questionnaires.	Submittal of questionnaire.
		P.C.C. Section 17.12.520	Payment of annual emission fees.	Payment of fees.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

	Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
2.	Plant Open Spaces, Roads and Streets, Material Handling Operations, Storage Piles, and Mineral Tailings (except for those subject to Chapter 17.16, Articles IV or VI of the P.C.C.)	P.C.C. Section 17.16.080 P.C.C. Section 17.16.090 P.C.C. Section 17.16.100 P.C.C. Section 17.16.110 P.C.C. Section 17.16.120	Implementation of reasonable precautions to prevent excessive amounts of particulate matter from becoming airborne from: (a) open spaces (P.C.C. Section 17.16.080), (b) plant roads and streets (P.C.C. Section 17.16.090), (c) material handling operations (P.C.C. Section 17.16.100), (d) storage piles (P.C.C. Section 17.16.110), and (e) mineral tailings (P.C.C. Section 17.16.120)	Regular inspection, application of water to regularly traveled unpaved roads, maintenance of roads, application of water as needed on material handling operations and storage piles.
3.	All non-point sources as defined in P.C.C. Section 17.16.055	P.C.C. Section 17.16.050	Opacity $\leq$ 20%	Performance of EPA Reference Method 9 Test.
4.	All point sources as defined in P.C.C. Section 17.16.130 unless otherwise specified in this table	P.C.C. Section 17.16.130	Opacity $\leq$ 20%	Performance of EPA Reference Method 9 Test.
5.	Diesel Electrowinning Hot Water Generator (6.0 MMBtu/hr)	P.C.C. Section 17.16.165.C.1	$PM \leq 1.02\ Q^{0.769}$ (where PM = emission limit in lb/hour, Q = heat input in MMBtu/hour)	Engineering Evaluation.
		P.C.C. Section 17.16.165.E	$SO_2 \leq$ 1.0 lb/MMBtu heat input.	Supplier certification of low sulfur fuel.
		P.C.C. Section 17.16.165.I.1	Opacity $\leq$ 15%	Performance of EPA Reference Method 9 Test.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

	Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
			Reporting to the Control Officer all six-minute periods in which the opacity exceeds 15%.	Submittal of report; maintenance of records.
6.	Equipment Subject to P.C.C. Section 17.16.360 (Table 6.1 presents the complete list of affected facilities for each regulation)	P.C.C. Section 17.16.360.B	$PM \leq 3.59\ P^{0.62}$, when $P \leq 30$ tph $PM \leq 17.31\ P^{0.16}$, when $P > 30$ tph (where PM = emission limit in lb/hour, P = total process rate in tons-mass/hour)	Performance of EPA Reference Method 5 Test.
		P.C.C. Section 17.16.360.F	Recording of the daily process rates and hours of operation of all material handling facilities.	Maintenance of records.
7.	Equipment Subject to P.C.C. Section 17.16.430 (Table 6.1 presents the complete list of affected facilities for each regulation)	P.C.C. Section 17.16.430.A.1	$PM \leq 3.59\ P^{0.62}$, when $P \leq 30$ tph $PM \leq 17.31\ P^{0.16}$, when $P > 30$ tph (where PM = emission limit in lb/hour, P = total process rate in tons-mass/hour)	Performance of EPA Reference Method 5 Test.
		P.C.C. Section 17.16.430.A.2	$SO_2 \leq 600$ ppm	Operation of equipment in a manner as to limit air pollution.
		P.C.C. Section 17.16.430.A.3	$NO_x \leq 500$ ppm	Operation of equipment in a manner as to limit air pollution.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
	P.C.C. Section 17.16.430.D	Operation of equipment, processes, and premises such that gaseous or odorous materials are not emitted in such quantities or concentrations as to cause air pollution.	Maintenance of records of control measures used to limit emissions.
	P.C.C. Section 17.16.430.F	Processing, storage, and transportation of solvents or other materials containing volatile organic compounds and acids in such a manner and by such means that the compounds will not evaporate, leak, escape, or otherwise be discharged into the ambient air as to cause or contribute to air pollution; and, where means are available, application of control methods, devices, or equipment to reduce effectively the contribution of these compounds to air pollution.	Use of low vapor pressure diluents (< 1.5 psia) or covers/enclosures on mixer/settler tanks. Use of effective means for controlling sulfuric acid mist emissions (see Section 2).
	P.C.C. Section 17.16.430.H	$H_2S \leq 0.03$ ppm_v for any averaging period of 30 minutes or more at any occupied place beyond the premises of the RCP.	Operation of Molybdenum Cleaner Area Scrubber.
8. Off-Road Machinery	P.C.C. Section 17.16.450.A	No off-road machinery shall emit smoke or dust for any period greater than 10 consecutive seconds, the opacity of which exceeds 40% (except for periods less than 10 consecutive seconds and the first 10 minutes of cold start operation).	Performance of EPA Reference Method 9 Test.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

	Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
9.	Roadway and Site Cleaning Machinery	P.C.C. Section 17.16.470.A	No roadway or site cleaning machinery shall emit smoke or dust for any period greater than 10 consecutive seconds, the opacity of which exceeds 40% (except for periods less than 10 consecutive seconds and the first 10 minutes of cold start operation).	Performance of EPA Reference Method 9 Test.
10.	Equipment Subject to P.C.C. Sections 17.16.490.A.43 and 17.16.490.A.81 (40 CFR 60 Subparts LL and IIII) (Table 6.1 presents the complete list of affected facilities for each regulation)	40 CFR 60.7(a)(1) P.C.C. Section 17.16.490.A.1	Provide notification of the date construction commenced postmarked no later than 30 days after such date.	Maintenance of Records.
		40 CFR 60.7(a)(3) P.C.C. Section 17.16.490.A.1	Provide notification of the actual date of initial startup postmarked within 15 days after such date.	Maintenance of Records.
		40 CFR 60.7(b) P.C.C. Section 17.16.490.A.1	Maintenance of records of the occurrence and duration of shutdown or malfunction of the emission unit.	Maintenance of Records.
		40 CFR 60.7(f) P.C.C. Section 17.16.490.A.1	Maintenance of a file of all measurements, including any performance testing measurements. Retention of the file for at least two years following the date of such measurements.	Maintenance of Records.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
	40 CFR 60.8(a) P.C.C. Section 17.16.490.A.1	Completion of performance test in Accordance to 40 CFR 60.8 demonstrating compliance with applicable limits within 60 days after achieving the maximum production rate, but no later than 180 days after initial startup. Submittal of written report of the results of the performance tests to the Control Officer and Administrator.	EPA Reference Method 9 in accordance to 40 CFR 60, Appendix A.
	40 CFR 60.8(d) P.C.C. Section 17.16.490.A.1	Notification to the Control Officer and Administrator 30 days prior to performance testing.	Maintenance of Records.
	40 CFR 60.11(d) P.C.C. Section 17.16.490.A.1	Operation of the equipment, to the extent practicable, in a manner consistent with good air pollution control practices for minimizing emissions.	Maintenance of Records.
11. Equipment Subject to P.C.C. Sections 17.16.490.A.43 (40 CFR 60 Subpart LL (Table 6.1 presents the complete list of affected facilities for each regulation)	40 CFR 60.382(a)(1) P.C.C. Section 17.16.490.A.43	On or after the date on which the performance test is completed, the stack emissions shall not contain particulate matter greater than 0.05 grams per dry standard cubic meter.	EPA Reference Method 5 or 17 in accordance to 40 CFR 60, Appendix A.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
	40 CFR 60.382(a)(2) P.C.C. Section 17.16.490.A.43	On or after the date on which the performance test is completed, the stack emissions will not exhibit greater than 7% opacity unless stack emissions are discharged from an affected facility using a wet scrubbing emission control device.	EPA Reference Method 9 in accordance to 40 CFR 60, Appendix A.
	40 CFR 60.382(b) P.C.C. Section 17.16.490.A.43	On or after the sixtieth (60^{th}) day after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup, fugitive emissions will not exhibit greater than 10 percent (10%) opacity.	EPA Reference Method 9 in accordance to 40 CFR 60, Appendix A.
	40 CFR 60.384(a) P.C.C. Section 17.16.490.A.43	Calibration, maintenance, and operation of continuous monitoring devices to measure: (a) the change in pressure of the gas stream through each scrubber using devices certified by the manufacturer to be accurate within ± 1 inch of water gauge pressure, and (b) the scrubbing liquid flow rate to each wet scrubber using devices certified by the manufacturer to be accurate within ± 5% of the design scrubbing liquid flow rate.	Maintenance of Records.
	40 CFR 60.384(b) P.C.C. Section 17.16.490.A.43	Annual calibration of each monitoring device in accordance with the manufacturer's instructions.	Performance of Calibrations and Maintenance of Records.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
	40 CFR 60.385(b) P.C.C. Section 17.16.490.A.43	Recording of the monitoring device measurements during the initial performance test and at least weekly thereafter.	Maintenance of Records.
	40 CFR 60.385(c),(d) P.C.C. Section 17.16.490.A.43	Submittal of semiannual reports (within 30 days following the end of the second and fourth calendar quarters) of occurrences when the monitoring device measurements differ by more than ± 30% from the average obtained during the most recent performance test.	Submittal of report; maintenance of records.
12. Thickener Area Emergency Generator (1,000 kW), PLS Pond Area Emergency Generator (1,000 kW), Main Substation Emergency Generator (750 kW), Administration Building Emergency Generator (750 kW), Electrowinning Building Emergency Generator (50 kW), Primary Crusher Fire Water Pump (400 hp), SX/EW Fire Water Pump (400 hp)	40 CFR 60.4206 P.C.C. Section 17.16.490.A.81	Engines must be operated and maintained to achieve the emission standards of 40 CFR 60.4205(b) according to the manufacturer's written instructions or procedures approved by the manufacturer over the entire life of the engine.	Maintenance of Records.
	40 CFR 60.4207(b) P.C.C. Section 17.16.490.A.81	Sulfur content of the fuel being fired must have a sulfur content of less than or equal to 15 ppm.	Maintenance of Records.
	40 CFR 60.4209 P.C.C. Section 17.16.490.A.81	Installation and operation of a non-resettable hour meter prior to start-up.	Maintenance of Records.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
	40 CFR 60.4211(c) P.C.C. Section 17.16.490.A.81	Purchase of an engine certified to the emission standards in §60.4205(b) and installed and configured according to the manufacturer's specifications.	Maintenance of Records.
	40 CFR 60.4211(e) P.C.C. Section 17.16.490.A.81	Maintenance checks and readiness testing may not exceed 100 hours per year.	Maintenance of Records.
	40 CFR 60.4214(b) P.C.C. Section 17.16.490.A.81	Initial notification is not required. If the standards applicable to non-emergency engines of the same model year are not met, the time and reason of operation of the engine in emergency and non-emergency service must be recorded.	Maintenance of Records.
	40 CFR 63.6590(c) P.C.C. Section 17.16.490.A.81	Meet the requirements of 40 CFR 60, Subpart IIII.	Maintenance of Records.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

	Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
13.	Thickener Area Emergency Generator (1,000 kW), PLS Pond Area Emergency Generator (1,000 kW), Main Substation Emergency Generator (750 kW), Administration Building Emergency Generator (750 kW), Electrowinning Building Emergency Generator (50 kW)	40 CFR 60.4205(b) P.C.C. Section 17.16.490.A.81	For engine displacement less than 10 liters per cylinder and rated power between 37 and 75 kW: PM ≤ 0.40 g/kW-hr CO ≤ 5.0 g/kW-hr NO_x + VOC ≤ 4.7 g/kW-hr For engine displacement less than 10 liters per cylinder and rated power greater than 560 kW: PM ≤ 0.20 g/kW-hr CO ≤ 3.5 g/kW-hr NO_x + VOC ≤ 6.4 g/kW-hr Opacity ≤ 20% during the acceleration mode Opacity ≤ 15 during the lugging mode Opacity ≤ 50 during the peaks in either the acceleration or lugging modes	Purchase of certified engine; maintenance of records.
14.	Primary Crusher Fire Water Pump (400 hp), SX/EW Fire Water Pump (400 hp)	40 CFR 60.4205(c) P.C.C. Section 17.16.490.A.81	For engine displacement less than 30 liters per cylinder and maximum engine power between 300 and 600 hp: PM ≤ 0.20 g/kW-hr CO ≤ 3.5 g/kW-hr NO_x + VOC ≤ 4.0 g/kW-hr	Purchase of certified engine; maintenance of records.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

	Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
15.	Crushing Area Scrubber	P.C.C. Section 17.12.190	$PM_{10} \leq 1.28$ lb/hr	EPA Reference Method 5 or 17 in accordance to 40 CFR 60, Appendix A.
16.	Stockpile Area Scrubber	P.C.C. Section 17.12.190	$PM_{10} \leq 2.59$ lb/hr	EPA Reference Method 5 or 17 in accordance to 40 CFR 60, Appendix A.
17.	Reclaim Tunnel Scrubber	P.C.C. Section 17.12.190	$PM_{10} \leq 1.07$ lb/hr	EPA Reference Method 5 or 17 in accordance to 40 CFR 60, Appendix A.
18.	Pebble Crusher Area Scrubber	P.C.C. Section 17.12.190	$PM_{10} \leq 1.56$ lb/hr	EPA Reference Method 5 or 17 in accordance to 40 CFR 60, Appendix A.
19.	Copper Concentrate Scrubber 1, Copper Concentrate Scrubber 2	P.C.C. Section 17.12.190	$PM_{10} \leq 3.55$ lb/hr	EPA Reference Method 5 or 17 in accordance to 40 CFR 60, Appendix A.
20.	Molybdenum Scrubber / Electrostatic Precipitator	P.C.C. Section 17.12.190	$PM_{10} \leq 0.02$ lb/hr	EPA Reference Method 5 or 17 in accordance to 40 CFR 60, Appendix A.
21.	Molybdenum Dust Collector	P.C.C. Section 17.12.190	$PM_{10} \leq 0.010$ gr/dscf	EPA Reference Method 5 or 17 in accordance to 40 CFR 60, Appendix A.

	Emission Unit	Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
22.	Laboratory Dust Collector 1, Laboratory Dust Collector 2, Laboratory Dust Collector 3	P.C.C. Section 17.12.190	$PM_{10} \leq 0.005$ gr/dscf	EPA Reference Method 5 or 17 in accordance to 40 CFR 60, Appendix A.
23.	Portable Generators (Nonroad Engines)	Not subject to the P.C.C.	Comply with emission standards in 40 CFR 89.112.	Maintenance of Records.
24.	Open Burning	P.C.C. Section 17.12.480.B, D	Receive authority to conduct open burning by obtaining a permit from the control officer or delegated authority. Meet all requirements of the open burning permit.	Apply for Open Burning Permits and Maintenance of Records.

Table 4.1 Applicable Regulatory Requirements and Methods for Demonstrating Compliance

5. PROCESS RATE INFORMATION AND OPERATING SCHEDULES

5.1 PROCESS RATES

Maximum hourly and annual process rates for each major process and piece of process equipment at the RCP are presented in Table 5.1. The mining rates presented in Table 5.1 correspond to Year 5 in the life of the mine. Although some mining rates in Year 5 are less than maximum annual mining rates possible throughout the life of the mine, the Year 5 mining rates when coupled with the greater haul truck travel during this year, produce the greatest annual emissions. The maximum hourly process rates presented in Table 5.1 for equipment at the RCP are for short term use. These process rates are not anticipated to be sustained for long periods of time (i.e. annually).

The process rates presented in Table 5.1 are used to calculate facility wide emissions as presented in Appendix E.

5.2 FUEL BURNING EQUIPMENT

A summary of all fuel burning equipment at the RCP, which requires a permit, is presented in Table 5.2. For each piece of fuel burning equipment, the type and quantity of fuels that will be used, the percent that will be used for process heat, the higher heating values of the fuels, and the potential sulfur and ash contents of the fuel are also included in Table 5.2.

5.3 RAW MATERIAL DESCRIPTION AND USAGE RATES

The annual usage rates of raw materials used at the RCP are presented in Table 5.3. Raw materials that will be used by the RCP include sulfide ore and oxide ore, the fuels described in Table 5.2, and chemicals and reagents utilized in the milling, flotation, and SX/EW processes.

5.4 ANTICIPATED OPERATING SCHEDULE AND LIMITATIONS ON SOURCE OPERATIONS AND WORK PRACTICE STANDARDS AFFECTING EMISSIONS

The RCP will be capable of operating continuously (8,760 hours/year, 24 hours/day, 365 days/year, and 7 days/week). Production rates will generally be evenly distributed throughout the year.

The laboratory dust collectors (PC-L1, PC-L2, and PC-L3) will be capable of being operated for two work shifts per day (16 hours/day). Calculated particulate emissions from the dust collectors, as presented in this application, are based on the 16 hour/day operating limit.

There are no other voluntary limitations on source operations and work practice standards affecting emissions for the RCP.

Table 5.1 Summary of Maximum Hourly and Annual Process Rates

Equipment / Activity	Process Rates [a]	
	Maximum Hourly	Annual
Mining		
Drilling	80 holes	27,840 holes
Blasting	1 blast	348 blasts
Loading Concentrate Ore	3,750 tons	27,375,000 tons
Loading Leach Ore	250 tons	1,825,000 tons
Loading Waste Rock	11,000 tons	80,300,000 tons
Hauling Concentrate Ore to Primary Crusher Dump Hopper / Run of Mine Stockpile	81 VMT	589,185 VMT
Hauling Leach Ore to Leach Pad	4 VMT	29,239 VMT
Hauling Waste Rock to Waste Rock Storage Area	298 VMT	2,178,198 VMT
Unloading Concentrate Ore to Run of Mine Stockpile	3,750 tons	2,737,500 tons
Unloading Leach Ore to Leach Pad	250 tons	1,825,000 tons
Unloading Waste Rock to Waste Rock Storage Area	11,000 tons	80,300,000 tons
Bulldozer Use	6 hours	55,170 hours
Water Truck Use	20 VMT	143,000 VMT
Grader Use	10 VMT	87,000 VMT
Support Vehicle Use	59 VMT	512,393 VMT

Equipment / Activity	Process Rates [a]	
	Maximum Hourly	Annual
Primary Crushing, Conveying, Coarse Ore Storage, and Reclaim Conveying		
Run of Mine Stockpile	26 acres	26 acres
Primary Crushing and Conveying	6,950 tons	27,375,000 tons
Unloading to Primary Crusher Dump Hopper; Primary Crusher; Crusher Discharge Hopper; Crusher Discharge Feeder; Stockpile Feed Conveyor; Stockpile Tripper Conveyor		
Coarse Ore Stockpile	5 acres	5 acres
Stockpile Reclaim	6,950 tons	27,375,000 tons
Reclaim Feeders (total); Reclaim Conveyor		
SAG Mill Feed Conveyor	8,726 tons	34,392,713 tons
Milling		
SAG Mill	8,726 tons	34,392,713 tons
Trommel Screen	8,726 tons	34,392,713 tons
Processing of Trommel Screen Oversize	1,851 tons	7,308,034 tons
Pebble Conveyor No. 1; Pebble Wash Screen		
Processing of Pebble Wash Screen Oversize	1,771 tons	6,979,913 tons
Pebble Conveyor No. 2; SAG Oversize Surge Bin; Pebble Crusher Feeder; Pebble Crusher; Pebble Conveyor No. 3		
Ball Mills (total)	16,220 tons	64,240,000 tons

Table 5.1 Summary of Maximum Hourly and Annual Process Rates

Table 5.1 Summary of Maximum Hourly and Annual Process Rates

Equipment / Activity	Process Rates [a]	
	Maximum Hourly	Annual
Flotation		
Copper Flotation Process	6,950 tons	27,375,000 tons
Copper Regrind Mills (total)	285 tons	1,131,500 tons
Molybdenum Flotation Process	90 tons	352,225 tons
Molybdenum Regrind Mill	30 tons	116,800 tons
Molybdenum Cleaner Regrind Mill	4 tons	16,425 tons
Dewatering		
Copper Concentrate Dewatering	138 tons	435,200 tons
Copper Concentrate Thickener; Filter Feed Trash Screen; Copper Concentrate Tanks; Copper Concentrate Filters; Copper Concentrate Conveyor		
Copper Concentrate Loadout Stockpile	1.17 acres	1.17 acres
Molybdenum Concentrate Dewatering	1.90 tons	6,000 tons
Molybdenum Filter Feed Tank; Molybdenum Concentrate Filter; Molybdenum Concentrate Dryer; Molybdenum Concentrate Bin; Molybdenum Concentrate Hopper; Molybdenum Concentrate Conveyor; Molybdenum Packaging and Weigh System		
Tailings Dewatering	10,722 tons	33,812,400 tons
Tailings Thickeners; Tailings Filter Feed Tanks; Tailings Filters; Conveyor Feed to Tailings Storage		
Tailings Storage	1,500 acres	1,500 acres

Table 5.1 Summary of Maximum Hourly and Annual Process Rates

Equipment / Activity	Process Rates [a]	
	Maximum Hourly	Annual
Solvent Extraction and Electrowinning		
Solvent Extraction (4 systems; surface mixer/settler area)	1 hour 9,132.9 ft^2	8,760 hours 9,132.9 ft^2
Electrowinning (surface cell area)	1 hour 2,640 ft^2	8,760 hours 2,640 ft^2
Fuel Burning Equipment		
Diesel Electrowinning Hot Water Generator	6.0 MMBtu	52,560 MMBtu
Thickener Area Emergency Generator	1,000 kW	1,000 kW
PLS Pond Area Emergency Generator	1,000 kW	1,000 kW
Main Substation Emergency Generator	750 kW	750 kW
Administration Building Emergency Generator	750 kW	750 kW
Electrowinning Building Emergency Generator	50 kW	50 kW
Primary Crusher Fire Water Pump	400 hp	400 hp
SX/EW Fire Water Pump	400 hp	400 hp

Table 5.1 Summary of Maximum Hourly and Annual Process Rates

Equipment / Activity	Process Rates [a]	
	Maximum Hourly	Annual
Miscellaneous Sources		
Bulk Pebble Lime Handling Bulk Pebble Lime Silo; Bulk Pebble Lime Screw Conveyor	5.18 tons	37,800 tons
Lime Handling Lime Storage Bin	2.59 tons	18,900 tons
Sodium Metasilicate Handling Sodium Metasilicate Storage Bin	0.41 tons	3,000 tons
Flocculant Handling Flocculant Storage Bins	0.15 tons	1,100 tons
Guar Handling Guar Feeder	0.02 tons	150 tons
Cobalt Sulfate Handling Cobalt Sulfate Feeder	0.0008 tons	6.0 tons
Tanks		
C7 Distribution Tank	59 gallons	430,733 gallons
MIBC Storage Tank	24 gallons	177,521 gallons
Diesel Fuel Storage Tank - Heavy Vehicles 1	925 gallons	6,750,000 gallons
Diesel Fuel Storage Tank - Heavy Vehicles 2	925 gallons	6,750,000 gallons

Table 5.1 Summary of Maximum Hourly and Annual Process Rates		
Equipment / Activity	Process Rates [a]	
	Maximum Hourly	Annual
Particulate Matter Pollution Control Equipment with Limits		
Crushing Area Scrubber	1 hour	8,760 hours
Stockpile Area Scrubber	1 hour	8,760 hours
Reclaim Tunnel Scrubber	1 hour	8,760 hours
Pebble Crusher Area Scrubber	1 hour	8,760 hours
Copper Concentrate Scrubber 1	1 hour	8,760 hours
Copper Concentrate Scrubber 2	1 hour	8,760 hours
Molybdenum Scrubber / Electrostatic Precipitator	1 hour	8,760 hours
Molybdenum Dust Collector	74,612 dscf	653,597,276 dscf
Laboratory Dust Collector 1	497,410 dscf	2,904,876,784 dscf
Laboratory Dust Collector 2	497,410 dscf	2,904,876,784 dscf
Laboratory Dust Collector 3	497,410 dscf	2,904,876,784 dscf

[a] VMT = vehicle miles traveled

Table 5.2 Summary of Fuel Burning Equipment and Fuel Usage Rates

Emission Unit ID	Emission Unit Description	Fuel Type	Power Rating	Fuel Rates (gallons)		% Used for Process Heat	Higher Heating Value [c]	Sulfur / Ash Content [d]
				Maximum Hourly	Annual			
FB01	Diesel Electrowinning Hot Water Generator (HWG) [a]	No. 2 Diesel Fuel	6.0 MMBtu/hr	43.8	383,650	100%	137,000 Btu/gallon	0.0015% / neg.
FB02	Thickener Area Emergency Generator (TEG) [b]	No. 2 Diesel Fuel	1,000 kW	68.5	34,260	0%	137,000 Btu/gallon	0.0015% / neg.
FB03	PLS Pond Area Emergency Generator (PEG) [b]	No. 2 Diesel Fuel	1,000 kW	68.5	34,260	0%	137,000 Btu/gallon	0.0015% / neg.
FB04	Main Substation Emergency Generator (MEG) [b]	No. 2 Diesel Fuel	750 kW	51.4	25,695	0%	137,000 Btu/gallon	0.0015% / neg.
FB05	Administration Building Emergency Generator (AEG) [b]	No. 2 Diesel Fuel	750 kW	51.4	25,695	0%	137,000 Btu/gallon	0.0015% / neg.
FB06	Electrowinning Building Emergency Generator (EWEG) [b]	No. 2 Diesel Fuel	50 kW	3.4	1,713	0%	137,000 Btu/gallon	0.0015% / neg.
FB07	Primary Crusher Fire Water Pump (PCFWP) [b]	No. 2 Diesel Fuel	400 hp	20.4	10,219	0%	137,000 Btu/gallon	0.0015% / neg.
FB08	SX/EW Fire Water Pump (SXFWP) [b]	No. 2 Diesel Fuel	400 hp	20.4	10,219	0%	137,000 Btu/gallon	0.0015% / neg.

[a] Annual fuel rates are based on 8,760 hours of operation.

[b] Annual fuel rates are based on 500 hours of operation and a brake-specific fuel consumption value of 7,000 Btu/hp-hr.

[c] From AP-42, Appendix A, page A-3

[d] neg. = negligible

Table 5.3 Chemical and Reagent Usage at the RCP

Main Chemical Name / Group	Purpose / Use	Storage Location	Maximum Hourly Usage [a]	Annual Usage
Mining				
Concentrate Ore [b]	Copper Concentrating	–	6,950 tons	27,375,000 tons
Leach Ore [b]	Leaching and Copper Extraction	–	2,375 tons	20,805,000 tons
Ammonium Nitrate Fuel Oil (ANFO)	Blasting	Mine Shop Area	52 tons	18,980 tons
Blasting Powder	Blasting	Mine Shop Area	0.24 tons	1,755 tons
Concentrate Ore Processing (Milling and Flotation)				
Methyl Isobutyl Carbinol (MIBC)	Frother	Reagent Storage Area	0.08 tons	600 tons
Calcium Oxide - High Calcium Pebble Lime	pH Modifier	Reagent Storage Area	7.77 tons	56,700 tons
Sodium Metasilicate	Dispersant	Reagent Storage Area	0.41 tons	3,000 tons
Sodium Hydrosulfide Solution (NaHS)	Copper Depressant	Reagent Storage Area	0.52 tons	3,780 tons
Sodium Thiophosphate Solution	Copper Depressant	Reagent Storage Area	0.05 tons	360 tons
Nonionic Polyacrylamide	Flocculant	Reagent Storage Area	0.15 tons	1,100 tons
Formulated Thionocarbamate	Promoter	Reagent Storage Area	0.11 tons	822 tons
Diesel Fuel	Collector	Reagent Storage Area	22.3 gallons	162,657 gallons

Table 5.3 Chemical and Reagent Usage at the RCP

Main Chemical Name / Group	Purpose / Use	Storage Location	Maximum Hourly Usage [a]	Annual Usage
C7 - Sodium Akylmonothiophosphate	Collector	Reagent Storage Area	0.28 tons	2,013 tons
Leach Ore Processing (Leaching, Solvent Extraction/Electrowinning)				
Sulfuric Acid (93%)	Leaching and Extraction	Acid Storage Area	21.19 tons	154,656 tons
Kerosene	Diluent for Extractant Reagent	SX Tank Farm	0.001 tons	9.3 tons
Isoalkanes 13-16	Diluent for Extractant Reagent	SX Tank Farm	0.003 tons	21.6 tons
5-Nonyl-2-hydroxy-benzaldoxime and petroleum distillate	Copper Extractant	Main Warehouse	0.0003 tons	2.4 tons
Cobalt Sulfate	Cathode / Anode Surface Modifier	Main Warehouse	0.0008 tons	6.0 tons
Guar Gum	Leveling Agent for EW	Main Warehouse	0.02 tons	150 tons
Acrylate Adduct	Acid Mist Control from EW	Main Warehouse	0.0005 tons	3.8 tons
Diatomaceous Earth	Organic Recovery	Main Warehouse	0.08 tons	600 tons
Clay	Organic Recovery	Main Warehouse	0.08 tons	600 tons

[a] Maximum hourly usage values are calculated based on the annual usage rates divided by 8,760 hours with an added 20% maximum capacity factor (except for the concentrate ore hourly usage rate and the ANFO usage rates). The hourly concentrate ore usage rate is based on the maximum capacity of the primary crusher. The ANFO usage rates are based on a possible 365 blasts/year and one blast/hour. Although 365 blasts are possible in one year, the RCP estimates that 348 blasts will be occur in Year 5.

[b] The ore usage rates presented in this table are based on peak mining rates. It is not anticipated that both peak rates can be achieved simultaneously and rates will naturally decrease with time.

6. DESCRIPTION OF PROCESS AND CONTROL EQUIPMENT

Each piece of process and control equipment that will be operated at the RCP and requires a permit is listed in Table 6.1 along with the corresponding size and/or production capacity. Since the RCP will use new equipment, the make, model, serial number and date of manufacture for the equipment are not available at this time. Also included in Table 6.1 are the regulatory citations that apply to each piece of equipment. Some equipment that use wet processes or are in closed buildings (SAG mill, grinding mills, conveyor transfers) do not emit emissions even though they are subject to specific requirements. Equipment that are not sources of emissions are identified in Table 6.1. Further detailed information about the air pollution control equipment is presented in Section 8.

Equipment	Equipment ID	Manufacturer / Model [a]	Quantity	Size or Capacity	Emission Status / Control Device	Applicable Regulatory Requirements
Primary Crushing, Conveying, Coarse Ore Storage, and Reclaim Conveying						
Crusher Dump Hopper	H-CDp	na	1	680 tons	Fugitive / Water Sprays	P.C.C. Section 17.16.360
Primary Crusher	PCr	Sandvik	1	6,950 tons/hr	Non-Fugitive / Crushing Area Scrubber	P.C.C. Section 17.16.360
Crusher Discharge Hopper	H-CDs	na	1	725 tons	No Emissions (Enclosed Process)	P.C.C. Section 17.16.360
Crusher Discharge Feeder	F-CD	na	1	25' L X 96" W	Non-Fugitive / Crushing Area Scrubber [b]	P.C.C. Section 17.16.360
Stockpile Feed Conveyor	CV-SF	na	1	2,690' L X 60" W	Non-Fugitive / Crushing Area Scrubber [b]	P.C.C. Section 17.16.360
Crushing Area Scrubber	PC-CAS	na	1	18,000 acfm	Non-Fugitive	P.C.C. Section 17.16.360
Stockpile Tripper Conveyor	CV-ST	na	1	343' L X 60" W	Non-Fugitive / Stockpile Area Scrubber [b,c]	P.C.C. Section 17.16.360
Stockpile Area Scrubber	PC-SAS	na	1	36,500 acfm	Non-Fugitive	P.C.C. Section 17.16.360
Reclaim Feeders	F-R1/R4	na	4	20' L X 48" W	No Emissions (Located Underground)	P.C.C. Section 17.16.360

Table 6.1 Process and Control Equipment Description Which Require a Permit

Table 6.1 Process and Control Equipment Description Which Require a Permit						
Equipment	Equipment ID	Manufacturer / Model [a]	Quantity	Size or Capacity	Emission Status / Control Device	Applicable Regulatory Requirements
Reclaim Conveyor	CV-R	na	1	932' L X 60" W	Non-Fugitive / Reclaim Tunnel Scrubber	P.C.C. Section 17.16.360
Reclaim Tunnel Scrubber	PC-RTS	na	1	15,000 acfm	Non-Fugitive	P.C.C. Section 17.16.360
SAG Mill Feed Conveyor	CV-SMF	na	1	660' L X 60" W	Non-Fugitive / Pebble Crusher Area Scrubber [b]	P.C.C. Section 17.16.360
Milling						
SAG Mill	M-SAG	Polysius	1	36' D X 17.5' EGL	No Emissions (Wet Process)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Trommel Screen	Sn-T	Polysius	1	16' L X 16' W	No Emissions (Wet Process)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Pebble Conveyor No. 1	CV-Pb1	na	1	135.5' L X 60" W	No Emissions (Clean, Wet Ore)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Pebble Wash Screen	Sn-PbW	na	1	10' L X 20' W	No Emissions (Wet Process)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Pebble Conveyor No. 2	CV-Pb2	na	1	675' L X 36" W	No Emissions (Clean, Wet Ore)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
SAG Oversize Surge Bin	B-SAGOS	na	1	500 tons	Non-Fugitive / Pebble Crusher Area Scrubber	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)

Equipment	Equipment ID	Manufacturer / Model [a]	Quantity	Size or Capacity	Emission Status / Control Device	Applicable Regulatory Requirements
Pebble Crusher Feeder	F-PbC	na	1	31.5' L X 48" W	Non-Fugitive / Pebble Crusher Area Scrubber	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Pebble Crusher	PbC	na	1	1,771 tons/hr	Non-Fugitive / Pebble Crusher Area Scrubber	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Pebble Conveyor No. 3	CV-Pb3	na	1	170.5' X 36" W	Non-Fugitive / Pebble Crusher Area Scrubber	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Pebble Crusher Area Scrubber	PC-PCAS	na	1	22,000 acfm	Non-Fugitive	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Ball Mills	M-B1/B2	na	2	26' D X 40' EGL	No Emissions (Wet Process)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Flotation, Regrind, and Concentrating						
Copper/Molybdenum/Tailings Flotation and Concentrating Equipment (flotation cells, column cells, thickeners, filters)	various	na	--	8,760 hr/yr	No Emissions (Wet Process)	P.C.C. Section 17.16.360
Copper Regrind Mills	M-CR1/CR2	na	2	11'-8" L X 13'-4" W	No Emissions (Wet Process)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Molybdenum Regrind Mill	M-MR	na	1	4' L X 4'-4" W	No Emissions (Wet Process)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)

Table 6.1 Process and Control Equipment Description Which Require a Permit

Equipment	Equipment ID	Manufacturer / Model [a]	Quantity	Size or Capacity	Emission Status / Control Device	Applicable Regulatory Requirements
Molybdenum Cleaner Regrind Mill	M-MCR	na	1	4 tons/hr	No Emissions (Wet Process)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Molybdenum Cleaner Area Scrubber	PC-MCAS	na	1	12,500 acfm	Non-Fugitive	P.C.C. Section 17.16.430
Copper Concentrate Dewatering and Stacking						
Filter Feed Trash Screen	Sn-FFT	na	1	60" L X 48" W	No Emissions (Wet Process)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Copper Concentrate Conveyor	CV-CC	na	1	330' L X 24" W	No Emissions (Enclosed Process)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Copper Concentrate Scrubbers	PC-CCS1/ CCS2	na	2	50,000 acfm each	Non-Fugitive	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Molybdenum Dewatering and Packaging						
Molybdenum Concentrate Dryer	D-MC	na	1	na	Non-Fugitive / Molybdenum Scrubber and Electrostatic Precipitator	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Molybdenum Scrubber	PC-MS	na	1	na	Non-Fugitive	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Electrostatic Precipitator	PC-EP	na	1	500 acfm	Non-Fugitive	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)

Table 6.1 Process and Control Equipment Description Which Require a Permit

Equipment	Equipment ID	Manufacturer / Model [a]	Quantity	Size or Capacity	Emission Status / Control Device	Applicable Regulatory Requirements
Molybdenum Concentrate Bin	B-MC	na	1	20 tons	Non-Fugitive / Molybdenum Dust Collector	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Molybdenum Dust Collector	PC-MDC	na	1	1,500 acfm	Non-Fugitive	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Molybdenum Concentrate Hopper	H-MC	na	1	20 ft^3	Non-Fugitive	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Molybdenum Concentrate Conveyor	CV-MC	na	1	90 tons/hr	No Emissions (Enclosed Process)	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Molybdenum Packaging and Weigh System	MPS	na	1	variable	Non-Fugitive / Molybdenum Dust Collector	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Tailings Dewatering and Placement						
Tailings Belt Feeders	F-T1/T14	na	14	na	No Emissions (Enclosed Process)	P.C.C. Section 17.16.430
Fixed Tailings Conveyor No. 1	CV-F1	na	1	na	No Emissions (Enclosed Process)	P.C.C. Section 17.16.430
Fixed Tailings Conveyor No. 2	CV-F2	na	1	na	No Emissions (Enclosed Process)	P.C.C. Section 17.16.430
Fixed Tailings Conveyor No. 3	CV-F3	na	1	na	Non-Fugitive	P.C.C. Section 17.16.430

Table 6.1 Process and Control Equipment Description Which Require a Permit

Equipment	Equipment ID	Manufacturer / Model [a]	Quantity	Size or Capacity	Emission Status / Control Device	Applicable Regulatory Requirements
Relocatable Conveyors	CV-R1/R2	na	2	na	Fugitive	P.C.C. Section 17.16.430
Shiftable Conveyors with Cross Conveyor Trippers	CV-S1/S2	na	2	na	Fugitive	P.C.C. Section 17.16.430
Belt Wagon Conveyor on Crawlers (movable)	CV-BW1	na	1	na	Fugitive	P.C.C. Section 17.16.430
Spreader Crawler Mounted Conveyors (movable)	CV-SP1/SP2	na	2	na	Fugitive	P.C.C. Section 17.16.430
Solvent Extraction and Electrowinning						
SX Primary Mix Tanks	T-E1P, E1PP, E2P, S1P	na	4	7.75' D X 9.75' H	Fugitive	P.C.C. Section 17.16.430
SX Secondary Mix Tanks	T-E1S, E1PS, E2S, S1S	na	4	9.5' D X 9.75' H	Fugitive	P.C.C. Section 17.16.430
SX Tertiary Mix Tanks	T-E1T, E1PT, E2T	na	3	9.5' D X 9.75' H	Fugitive	P.C.C. Section 17.16.430
SX Settlers	ES-E1, E1P, E2, SS-S1	na	4	64' L X 33' W X 3.33' H	Fugitive	P.C.C. Section 17.16.430
Electrowinning Commercial Cells	EWCC	na	30	22' L X 4' W X 5' H	Fugitive / Cell Ventilation Wet Scrubbers	P.C.C. Section 17.16.430

Table 6.1 Process and Control Equipment Description Which Require a Permit

Equipment	Equipment ID	Manufacturer / Model [a]	Quantity	Size or Capacity	Emission Status / Control Device	Applicable Regulatory Requirements
Cell Ventilation Wet Scrubbers	PC-EWCVS1/ EWCVS6	na	6	5,000 acfm each	Non-Fugitive	P.C.C. Section 17.16.430
Fuel Burning Equipment						
Diesel Electrowinning Hot Water Generator	HWG	na	1	6.0 MMBtu/hr	Non-Fugitive	P.C.C. Section 17.16.165
Thickener Area Emergency Generator	TEG	na	1	1,000 kW	Non-Fugitive	P.C.C. Section 17.16.490.A.81 (40 CFR 60, Subpart IIII)
PLS Pond Area Emergency Generator	PEG	na	1	1,000 kW	Non-Fugitive	P.C.C. Section 17.16.490.A.81 (40 CFR 60, Subpart IIII)
Main Substation Emergency Generator	MEG	na	1	750 kW	Non-Fugitive	P.C.C. Section 17.16.490.A.81 (40 CFR 60, Subpart IIII)
Administration Building Emergency Generator	AEG	na	1	750 kW	Non-Fugitive	P.C.C. Section 17.16.490.A.81 (40 CFR 60, Subpart IIII)
Electrowinning Building Emergency Generator	EWEG	na	1	50 kW	Non-Fugitive	P.C.C. Section 17.16.490.A.81 (40 CFR 60, Subpart IIII)
Primary Crusher Fire Water Pump	PCFWP	na	1	400 hp	Non-Fugitive	P.C.C. Section 17.16.490.A.81 (40 CFR 60, Subpart IIII)
SX/EW Fire Water Pump	SXFWP	na	1	400 hp	Non-Fugitive	P.C.C. Section 17.16.490.A.81 (40 CFR 60, Subpart IIII)

Table 6.1 Process and Control Equipment Description Which Require a Permit						
Equipment	Equipment ID	Manufacturer / Model [a]	Quantity	Size or Capacity	Emission Status / Control Device	Applicable Regulatory Requirements
Miscellaneous Sources						
Bulk Pebble Lime Silo	S-BPL	na	1	na	Non-Fugitive / Bulk Pebble Lime Silo Bin Vent	P.C.C. Section 17.16.430
Bulk Pebble Lime Silo Screw Conveyor	CV-BPLS	na	1	na	No Emissions (Enclosed Process)	P.C.C. Section 17.16.430
Bulk Pebble Lime Silo Bin Vent	PC-BPLBV	na	1	750 / 1,750 acfm	Non-Fugitive	P.C.C. Section 17.16.430
Lime Storage Bin	B-L	na	1	na	Non-Fugitive / Lime Storage Bin Vent	P.C.C. Section 17.16.430
Lime Storage Bin Vent	PC-LSBV	na	1	750 / 1,750 acfm	Non-Fugitive	P.C.C. Section 17.16.430
Sodium Metasilicate Storage Bin	B-SM	na	1	na	Non-Fugitive / Sodium Metasilicate Storage Bin Vent	P.C.C. Section 17.16.430
Sodium Metasilicate Storage Bin Vent	PC-SMSBV	na	1	750 / 1,750 acfm	Non-Fugitive	P.C.C. Section 17.16.430
Flocculant Storage Bin 1	B-F1	na	1	na	Non-Fugitive	P.C.C. Section 17.16.430
Flocculant Storage Bin 2	B-F2	na	1	na	Non-Fugitive	P.C.C. Section 17.16.430

Table 6.1 Process and Control Equipment Description Which Require a Permit

Equipment	Equipment ID	Manufacturer / Model [a]	Quantity	Size or Capacity	Emission Status / Control Device	Applicable Regulatory Requirements
Guar Feeder	F-Gu	na	1	na	Non-Fugitive	P.C.C. Section 17.16.430
Cobalt Sulfate Feeder	F-CoS	na	1	na	Non-Fugitive	P.C.C. Section 17.16.430
Tanks						
C7 Distribution Tank	T-C7D	na	1	11,845 gallons	Non-Fugitive	P.C.C. Section 17.16.430
MIBC Storage Tank	T-MIBCS	na	1	11,845 gallons	Non-Fugitive	P.C.C. Section 17.16.430
Diesel Fuel Storage Tanks - Heavy Vehicles	T-DFS-HV1/HV2	na	2	100,000 gallons	Non-Fugitive	P.C.C. Section 17.16.430
Other Pollution Control Equipment						
Laboratory Dust Collectors	PC-L1/L3	na	3	10,000 acfm each	Non-Fugitive	P.C.C. Section 17.16.490.A.43 (40 CFR 60, Subpart LL)
Laboratory Wet Scrubber	PC-LWS	na	1	9,000 acfm	Non-Fugitive	P.C.C. Section 17.16.430

[a] na = not available at this time

[b] This equipment has water spray control for fugitive particulate emissions not captured by the scrubbers. Emission calculations in this permit application are based on 100% capture efficiency of the scrubbers.

[c] This equipment is located within the coarse ore stockpile building in addition to being controlled by the scrubbers. Emission calculations in this permit application are based on 100% capture efficiency of the scrubbers.

7. SITE DIAGRAM

Site diagrams of the RCP showing the process area boundary, locations of major equipment, facility roads, and the surrounding topography is presented in Appendix F. An overall vicinity map showing the facility boundaries is presented in Figure F-1. A plan view showing the planned ultimate configuration of the facility is presented in Figure F-2. A general facilities site plan showing the locations of major equipment and processes is presented in Figure F-3.

8. AIR POLLUTION CONTROL INFORMATION

8.1 DESCRIPTIONS OF METHODS FOR DEMONSTRATING COMPLIANCE

Methods that will be used to demonstrate compliance with applicable regulatory requirements for the RCP are presented in Table 4.1.

8.2 DESCRIPTIONS OF AIR POLLUTION CONTROL EQUIPMENT

The characteristics of the air pollution control used at the RCP are presented in Table 8.1. This table includes: (a) the list of emission points controlled; (b) the control efficiencies; (c) the type of pollutant controlled; (d) the exhaust flow rate; and (e) the PM_{10} discharge grain loading / emission limit (if applicable). All discharge grain loadings and emission limits represent voluntarily accepted limits. The process locations of the air pollution control equipment are described in Section 2 and are presented in the process flow diagrams located in Appendix B.

Water trucks are used on the unpaved roads at the RCP and are assumed to provide a control efficiency of 90%. The RCP will implement a regular dust control program which will include the use of water trucks and good operating practices to provide a control efficiency of 90% to all regularly traveled unpaved plant roads, including haul roads within and outside of the pits. The dust control program is presented in Appendix G.

The current design of the RCP includes the use of six wet scrubbers, one cyclone scrubber, one baghouse, and one electrostatic precipitator for particulate matter control. The RCP is investigating the possible use of cartridge filter dust collectors or baghouses instead of the scrubbers to provide better control efficiency. An updated description of the pollution control equipment will be submitted if the design of pollution control systems at the RCP is modified to replace the scrubbers.

8.3 AMBIENT AIR IMPACT ANALYSIS

A demonstration that emissions from the RCP will not cause exceedances of the national ambient air quality standards (NAAQS) is not required by PDEQ because emissions from the facility are less than those that trigger Major New Source Review. An air impact analysis demonstrating protection of applicable standards will be included in the Environmental Impact Statement that applies to the RCP.

Table 8.1 Air Pollution Control Equipment at the RCP

Emission Unit ID	Air Pollution Control Device	Emission Points Controlled	Pollutants Controlled	PM_{10} Control Efficiency (Rated and Operating)	Exhaust Flow Rate	PM_{10} Grain Loading / Limit
--	Road Watering	Haul Truck Roads	Particulates	90%	--	--
--	Road Watering	Unpaved General Mine Roads	Particulates	90%	--	--
--	Water Sprays	Material Handling Emission Point: • Unloading to Primary Crusher Dump Hopper from Haul Trucks or Run of Mine Stockpile • Crusher Discharge Hopper to Crusher Discharge Feeder • Crusher Discharge Feeder to Stockpile Feed Conveyor • Stockpile Feed Conveyor to Stockpile Tripper Conveyor • Reclaim Conveyor to SAG Mill Feed Conveyor	Particulates	82.5%	--	--
PCL01	Crushing Area Scrubber	Process Equipment: • Primary Crusher Material Handling Emission Points: • Crusher Discharge Hopper to Crusher Discharge Feeder • Crusher Discharge Feeder to Stockpile Feed Conveyor	Particulates	99%	18,000 acfm	1.28 lb/hr
PCL02	Stockpile Area Scrubber	Material Handling Emission Points: • Stockpile Feed Conveyor to Stockpile Tripper Conveyor • Stockpile Tripper Conveyor to Covered Coarse Ore Stockpile General Ventilation of the Stockpile Building	Particulates	99%	36,500 acfm	2.59 lb/hr

Table 8.1 Air Pollution Control Equipment at the RCP

Emission Unit ID	Air Pollution Control Device	Emission Points Controlled	Pollutants Controlled	PM_{10} Control Efficiency (Rated and Operating)	Exhaust Flow Rate	PM_{10} Grain Loading / Limit
PCL03	Reclaim Tunnel Scrubber	Material Handling Emission Points: • Reclaim Feeders to Reclaim Conveyor	Particulates	99%	15,000 acfm	1.07 lb/hr
PCL04	Pebble Crusher Area Scrubber	Process Equipment: • Pebble Crusher Material Handling Emission Points: • Reclaim Conveyor to SAG Mill Feed Conveyor • Pebble Conveyor No. 2 to SAG Oversize Surge Bin • SAG Oversize Surge Bin to Pebble Crusher Feeder • Pebble Crusher to Pebble Conveyor No.3 • Pebble Conveyor No. 3 to SAG Mill Feed Conveyor	Particulates	99%	22,000 acfm	1.56 lb/hr
PCL05	Copper Concentrate Scrubber 1	Material Handling Emission Points: • Copper Concentrate Conveyor to Copper Concentrate Loadout Stockpile • Copper Concentrate Loadout Stockpile to Shipment Truck via Front End Loader General Ventilation of the Copper Concentrate Loadout Building	Particulates	99%	50,000 acfm	3.55 lb/hr
PCL06	Copper Concentrate Scrubber 2	Process Equipment: • Copper Concentrate Conveyor to Copper Concentrate Loadout Stockpile • Copper Concentrate Loadout Stockpile to Shipment Truck via Front End Loader General Ventilation of the Copper Concentrate Loadout Building	Particulates	99%	50,000 acfm	3.55 lb/hr

Table 8.1 Air Pollution Control Equipment at the RCP

Emission Unit ID	Air Pollution Control Device	Emission Points Controlled	Pollutants Controlled	PM_{10} Control Efficiency (Rated and Operating)	Exhaust Flow Rate	PM_{10} Grain Loading / Limit
PCL07	Molybdenum Scrubber	Process Equipment: • Molybdenum Concentrate Dryer	Particulates	99%	Vents to the Electrostatic Precipitator	--
PCL07	Electrostatic Precipitator	Process Equipment: • Molybdenum Concentrate Dryer	Particulates	99.5%	500 acfm	0.02 lb/hr
PCL08	Molybdenum Dust Collector	Material Handling Emission Points: • Molybdenum Concentrate Dryer to Molybdenum Concentrate Bin • Molybdenum Concentrate Conveyor to Molybdenum Packaging and Weigh System	Particulates	99.9%	1,500 acfm	0.010 gr/dscf
PCL09	Laboratory Dust Collector 1	Process Equipment: • Laboratory Equipment (crushers, pulverizers, splitters, sieve shakers, blenders)	Particulates	99%	10,000 acfm	0.005 gr/dscf
PCL10	Laboratory Dust Collector 2	Process Equipment: • Laboratory Equipment (crushers, pulverizers, splitters, sieve shakers, blenders)	Particulates	99%	10,000 acfm	0.005 gr/dscf
PCL11	Laboratory Dust Collector 3	Process Equipment: • Laboratory Equipment (crushers, pulverizers, splitters, sieve shakers, blenders)	Particulates	99%	10,000 acfm	0.005 gr/dscf

Table 8.1 Air Pollution Control Equipment at the RCP

Emission Unit ID	Air Pollution Control Device	Emission Points Controlled	Pollutants Controlled	PM_{10} Control Efficiency (Rated and Operating)	Exhaust Flow Rate	PM_{10} Grain Loading / Limit
--	Bulk Pebble Lime Silo Bin Vent	Material Handling Emission Points: • Transfer of Bulk Pebble Lime to the Bulk Pebble Lime Silo	Particulates	90%	750 / 1,750 acfm [a]	--
--	Lime Storage Bin Vent	Material Handling Emission Points: • Transfer of Lime to the Lime Storage Bin	Particulates	90%	750 / 1,750 acfm [a]	--
--	Sodium Metasilicate Storage Bin Vent	Material Handling Emission Points: • Transfer of Sodium Metasilicate to the Sodium Metasilicate Storage Bin	Particulates	90%	750 / 1,750 acfm [a]	--
--	Molybdenum Cleaner Area Scrubber	Material Handling Emission Points: • Sodium Hydrosulfide Loading Point • Sodium Hydrosulfide Mix Tank • Sodium Hydrosulfide Distribution Tank General Ventilation of the Flotation Building	H_2S	99%	12,500 acfm	--
--	6 EW Cell Ventilation Scrubbers	Process Equipment: • Electrowinning Cells	H_2SO_4, Cobalt Compounds	99%	5,000 acfm each	--
--	Laboratory Scrubber	Laboratory Equipment	Gaseous Emissions from Chemical Fume Hoods	--	9,000 acfm	--

[a] 750 acfm during filing from truck positive displacement blower, 1,750 acfm during bursts as truck empties.

9. COMPLIANCE PLAN

9.1 COMPLIANCE WITH CHAPTER 17.16, ARTICLES III, IV, V, AND VI OF THE P.C.C.

Compliance with Articles III, IV, V and VI will be demonstrated using the methods described in Table 4.1.

9.2 COMPLIANCE WITH CHARPTER 17.16, ARTICLE VII OF THE P.C.C. AND RULES PROMULGATED PURSUANT TO A.R.S. §49-426.03 AND §49-426.06

Compliance with Article VII of the P.C.C. and the rules promulgated pursuant to A.R.S. §49-426.03 and A.R.S. §49-426.06 will be demonstrated using the methods described in Table 4.1.

9.3 COMPLIANCE WITH VOLUNTARILY ACCEPTED LIMITATIONS

Compliance with P.C.C. Section 17.12.190 will be demonstrated using the methods described in Table 4.1. Table 4.1 demonstrates that the voluntarily accepted emission limitations are as stringent as the emission limitations that would otherwise be applicable, and that the emission limitations and methods used to demonstrate compliance are permanent, quantifiable, and otherwise enforceable as a practical matter.

9.4 COMPLIANCE SCHEDULE

The RCP will comply with all applicable regulatory requirements using the methods listed in Table 4.1. For applicable requirements that become effective during the permit term, the RCP will meet such requirements as required by the regulations in a timely manner.

9.5 COMPLIANCE WITH CONTROL EFFICIENCY FOR FUGITIVE SOURCES

A dust control plan demonstrating a 90% control efficiency for fugitive dust emissions from regularly traveled unpaved haul roads at the RCP is presented in Appendix G.

10. COMPLIANCE CERTIFICATION

A certification of compliance with all applicable requirements signed by the responsible official of RCC is presented in Appendix A.

11. ACID RAIN PROGRAM COMPLIANCE AND NEW MAJOR SOURCE REQUIREMENTS

11.1 ACID RAIN COMPLIANCE PLAN

The RCP is not subject to any acid rain requirements. Therefore, an acid rain compliance plan is not required.

11.2 NEW MAJOR SOURCE REQUIREMENTS

The RCP is a not a major source. Therefore, the new major source requirements do not apply.

12. CALCULATIONS

Calculations were used in this application to determine process rates and emission rates. A description of these calculations is presented in Appendix D.

APPENDIX A

STANDARD PERMIT APPLICATION FORM

RECEIVED
PIMA COUNTY

JUL 29 2010

DEPARTMENT OF
ENVIRONMENTAL QUALITY

PIMA COUNTY DEPARTMENT OF ENVIRONMENTAL QUALITY
Air Program
150 W. Congress St. • Suite 109 • Tucson, AZ 85701 • Phone: (520) 740-3340

STANDARD PERMIT APPLICATION FORM
FOR CLASS II/III SOURCES

(As required by A.R.S. § 49-480, and Title 17 of the Pima County Code)

1. Permit to be issued to (Arizona Corporate Commission Registered Name): Rosemont Copper Company

2. Mailing Address: P.O. Box 35130
   City: Tucson State: AZ ZIP: 85740-5130

3. Name (or names) of Owner or Operator: Rosemont Copper Company
   FAX #: Phone: (602) 315-9582
   Email: jsturgess@augustaresource.com

4. Name of Owner's Agent:
   FAX #: Phone:
   Email:

5. Plant Name (if different than item #1): Rosemont Copper Project

6. Proposed Equipment/Plant Location Address: 12700 E. Greaterville Road
   City: Sonoita State: AZ ZIP: 85637

7. Plant/Site Manager/Contact Person: Kathy Arnold, Director of Environmental and Regulatory Affairs
   FAX #: (520) 297-7724 Phone: (520) 297-7723
   Email: karnold@rosemontcopper.com

8. General Nature of Business: Copper Mining and Processing
   Standard Industrial Classification Code(s): 1021 Permit Class: Class II

9. Type of Organization: ☒ Corporation ☐ Individual Owner ☐ Partnership ☐ Government Entity ☐ Other

10. Permit Application Basis *(Check all that apply)*: ☒ New Source ☐ General Permit ☐ Portable Source
    ☐ Renewal *Revision:* ☐ Administrative ☐ Minor ☐ Significant Existing Permit #
    Date of Commencement of Construction or Modification: Upon issuance of permit.
    Is any of the equipment to be leased to another individual or entity? ☐ Yes ☒ No

11. Typed or Printed Name of Responsible Official (RO): Jamie Sturgess
    Official Title of RO: Vice President, Sustainable Development
    RO Fax #: RO Phone #: (602) 315-9582
    RO Email: jsturgess@augustaresource.com Date:

12. Signature of Responsible Official of Organization: [signature]

EQUIPMENT LIST

The following table should include all equipment utilized at the facility and be complete with all data requested. The date of manufacturer must be included in order to determine if portions of the facility are subject to NSPS. Make additional copies of this form if necessary.

Type of Equipment	Manufacturer	Model	Equipment ID	Maximum Rated Capacity	Fuel(s) Used (If Applicable)	Date of Manufacturer	Date of Installation
Crusher Dump Hopper	na	na	H-CDp	880 tons	–	na	New Source
Primary Crusher	Sandvik	na	PCr	6,950 tons/hr	–	na	New Source
Crusher Discharge Hopper	na	na	H-CDs	725 tons	–	na	New Source
Crusher Discharge Feeder	na	na	F-CD	25' L X 96" W	–	na	New Source
Stockpile Feed Conveyor	na	na	CV-SF	2,690' L X 60" W	–	na	New Source
Crushing Area Scrubber	na	na	PC-CAS	18,000 acfm	–	na	New Source
Stockpile Tripper Conveyor	na	na	CV-ST	343' L X 60" W	–	na	New Source
Stockpile Area Scrubber	na	na	PC-SAS	36,500 acfm	–	na	New Source
Reclaim Feeders	na	na	F-R1/R4	20' L X 48" W	–	na	New Source
Reclaim Conveyor	na	na	CV-R	932' L X 60" W	–	na	New Source
Reclaim Tunnel Scrubber	na	na	PC-RTS	15,000 acfm	–	na	New Source
SAG Mill Feed Conveyor	na	na	CV-SMF	660' L X 60" W	–	na	New Source
SAG Mill	Polysius	na	M-SAG	36' D X 17.5' EGL	–	na	New Source
Trommel Screen	Polysius	na	Sn-T	16' L X 16' W	–	na	New Source
Pebble Conveyor No. 1	na	na	CV-Pb1	135.5' L X 60" W	–	na	New Source
Pebble Wash Screen	na	na	Sn-PbW	10' L X 20' W	–	na	New Source
Pebble Conveyor No. 2	na	na	CV-Pb2	675' L X 36" W	–	na	New Source
SAG Oversize Surge Bin	na	na	B-SAGOS	500 tons	–	na	New Source

Type of Equipment	Manufacturer	Model	Equipment ID	Maximum Rated Capacity	Fuel(s) Used (If Applicable)	Date of Manufacturer	Date of Installation [1]
Pebble Crusher Feeder	na	na	F-PbC	31.5' L X 48" W	--	na	New Source
Pebble Crusher	na	na	PbC	1,771 tons/hr	--	na	New Source
Pebble Conveyor No. 3	na	na	CV-Pb3	170.5' X 36" W	--	na	New Source
Pebble Crusher Area Scrubber	na	na	PC-PCAS	22,000 acfm	--	na	New Source
Ball Mills	na	na	M-B1/B2	26' D X 40' EGL	--	na	New Source
Copper/Molybdenum/Tailings Flotation and Concentrating Equipment (flotation cells, column cells, thickeners, filters)	na	na	various	8,760 hr/yr	--	na	New Source
Copper Regrind Mills	na	VTM-150-WB	M-CR1/CR2	11'-8" L X 13'-4" W	--	na	New Source
Molybdenum Regrind Mill	na	VTM-40-WB	M-MR	4' L X 4'-4" W	--	na	New Source
Molybdenum Cleaner Regrind Mill	na	VTM-70-WB	M-MCR	4 tons/hr	--	na	New Source
Molybdenum Cleaner Area Scrubber	na	na	PC-MCAS	12,500 acfm	--	na	New Source
Filter Feed Trash Screen	na	na	Sn-FFT	60" L X 48" W	--	na	New Source
Copper Concentrate Conveyor	na	na	CV-CC	330' L X 24" W	--	na	New Source
Copper Concentrate Scrubbers	na	na	PC-CCS1/CCS2	50,000 acfm each	--	na	New Source
Molybdenum Concentrate Dryer	na	na	D-MC	na	--	na	New Source
Molybdenum Scrubber	na	na	PC-MS	na	--	na	New Source
Electrostatic Precipitator	na	na	PC-EP	500 acfm	--	na	New Source
Molybdenum Concentrate Bin	na	na	B-MC	20 tons	--	na	New Source
Molybdenum Dust Collector	na	na	PC-MDC	1,500 acfm	--	na	New Source
Molybdenum Concentrate Hopper	na	na	H-MC	20 ft^3	--	na	New Source
Molybdenum Concentrate Conveyor	na	na	CV-MC	90 tons/hr	--	na	New Source

Type of Equipment	Manufacturer	Model	Equipment ID	Maximum Rated Capacity	Fuel(s) Used (If Applicable)	Date of Manufacturer	Date of Installation
Molybdenum Packaging and Weigh System	na	na	MPS	variable	--	na	New Source
Tailings Belt Feeders	na	na	F-T1/T14	na	--	na	New Source
Fixed Tailings Conveyor No. 1	na	na	CV-F1	na	--	na	New Source
Fixed Tailings Conveyor No. 2	na	na	CV-F2	na	--	na	New Source
Fixed Tailings Conveyor No. 3	na	na	CV-F3	na	--	na	New Source
Relocatable Conveyors	na	na	CV-R1/R2	na	--	na	New Source
Shiftable Conveyors with Cross Conveyor Trippers	na	na	CV-S1/S2	na	--	na	New Source
Belt Wagon Conveyor on Crawlers (movable)	na	na	CV-BW1	na	--	na	New Source
Spreader Crawler Mounted Conveyors (movable)	na	na	CV-SP1/SP2	na	--	na	New Source
SX Primary Mix Tanks	na	na	T-E1P, E1PP, E2P, S1P	7.75' D X 9.75' H	--	na	New Source
SX Secondary Mix Tanks	na	na	T-E1S, E1PS, E2S, S1S	9.5' D X 9.75' H	--	na	New Source
SX Tertiary Mix Tanks	na	na	T-E1T, E1PT, E2T	9.5' D X 9.75' H	--	na	New Source
SX Settlers	na	na	ES-E1, E1P, E2, SS-S1	64' L X 33' W X 3.33' H	--	na	New Source
Electrowinning Commercial Cells	na	na	EWCC	22' L X 4' W X 5' H	--	na	New Source
Cell Ventilation Wet Scrubbers	na	na	PC-EWCVS1/ EWCVS6	5,000 acfm	--	na	New Source
Diesel Electrowinning Hot Water Generator	na	na	HWG	6.0 MMBtu/hr	Diesel	na	New Source
Thickener Area Emergency Generator	na	na	TEG	1,000 kW	Diesel	na	New Source
PLS Pond Area Emergency Generator	na	na	PEG	1,000 kW	Diesel	na	New Source
Main Substation Emergency Generator	na	na	MEG	750 kW	Diesel	na	New Source
Administration Building Emergency Generator	na	na	AEG	750 kW	Diesel	na	New Source
Electrowinning Building Emergency Generator	na	na	EWEG	50 kW	Diesel	na	New Source

Type of Equipment	Manufacturer	Model	Equipment ID	Maximum Rated Capacity	Fuel(s) Used (If Applicable)	Date of Manufacturer	Date of Installation [1]
Primary Crusher Fire Water Pump	na	na	PCFWP	400 hp	Diesel	na	New Source
SX/EW Fire Water Pump	na	na	SXFWP	400 hp	Diesel	na	New Source
Bulk Pebble Lime Silo	na	na	S-BPL	na	--	na	New Source
Bulk Pebble Lime Silo Screw Conveyor	na	na	CV-BPLS	na	--	na	New Source
Bulk Pebble Lime Silo Bin Vent	na	na	PC-BPLBV	750 / 1,750 acfm	--	na	New Source
Lime Storage Bin	na	na	B-L	na	--	na	New Source
Lime Storage Bin Vent	na	na	PC-LSBV	750 / 1,750 acfm	--	na	New Source
Sodium Metasilicate Storage Bin	na	na	B-SM	na	--	na	New Source
Sodium Metasilicate Storage Bin Vent	na	na	PC-SMSBV	750 / 1,750 acfm	--	na	New Source
Flocculant Storage Bin 1	na	na	B-F1	na	--	na	New Source
Flocculant Storage Bin 2	na	na	B-F2	na	--	na	New Source
Guar Feeder	na	na	F-Gu	na	--	na	New Source
Cobalt Sulfate Feeder	na	na	F-CoS	na	--	na	New Source
C7 Distribution Tank	na	na	T-C7D	11,845 gallons	--	na	New Source
MIBC Storage Tank	na	na	T-MIBCS	11,845 gallons	--	na	New Source
Diesel Fuel Storage Tanks - Heavy Vehicles	na	na	T-DFS-HV1/HV2	100,000 gallons	--	na	New Source
Laboratory Dust Collectors	na	na	PC-L1/L3	10,000 acfm	--	na	New Source
Laboratory Wet Scrubber	na	na	PC-LWS	9,000 acfm	--	na	New Source

[1] Provide the date of installation or the most recent date of reconsruction/modification of your equipment.
na = not available

Statement of Compliance with all Applicable Requirements

Permit Number (If existing source) ________

Any applicant who fails to submit any relevant facts or who has submitted incorrect information in a permit application shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrected information. In addition, an applicant shall provide additional information as necessary to address any requirements that become applicable to the source after the date it files a complete application, but prior to release of a proposed permit. Should there be any discrepancies between this application package and Title 17 of the Pima County Code (PCC), the PCC shall be preferred.

This statement must be signed by a Responsible Official. Applications without a signed statement will be deemed incomplete.

> *The responsible official is defined as a person who is in charge of principal business functions or who performs policy or decision making functions for the business. This may also include an authorized representative for such persons. For a complete definition, see Pima County Air Quality Control, Title 17, Section 17.04.340(A)(199).*

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Pima County Department of Environmental Quality (PDEQ) as public record. I also attest that I am in compliance with the applicable requirements and will continue to comply with such requirements and any future requirements that become effective during the life of my permit. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the requirements of Title 17 of the Pima County Code and any permit issued thereof.

Name (Print/Type): Jamie Sturgess Title: Vice President, Sustainable Development

(Signature): Jamie Sturgess Date: July 27, 2010

Certification of Truth, Accuracy, and Completeness

17.12.165(H) - Certification of Truth, Accuracy, and Completeness. Any application form, report, or compliance certification submitted pursuant to this Chapter shall contain certification by a responsible official of truth, accuracy, and completeness. This certification shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the documents are true, accurate, and complete.

By my signature I,(Name) Jamie Sturgess, hereby certify that based on information and belief formed after reasonable inquiry, the statements and information in this document are true, accurate, and complete.

(Signature): Jamie Sturgess

Official Title: Vice President, Sustainable Development Date: July 27, 2010

APPENDIX B

PROCESS FLOW DIAGRAMS

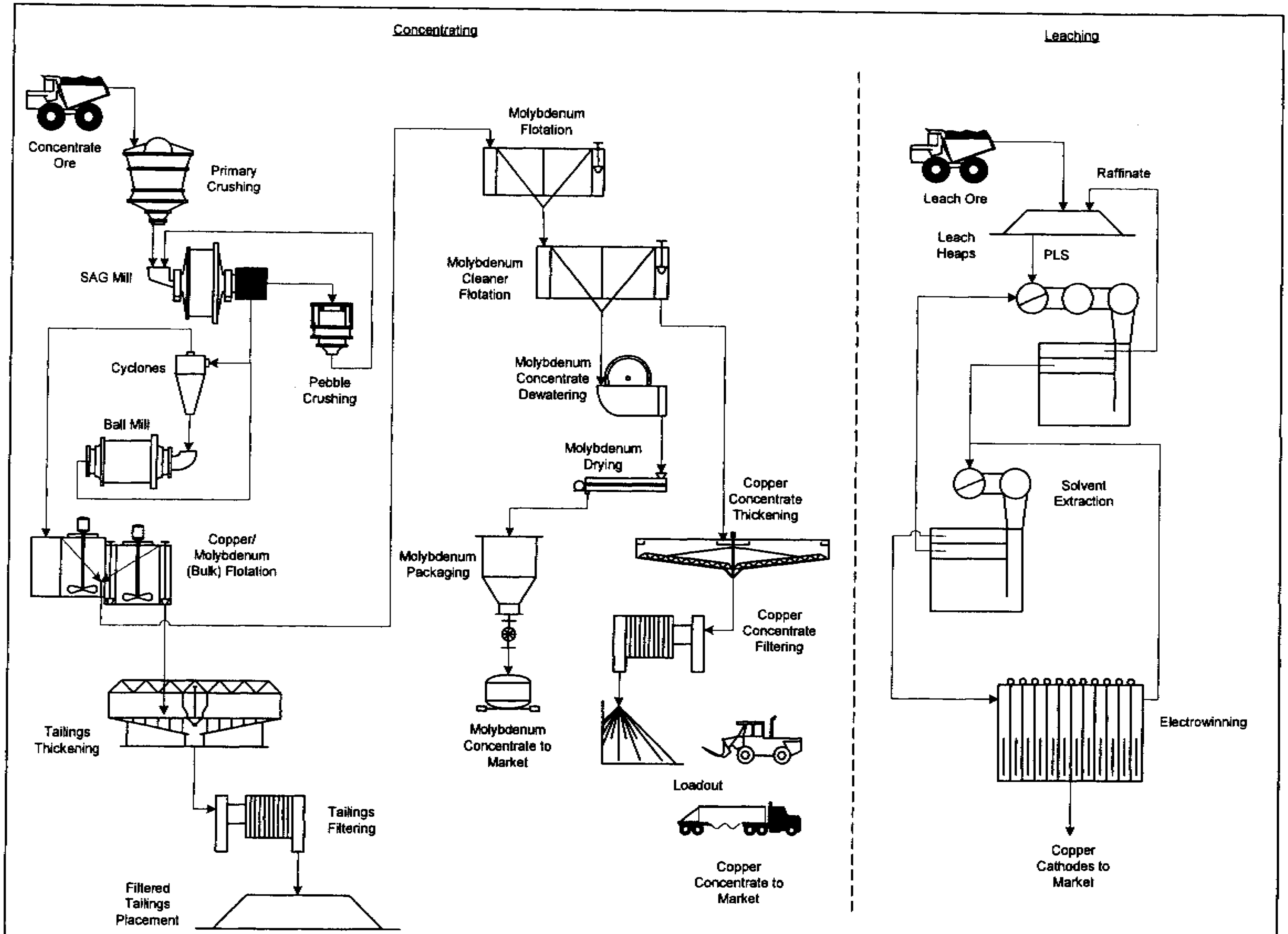

Figure B.1 Overall Processes at the RCP

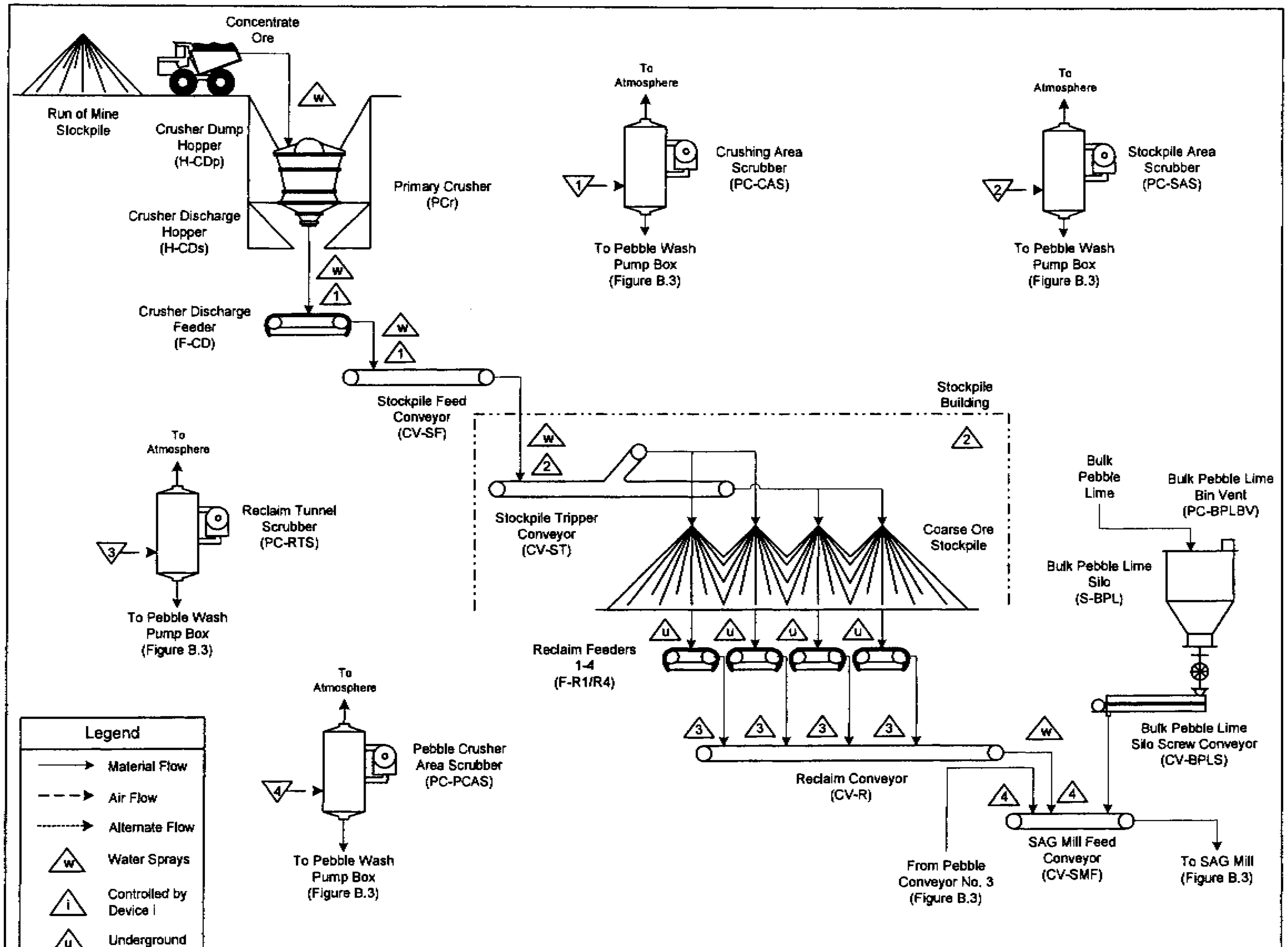

Figure B.2 Primary Crushing and Coarse Ore Storage

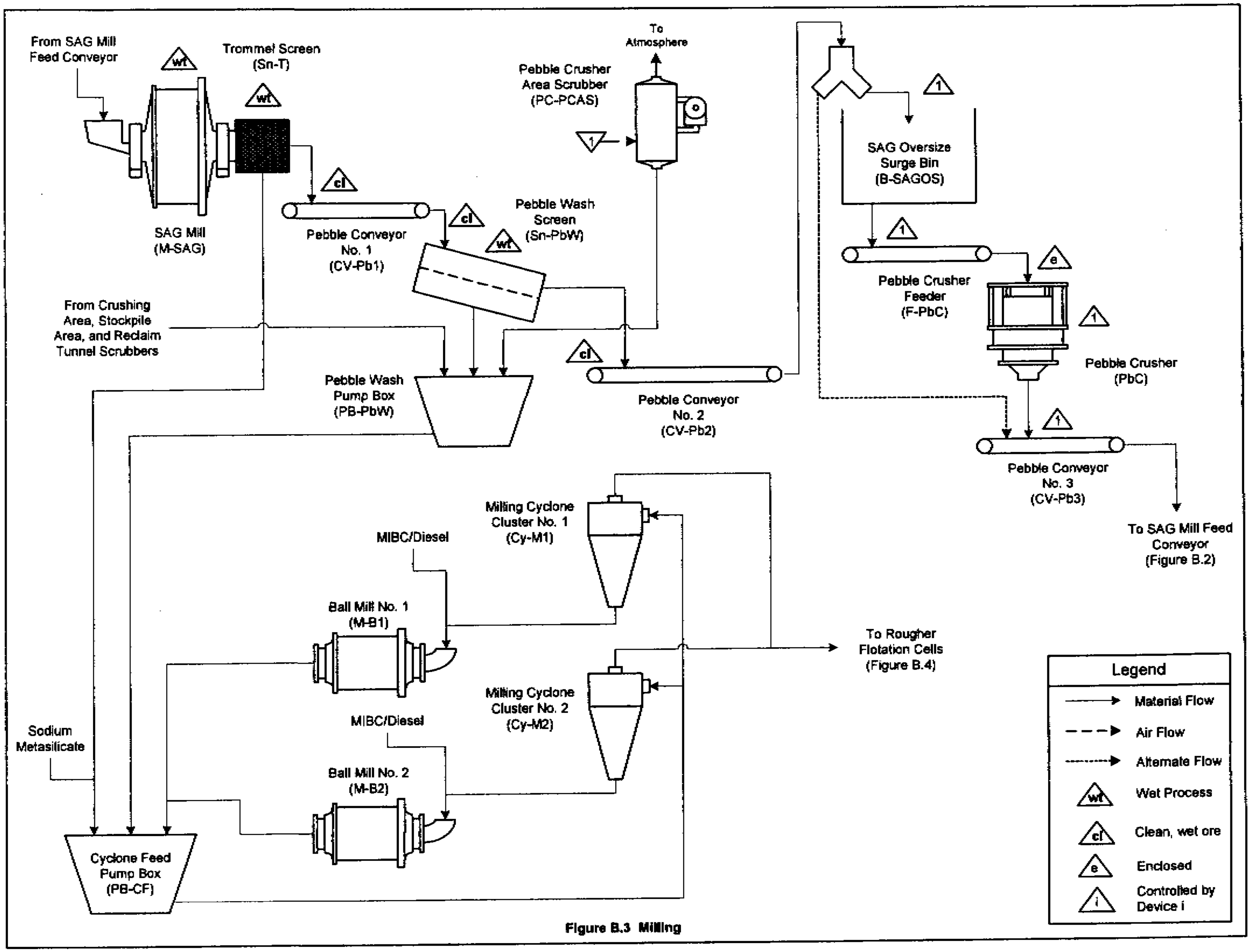

Figure B.3 Milling

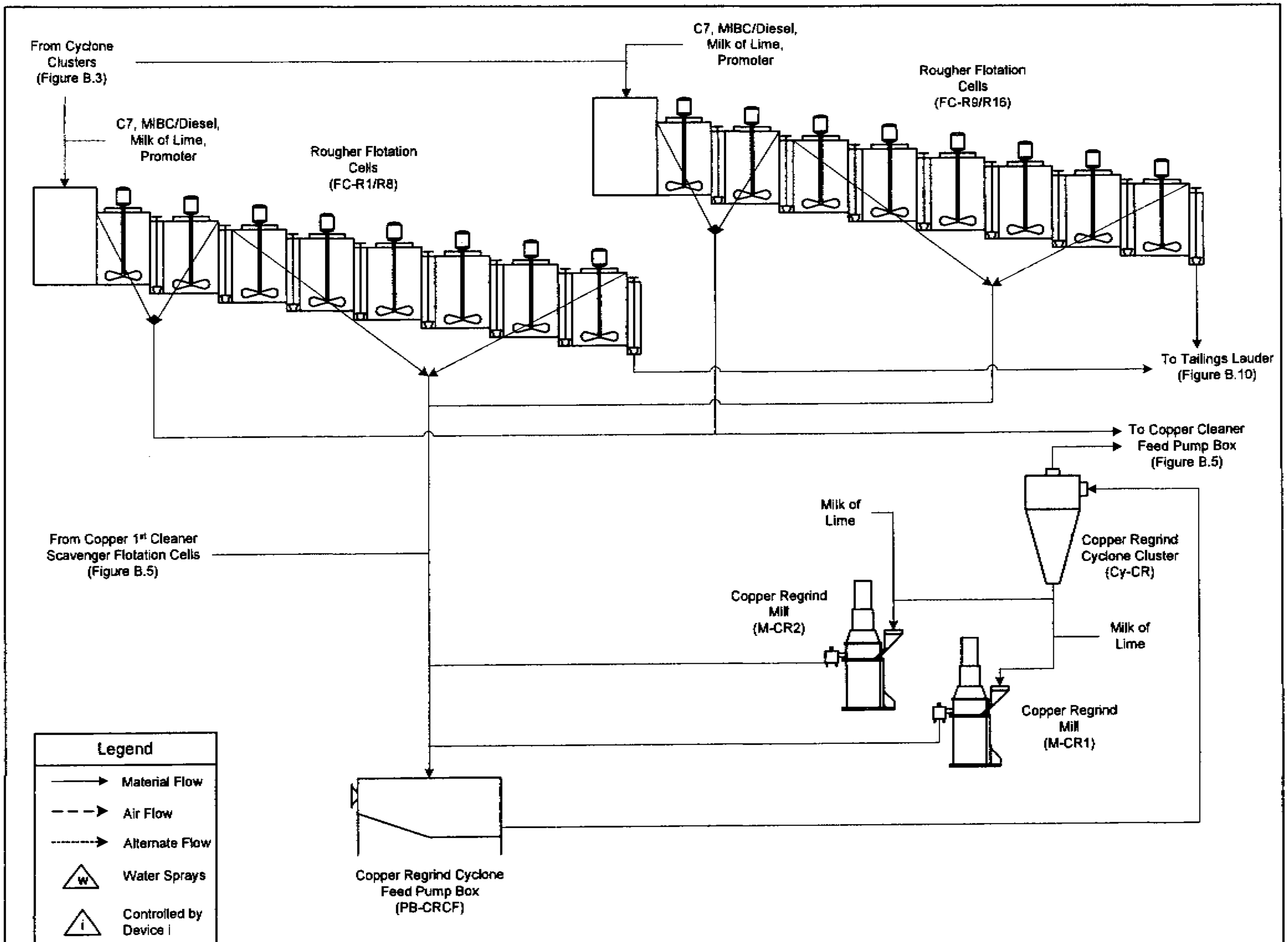

Figure B.4 Rougher Flotation

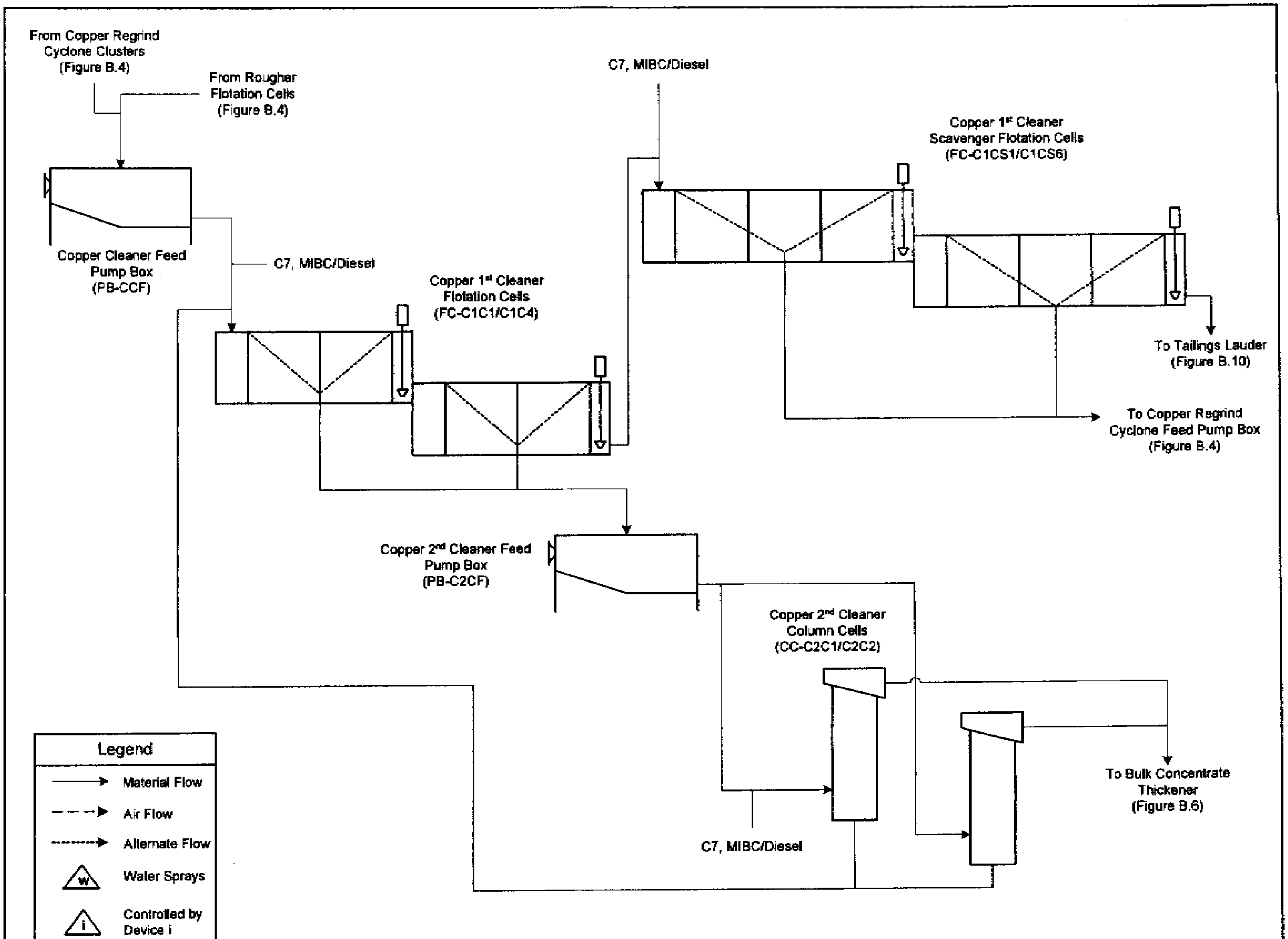

Figure B.5 Copper Cleaner Flotation

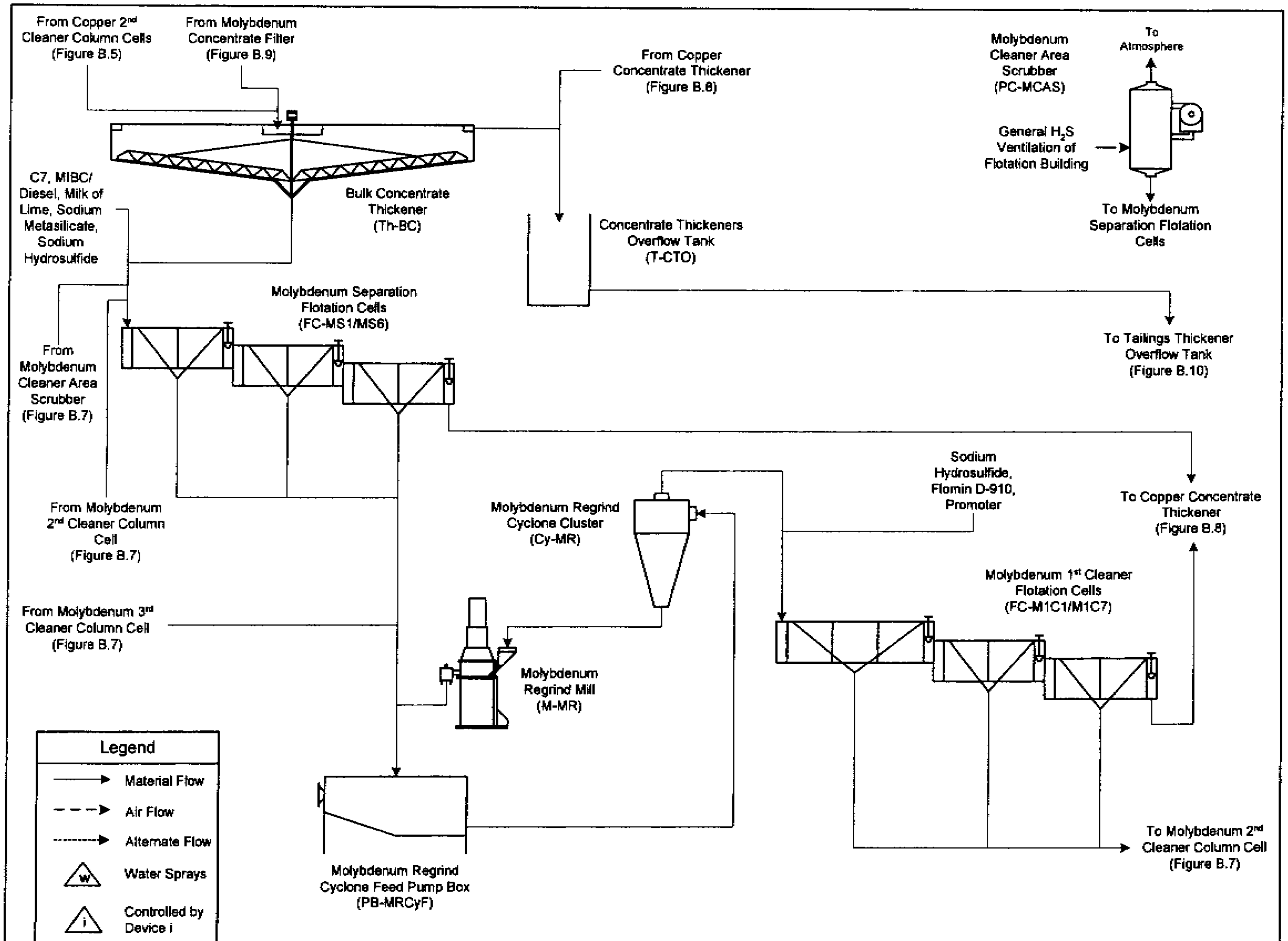

Figure B.6 Molybdenum Flotation

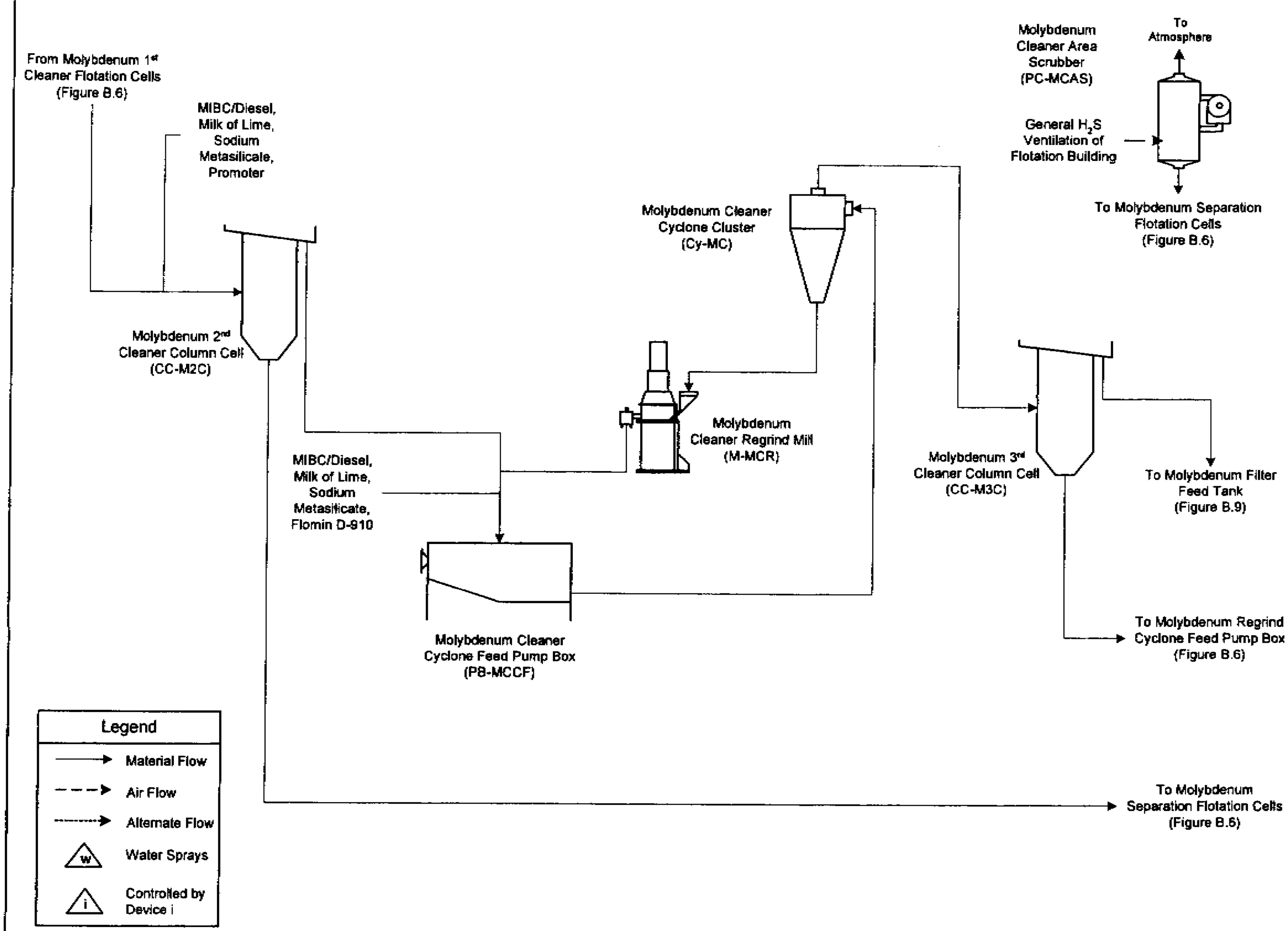

Figure B.7 Molybdenum Cleaner Flotation

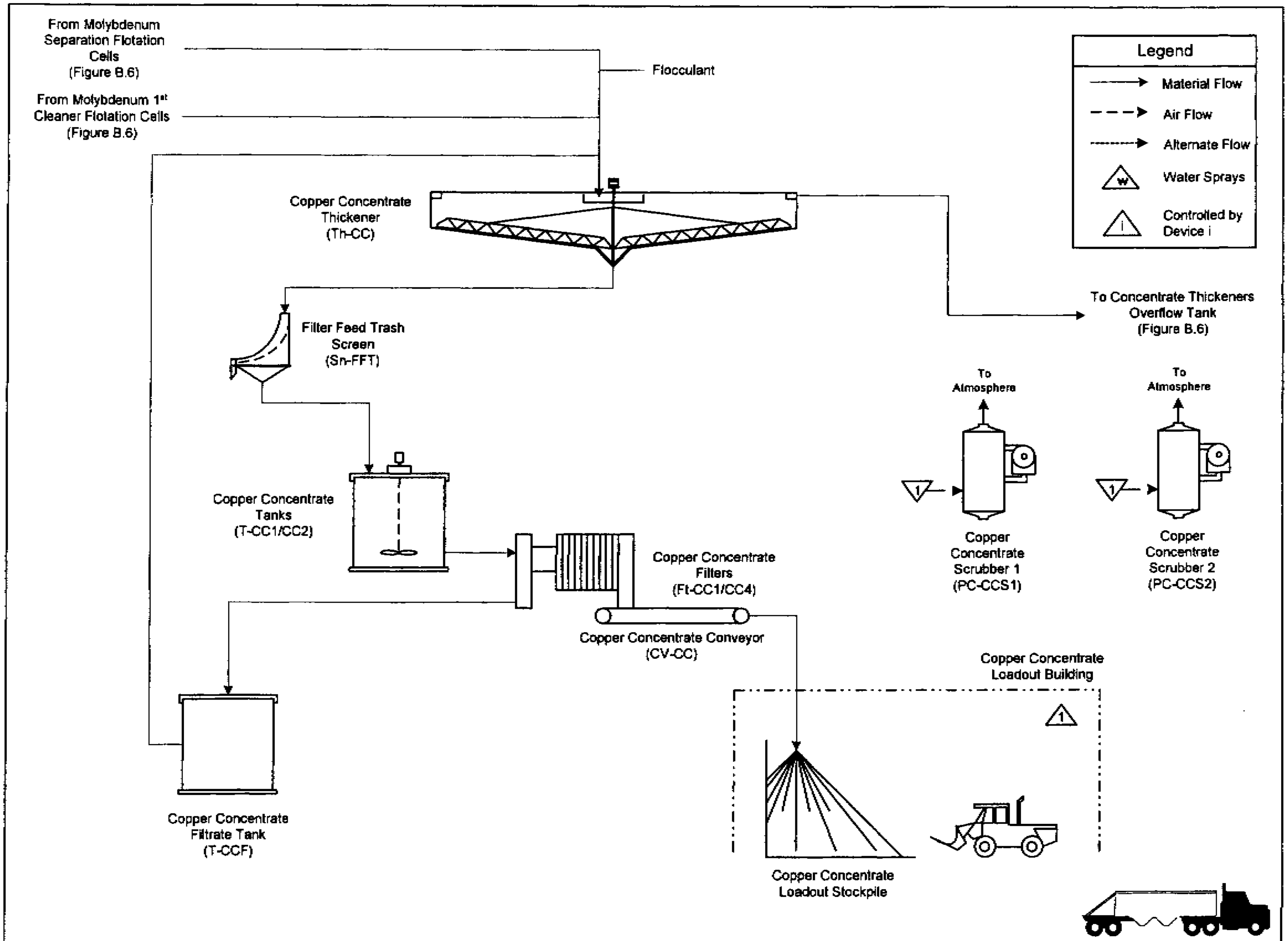

Figure B.8 Copper Concentrate Dewatering

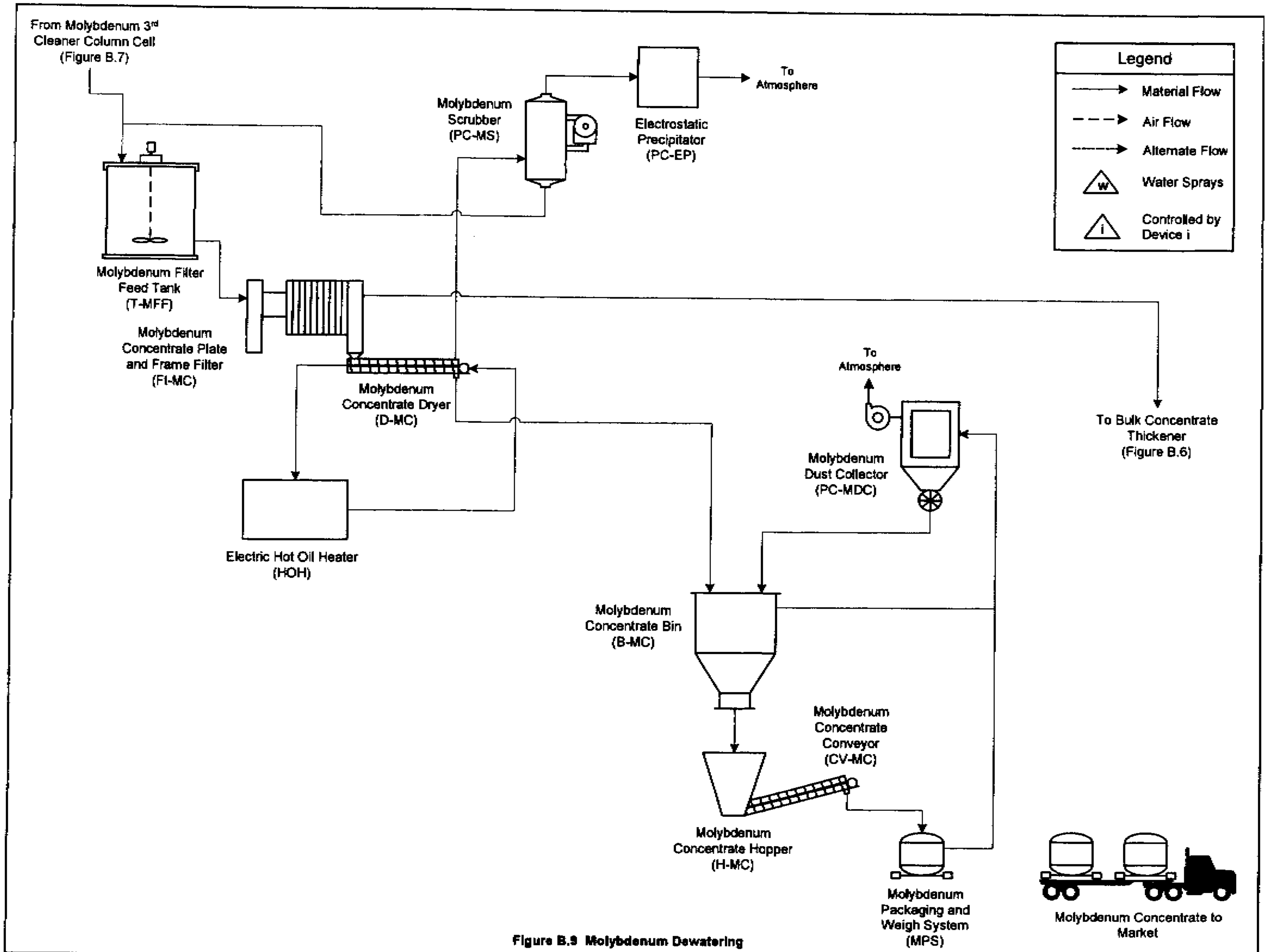

Figure B.9 Molybdenum Dewatering

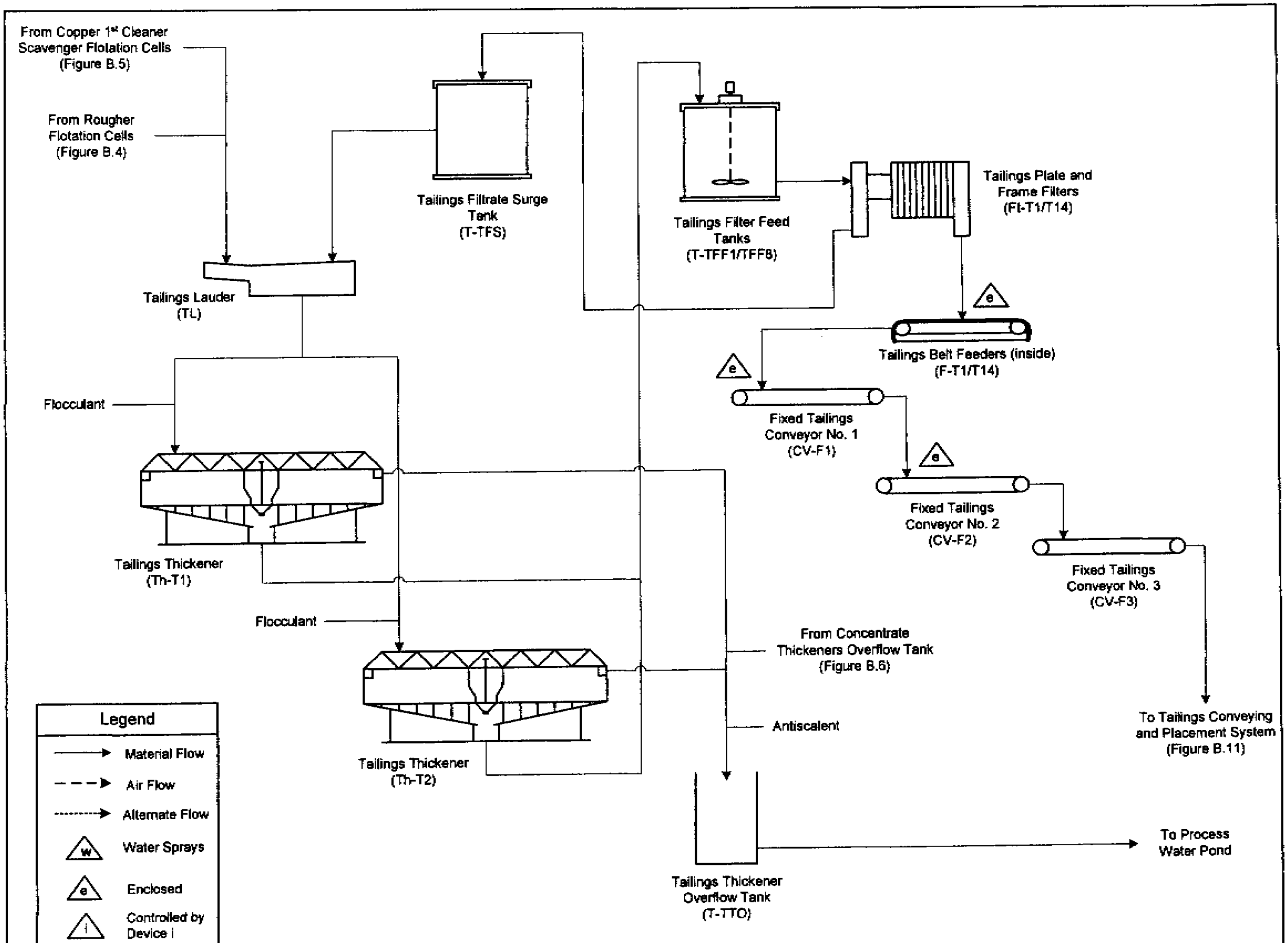

Figure B.10 Tailings Dewatering

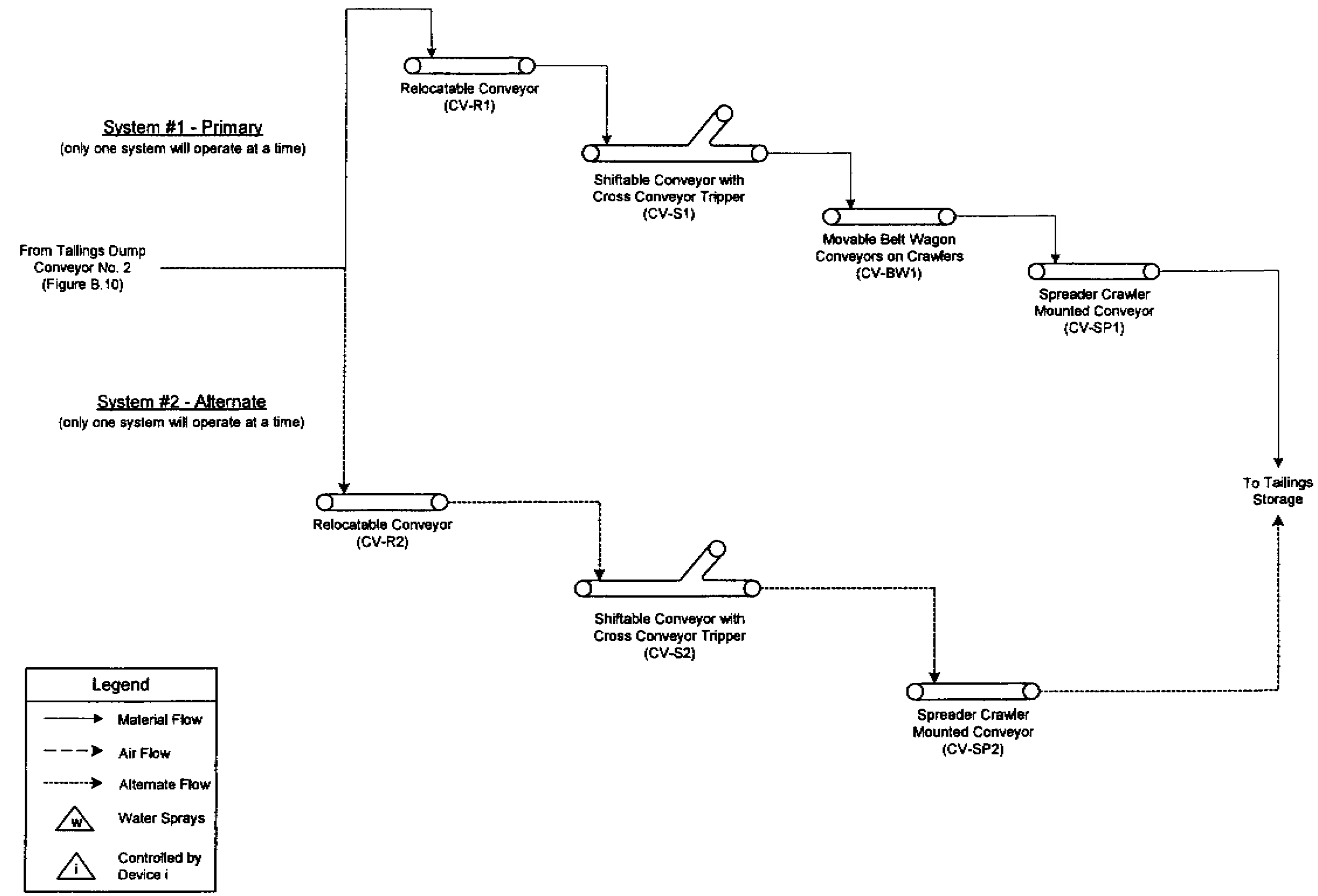

Figure B.11 Tailings Conveying and Placement System

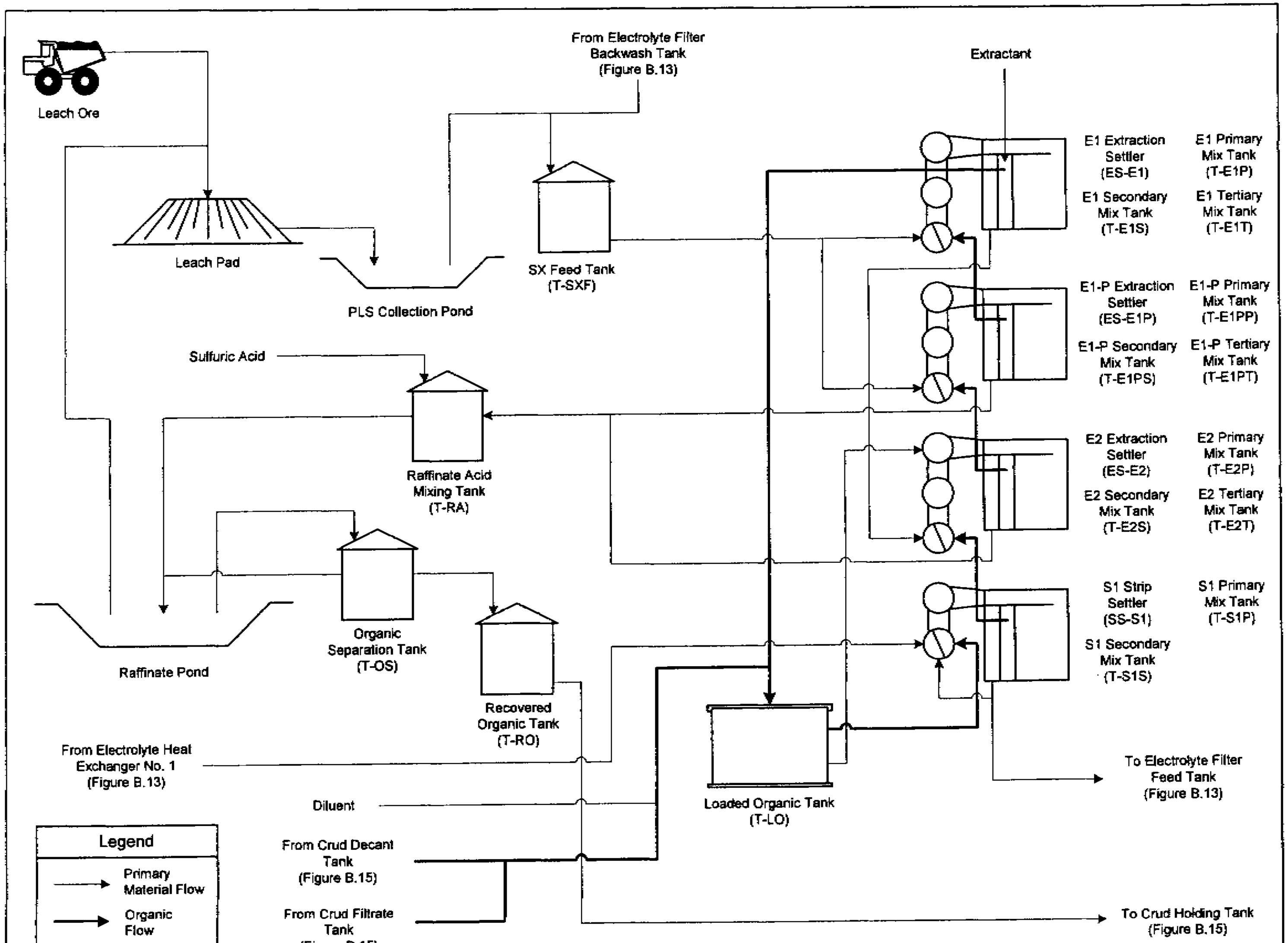

Figure B.12 Heap Leaching and Solvent Extraction

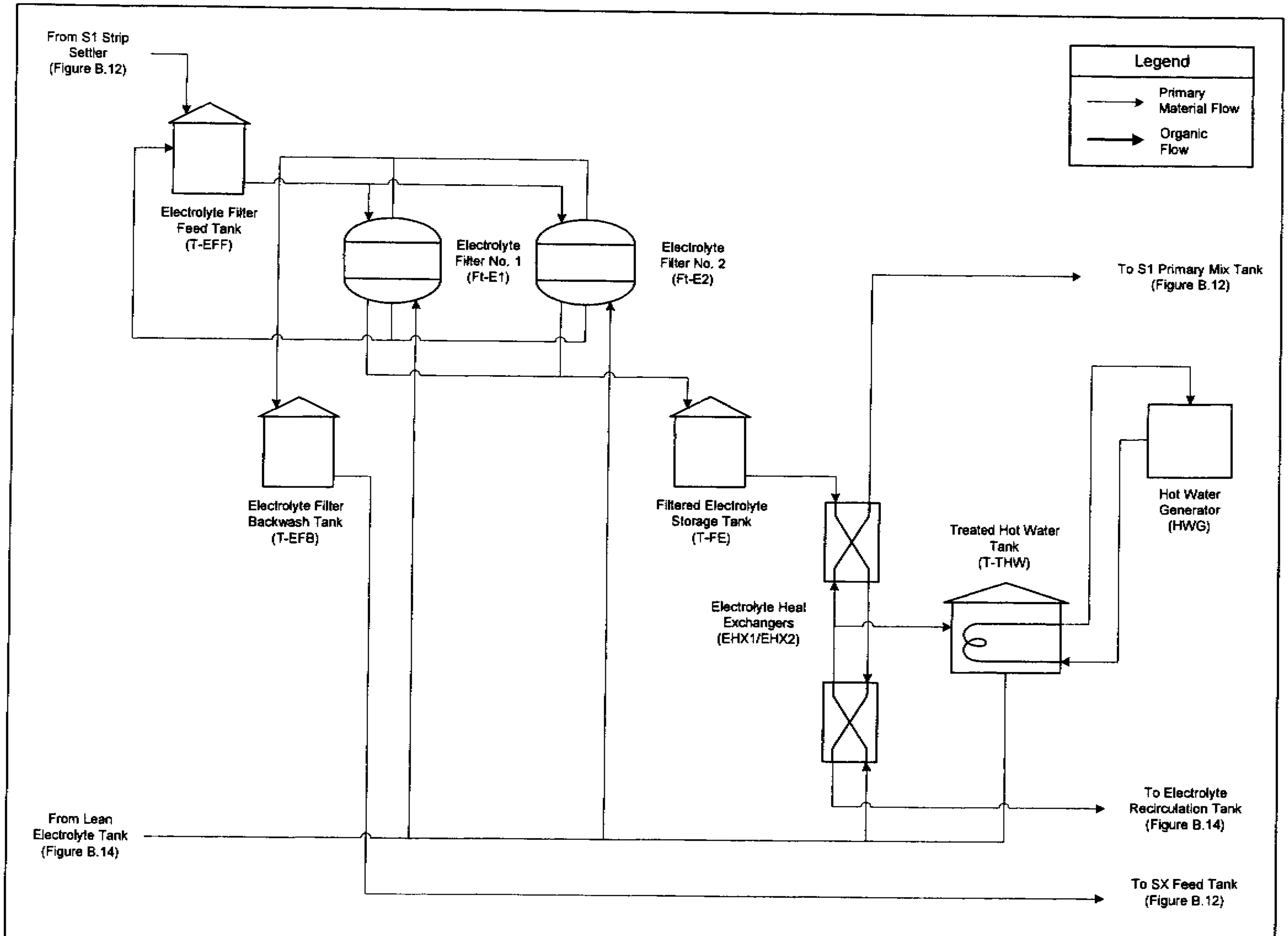

Figure B.13 Electrolyte Filtering and Heating

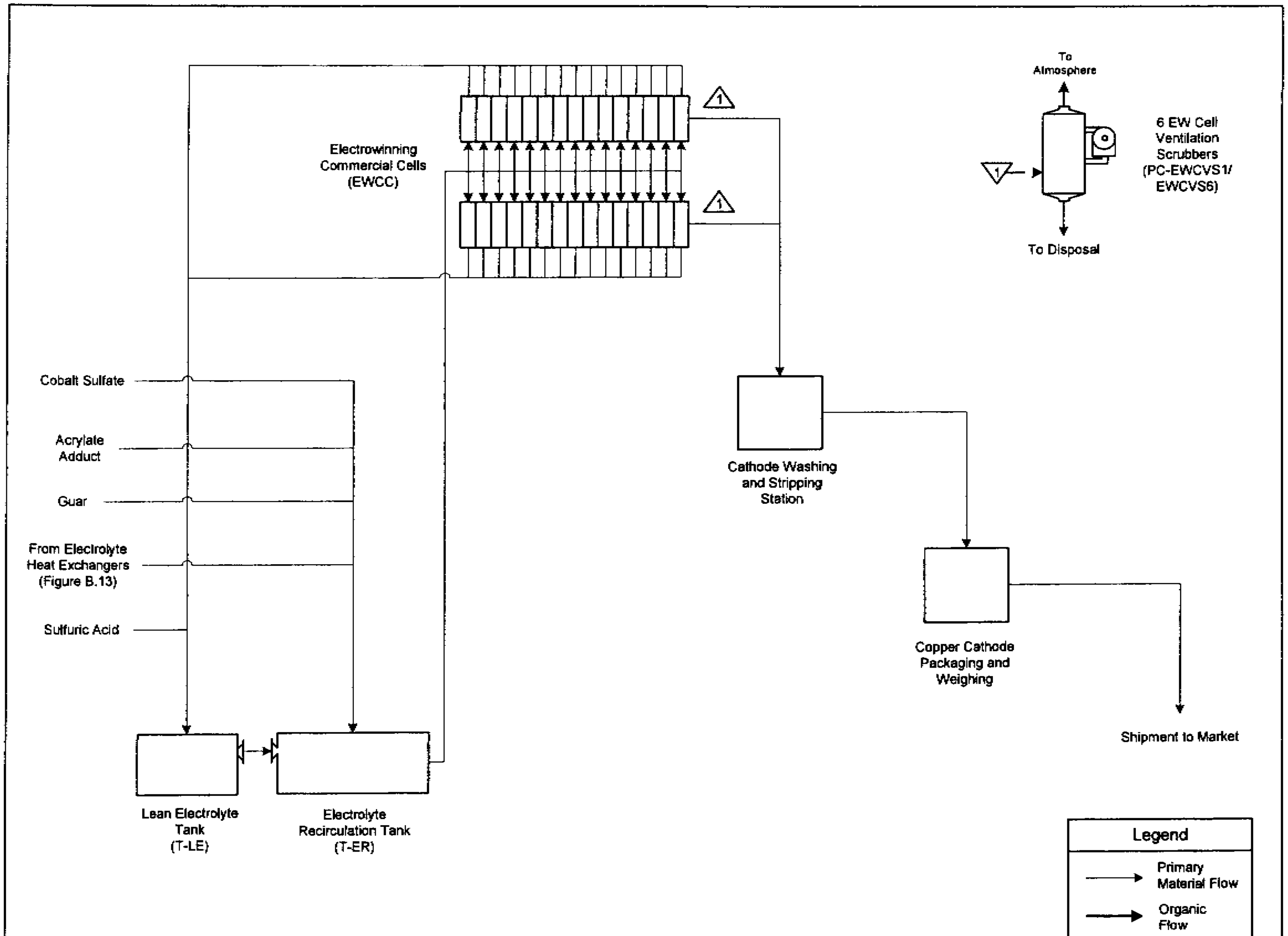

Figure B.14 Electrowinning and Cathode Handling

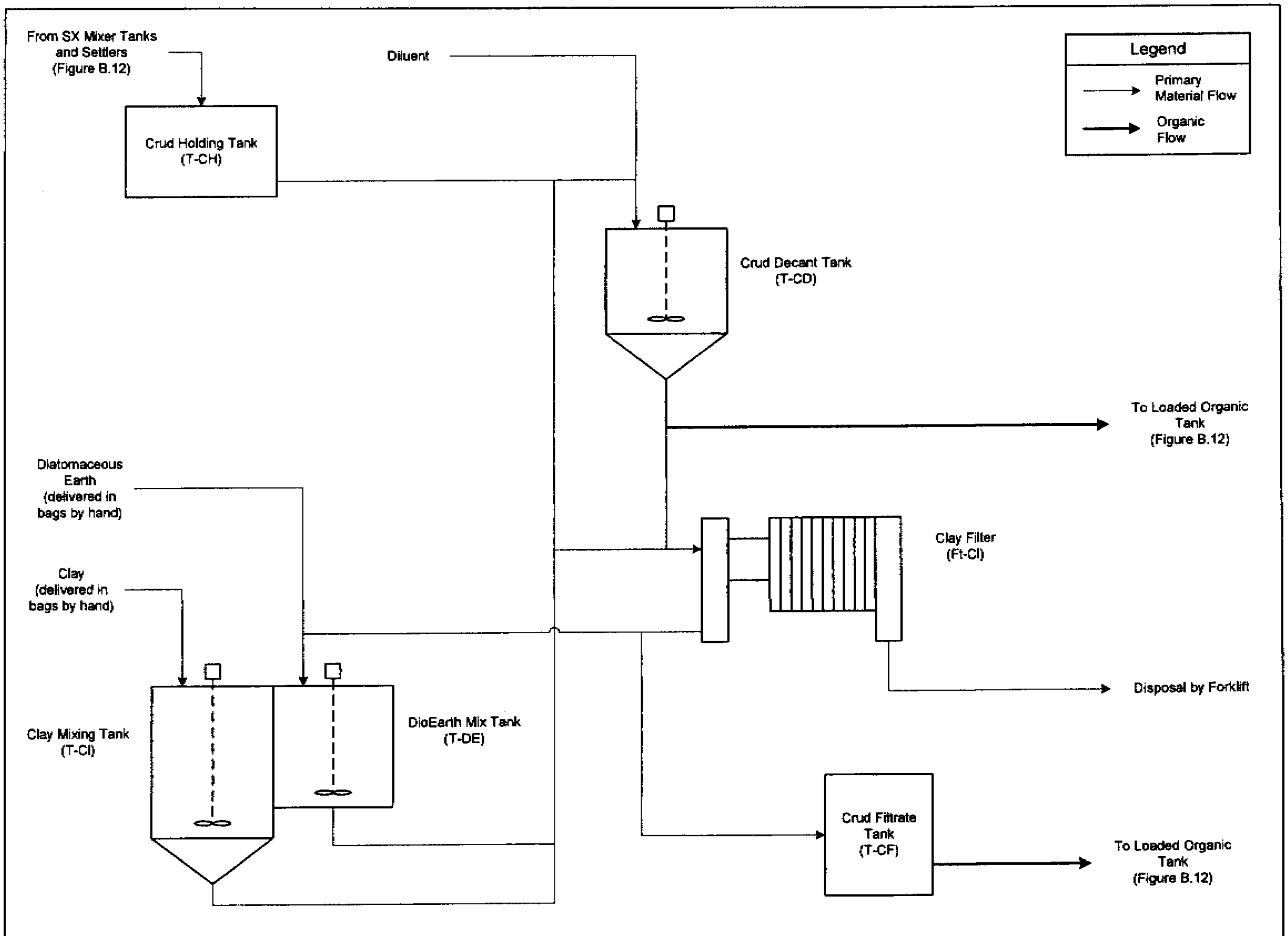

Figure B.15 Crud Treatment

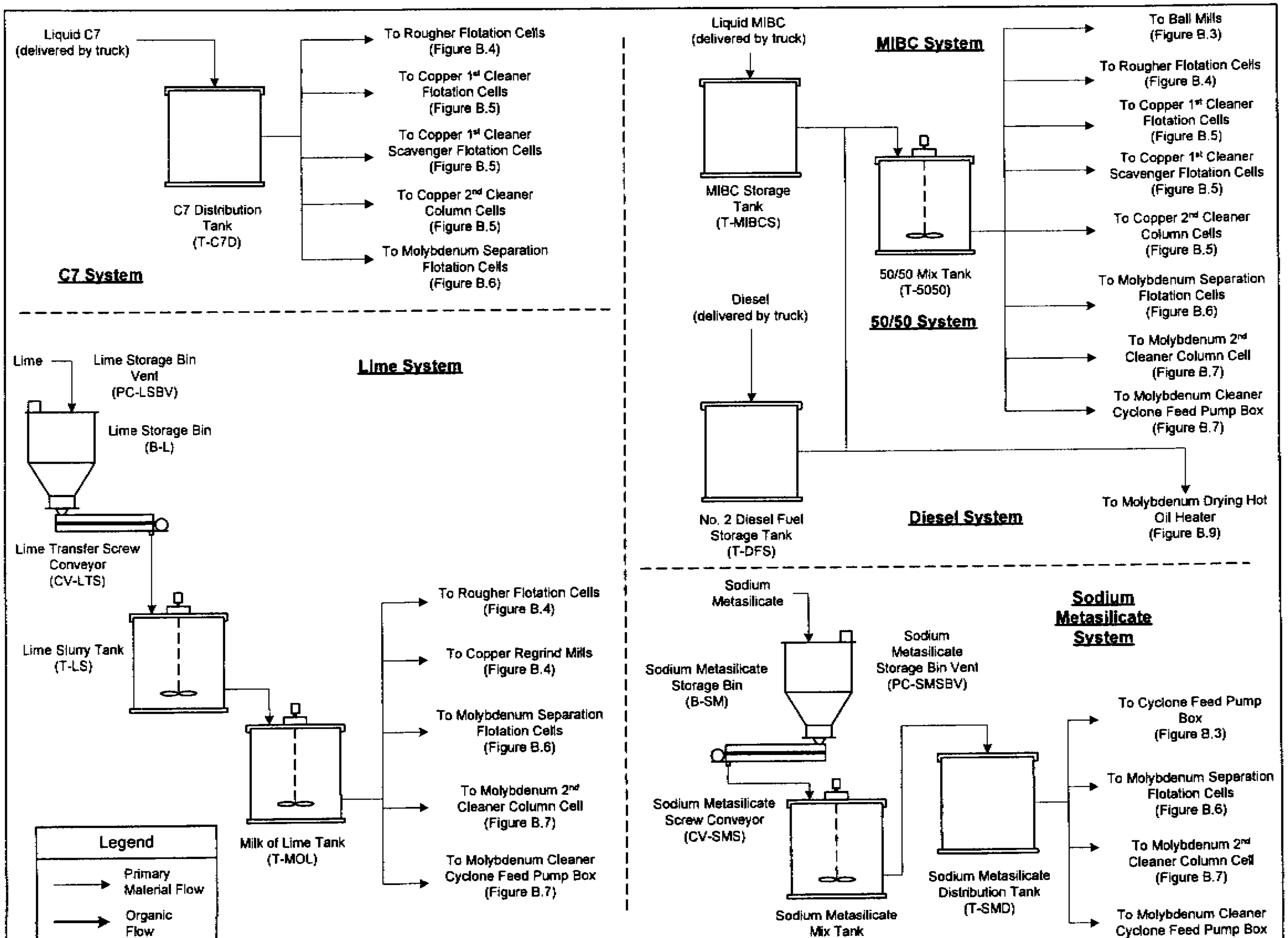

Figure B.16 Reagent Systems

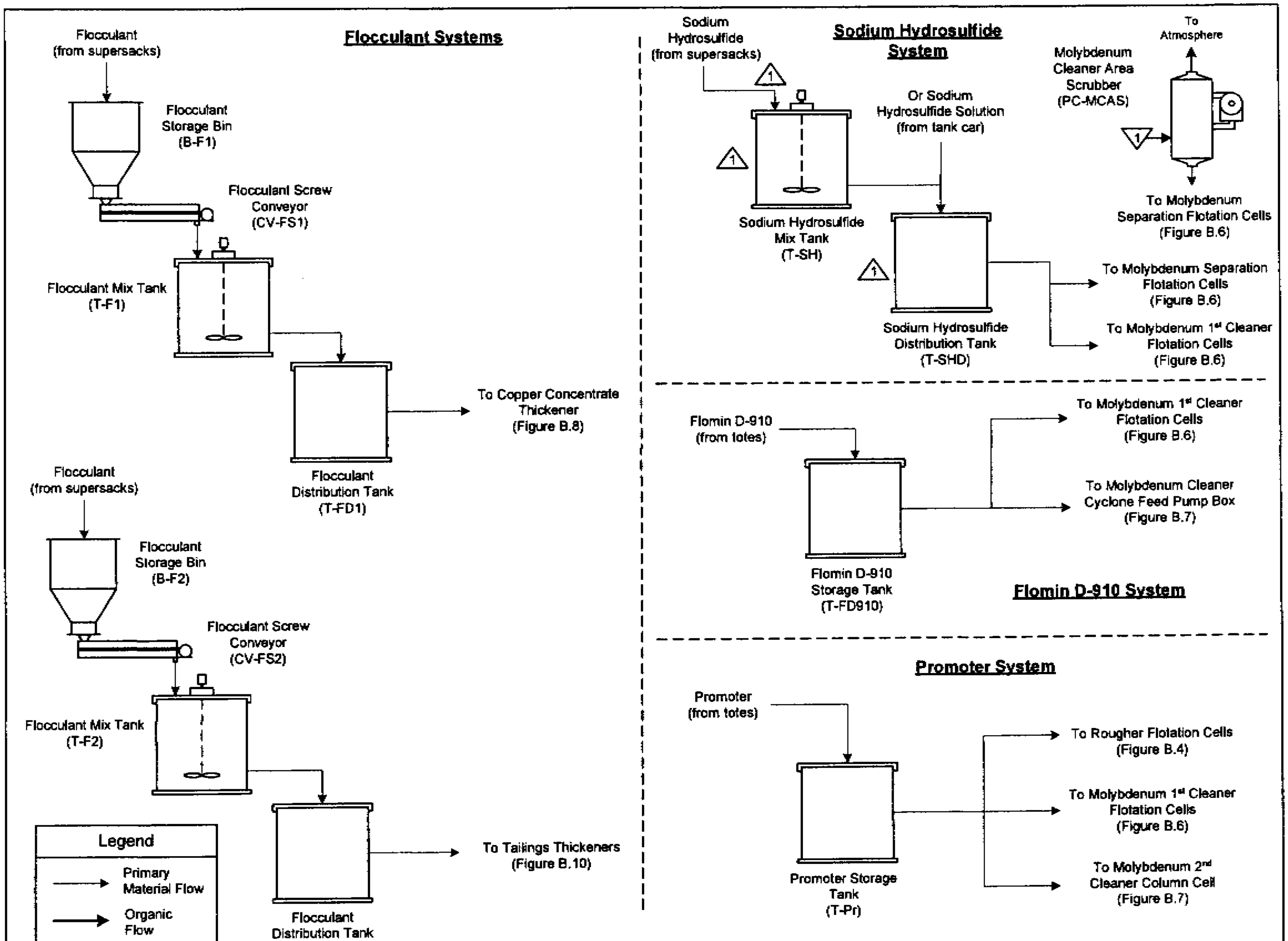

Figure B.17 Reagent Systems

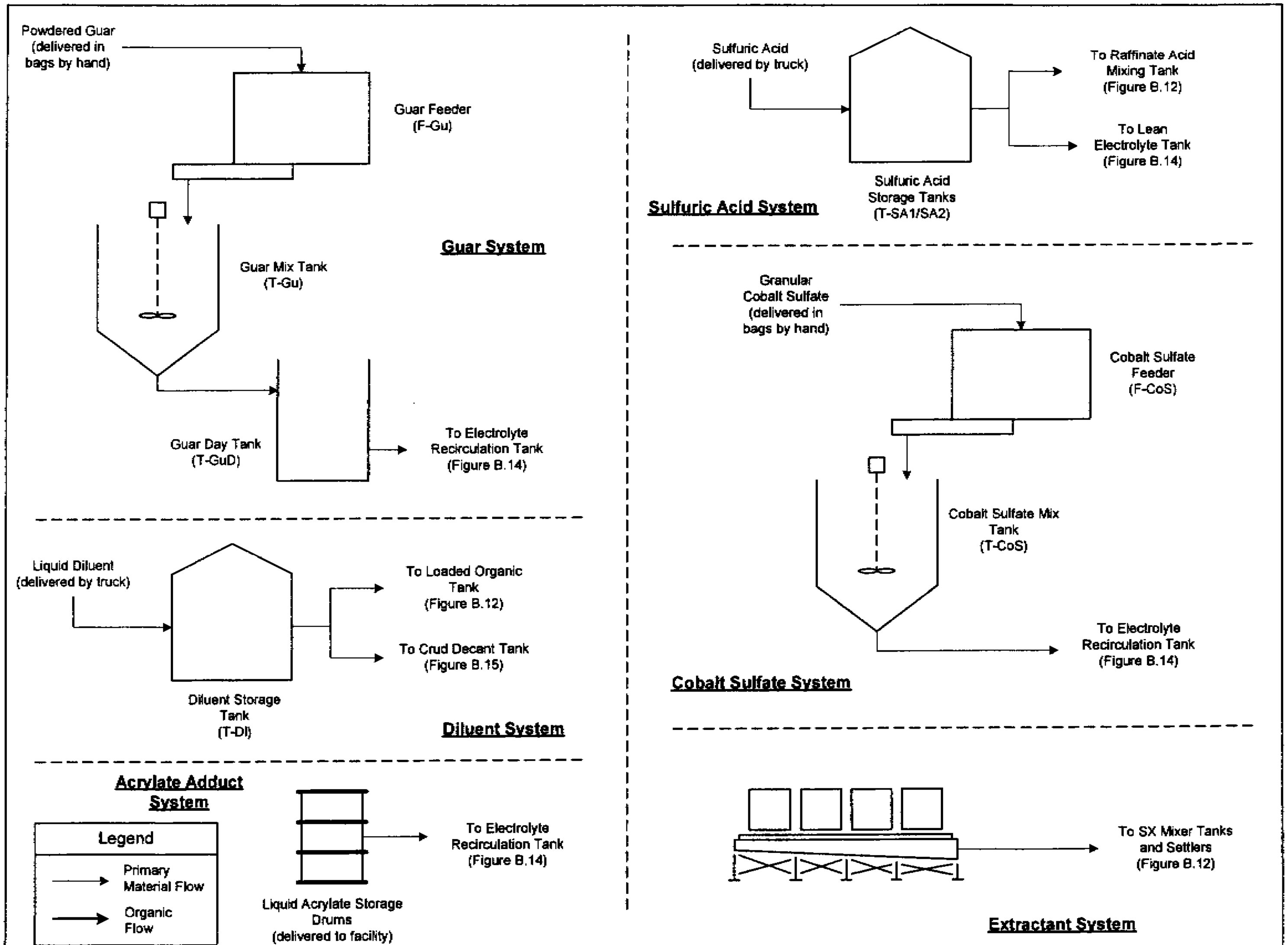

Figure B.16 Solvent Extraction Reagent Systems

APPENDIX C

INSIGNIFICANT AND TRIVIAL ACTIVITIES FOR THE RCP

Insignificant Activities

"Insignificant activity" means an activity in an emissions unit that is not otherwise subject to any applicable requirement and which belongs to one of the following categories. The specific insignificant activities applicable to the RCP are listed for each category.

A. Landscaping, building maintenance, or janitorial activities.

1. Landscaping and site housekeeping activities.
2. Fugitive emissions from landscaping activities.
3. Use of pesticides, fumigants, and herbicides.
4. Grounds keeping activities and products.
5. Internal combustion engines used for landscaping activities.
6. Housekeeping activities and associated products used for cleaning purposes, including the use of fixed vacuum cleaning systems for collecting spilled and accumulated materials at the source.
7. Air conditioning, cooling, heating, or ventilating equipment not designed to remove air contaminants generated from associated or other equipment.
8. General office activities, such as paper shredding, copying, photographic activities, and blueprinting.
9. Consumer use of paper trimmers/binders.
10. Restroom facilities and associated cleanup operations and stacks or vents used to prevent the escape of sewer gases through plumbing traps.
11. Smoking rooms and areas.
12. Use of consumer products, including hazardous substances (as defined in the Federal Hazardous Substances Act, 15 U.S.C. §1261, Section 2(f)) where the product is used in the same manner as normal consumer use.
13. Vacuum cleaning systems used exclusively for industrial or commercial purposes.
14. Laundry activities, except for dry cleaning and steam boilers.

B. Gasoline storage tanks with capacity of ten thousand gallons or less.

1. 10,000 gallon Gasoline Storage Tank
2. Storage tanks with a capacity of 10,000 gallons or less and with a maximum true vapor pressure less than or equal to the maximum true vapor pressure of gasoline at the same storage conditions.
   i. 1,692 gallon 50/50 Mix Tank

C. Diesel and fuel oil storage tanks with capacity of forty thousand gallons or less.

1. 11,000 gallon Diesel Fuel Storage Tank – EW Hot Water Generator
2. 11,845 gallon Diesel Fuel Storage Tank – Concentrate Ore Processing
3. 1,000 gallon Diesel Fuel Storage Tank – Motivator
4. 10,000 gallon Diesel Fuel Storage Tank – Light Vehicles

5. Storage tanks with a capacity of 40,000 gallons or less and with a maximum true vapor pressure less than or equal to the maximum true vapor pressure of diesel at the same storage conditions.
   i. 5,000 gallon Flocculant Mix Tanks
   ii. 5,000 gallon Flocculant Distribution Tanks
   iii. 3,000 gallon Promoter Storage Tank
   iv. 500 gallon Guar Mix Tank
   v. 500 gallon Guar Day Tank
   vi. 9,500 gallon Diluent Storage Tank
   vii. 165 gallon Decant Tank
   viii. 3,000 gallon Automatic Transmission Fluid Storage Tank
   ix. 5,876 gallon Engine Oil Storage Tank
   x. 3,000 gallon Hydraulic Fluid Storage Tank
   xi. 3,000 gallon Gear Oil Storage Tank
   xii. 5,876 gallon Used Oil Storage Tank
   xiii. 275 gallon Automatic Transmission Fluid Day Tank
   xiv. 275 gallon Engine Oil Day Tank
   xv. 275 gallon Hydraulic Fluid Day Tank
   xvi. 275 gallon Gear Oil Day Tank
   xvii. 275 gallon Used Oil Day Tank

6. Constant level process tanks where emissions generated would be less than emissions generated from an equivalent size diesel fuel storage tank being refilled multiple times per year.
   i. 1,650 gallon Organic Separation Tank
   ii. 840 gallon Recovered Organic Tank
   iii. 67,600 gallon Loaded Organic Tank
   iv. 90,000 gallon Crud Holding Tank
   v. 10,000 gallon Crud Decant Tank
   vi. 5,000 gallon Crud Filtrate Tank

D. Batch mixers with rated capacity of five cubic feet or less.

E. Wet sand and gravel production facilities that obtain material from subterranean and subaqueous beds, whose production rate is two hundred tons/hour or less, and whose permanent in-plant roads are paved and cleaned to control dust. This does not include activities in emissions units which are used to crush or grind any nonmetallic minerals.

F. Hand-held or manually operated equipment used for buffing, polishing, carving, cutting, drilling, machining, routing, sanding, sawing, surface grinding, or turning of ceramic art work, precision parts, leather, metals, plastics, fiberboard, masonry, carbon, glass or wood.

G. Powder coating operations.

H. Internal combustion (IC) engine-driven compressors, IC engine-driven electrical generator sets, and IC engine-driven water pumps used only for emergency replacement or standby service.

1. IC engine driven electrical generators not subject to any applicable requirement.
2. IC engine driven compressors, generators, welders, light plants, sump pumps, and compactors used at various operating divisions.
3. Portable Emergency Generators.

I. Lab equipment used exclusively for chemical and physical analyses.

1. Analytical and experimental laboratory equipment which is bench scale in nature, including quality control/quality assurance laboratories that are used as part of mineral evaluations, and research and development laboratories.
   i. Equipment used in the analytical laboratory.

2. Small pilot scale research and development projects, which include, but are not limited to the following.
   i. The testing of water mist/spray controls for dust abatement.
   ii. The testing of roadway surface treatment coating for dust abatement.
   iii. Research involving alternate product forms.
   iv. Geologic and hydrogeologic exploration and drilling activities.

3. Lab equipment used for chemical and physical analysis.
   i. Equipment used in the analytical laboratory.

4. Routine calibration and maintenance of laboratory equipment or other analytical instruments.
5. Equipment used for quality control/assurance or inspection purposes, including sampling equipment used to withdraw materials for analysis.
6. Hydraulic and hydrostatic testing equipment.
7. Environmental chambers not using hazardous air pollutant gasses.

J. Any other activity which the control officer determines is not necessary, because of its emissions due to size or production rate, to be included in an application in order to determine all applicable requirements and to calculate any fee.

1. Fossil fuel burning equipment with an aggregate heat input of less than 500,000 Btu/hour.

Trivial Activities

"Trivial activities" means activities and emissions units, such as the following, that may be omitted from a Class I or Class II permit application. Certain activities from the following list include qualifying statements intended to exclude similar activities:

A. Combustion emissions from propulsion of mobile sources.

1. Tailpipe emissions for all mobile sources.

B. Air-conditioning units used for human comfort that do not have applicable requirements under Title VI of the Act.

C. Ventilating units used for human comfort that do not exhaust air pollutants into the ambient air from any manufacturing, industrial or commercial process.

D. Non-commercial food preparation.

1. Facilities used for preparing food or beverages for consumption at the RCP.

E. Janitorial services and consumer use of janitorial products.

F. Internal combustion engines used for landscaping purposes.

G. Laundry activities, except for dry-cleaning and steam boilers.

H. Bathroom and toilet vent emissions.

I. Emergency or backup electrical generators at residential locations.

J. Tobacco smoking rooms and areas.

K. Blacksmith forges.

L. Plant maintenance and upkeep activities, including grounds-keeping, general repairs, cleaning, painting, welding, plumbing, re-tarring roofs, installing insulation, and paving parking lots, if these activities are not conducted as part of a manufacturing process, are not related to the RCP's primary business activity, and do not otherwise trigger a permit revision. Cleaning and painting activities qualify as trivial activities if they are not subject to VOC or HAP control requirements.

M. Repair or maintenance shop activities not related to the RCP's primary business activity, not including emissions from surface coating, de-greasing, or solvent metal cleaning activities, and not otherwise triggering a permit revision.

N. Portable electrical generators that can be moved by hand from one location to another. "Moved by hand" means capable of being moved without the assistance of any motorized or non-motorized vehicle, conveyance, or device.

O. Hand-held equipment for buffing, polishing, cutting, drilling, sawing, grinding, turning, or machining wood, metal, or plastic.

P. Brazing, soldering, and welding equipment and cutting torches related to manufacturing and construction activities that do not result in emission of HAP metals. Brazing, soldering, and welding equipment, and cutting torches related to manufacturing and construction activities that emit HAP metals are insignificant activities based on size or production level thresholds. Brazing, soldering, and welding equipment, and cutting torches directly related to plant maintenance and upkeep and repair or maintenance shop activities that emit HAP metals are treated as trivial and listed separately in this definition.

Q. Air compressors and pneumatically operated equipment, including hand tools.

R. Batteries and battery charging stations, except at battery manufacturing plants.

S. Storage tanks, vessels, and containers holding or storing liquid substances that will not emit any VOC or HAP.

1. Water Tanks
2. Copper Concentrate Tanks
3. Copper Concentrate Filtrate Tank
4. Molybdenum Filter Feed Tank
5. Tailings Filtrate Surge Tank
6. Tailings Filter Feed Tanks
7. SX Feed Tank
8. Raffinate Acid Mixing Tank
9. Filtered Electrolyte Storage Tank
10. Electrolyte Filter Backwash Tank
11. Lean Electrolyte Tank
12. Electrolyte Recirculation Tank
13. Clay Mixing Tank
14. DioEarth Mix Tank
15. Lime Slurry Tank
16. Milk of Lime Tank
17. Sodium Metasilicate Mix Tank
18. Sodium Metasilicate Distribution Tank
19. Sodium Hydrosulfide Mix Tank
20. Sodium Hydrosulfide Distribution Tank
21. Sodium Thiophosphate Solution Tank
22. Sulfuric Acid Storage Tanks
23. Cobalt Sulfate Mix Tanks
24. Cathode Wash Tank Stripping Machine (EW Building)

T. Storage tanks, reservoirs, and pumping and handling equipment of any size containing soaps, vegetable oil, grease, animal fat, and nonvolatile aqueous salt solutions, if appropriate lids and covers are used.

U. Equipment used to mix and package soaps, vegetable oil, grease, animal fat, and nonvolatile aqueous salt solutions, if appropriate lids and covers are used.

V. Drop hammers or hydraulic presses for forging or metalworking.

W. Equipment used exclusively to slaughter animals, not including other equipment at slaughterhouses, such as rendering cookers, boilers, heating plants, incinerators, and electrical power generating equipment.

X. Vents from continuous emissions monitors and other analyzers.

Y. Natural gas pressure regulator vents, excluding venting at oil and gas production facilities.

Z. Hand-held applicator equipment for hot melt adhesives with no VOC in the adhesive formulation.

AA. Equipment used for surface coating, painting, dipping, or spraying operations, except those that will emit VOC or HAP.

BB. CO_2 lasers used only on metals and other materials that do not emit HAP in the process.

CC. Electric or steam-heated drying ovens and autoclaves, but not the emissions from the articles or substances being processed in the ovens or autoclaves or the boilers delivering the steam.

1. Electric Hot Oil Heater supplying hot oil to the Molybdenum Concentrate Dryer

DD. Salt baths using nonvolatile salts that do not result in emissions of any regulated air pollutants.

EE. Laser trimmers using dust collection to prevent fugitive emissions.

FF. Bench-scale laboratory equipment used for physical or chemical analysis, but not laboratory fume hoods or vents.

1. Equipment used in the analytical laboratory.

GG. Routine calibration and maintenance of laboratory equipment or other analytical instruments.

HH. Equipment used for quality control, quality assurance, or inspection purposes, including sampling equipment used to withdraw materials for analysis.

II. Hydraulic and hydrostatic testing equipment.

JJ. Environmental chambers not using HAP gases.

KK. Shock chambers.

LL. Humidity chambers.

MM. Solar simulators.

NN. Fugitive emissions related to movement of passenger vehicles, if the emissions are not counted for applicability purposes under 17.04.340(127)(c) and any required fugitive dust control plan or its equivalent is submitted with the application.

1. Employee pickup trucks and vans.

OO. Process water filtration systems and demineralizers.

PP. Demineralized water tanks and demineralizer vents.

QQ. Oxygen scavenging or de-aeration of water.

RR. Ozone generators.

SS. Fire suppression systems.

TT. Emergency road flares.

UU. Steam vents and safety relief valves.

VV. Steam leaks.

WW. Steam cleaning operations and steam sterilizers.

1. Steam Cleaning Machine

<u>**Additional Activities Not Otherwise Subject to Any Applicable Requirement**</u>

A. Water and Wastewater Treatment (excluding remediation projects and sewage treatment plants subject to 40 CFR 60 Subpart O)

1. Water treatment or storage or cooling systems for process liquids and gases containing no chromium water treatment compounds.
2. The collection, transmission, liquid treatment, and solids treatment processes at domestic type wastewater and sewage treatment works, or treatment facilities, including septic tank systems, which treat only domestic type wastewater and sewage.

B. Burning Activities

1. Firefighting activities and training conducted at the source in preparation for fighting fires (all reporting and permitting requirements that apply to such operations will be followed).
2. Flares used to indicate danger (emergency road flares).
3. Unplanned Fires

C. Roadways

1. Activities associated with the construction, repair of maintenance roads or other paved or open areas, including operation of street sweepers, vacuum trucks, spray trucks and other vehicles related to the control of fugitive emissions of such roads or other areas.
2. Unpaved public and private roadways, except for haul roads located within a stationary source site boundary.
3. Road and lot paving operations at commercial and industrial facilities.
4. Street and parking lot striping.
5. Fugitive dust emissions from the operation of a passenger automobile, station wagon, pickup truck, or van at a stationary source.

D. General Maintenance

1. General cleanup and maintenance operations which include but are not limited to:
   i. Small equipment operations such as bobcats, loaders, backhoes, and other small earth moving activities used as part of facility cleanup and material haulage.
   ii. Ore, rock, tailings and reclamation practices.
   iii. Road surface maintenance and cleaning.
   iv. Tailings dam maintenance
   v. Demolition, renovation, and salvage operations.
   vi. Waste concrete handling.
   vii. Potable waterfield maintenance.
   viii. Drilling and well development.
   ix. Salvage operations.
   x. Cleanup of ditches.
   xi. Stormwater drainage control.

2. Repair or maintenance shop activities not related to the source's primary business activity.

E. Miscellaneous

Based on the size of the equipment, the infrequency of use, and engineering judgment, any emissions from the following activities are considered negligible.

1. Equipment using water, water and soap or detergent, or a suspension of abrasives in water for purposes of cleaning or finishing.
2. Construction and disturbance of surface areas for purposes of land development (water trucks will be used for dust suppression measures where applicable).
3. Activities at a source associated with the maintenance, repair or dismantlement of an emission unit or other equipment installed at the source, including preparation for maintenance, repair or dismantlement and preparation for subsequent startup, including preparation of a shutdown vessel for entry, replacement of insulation, welding and cutting, and purging of a vessel prior to startup; also includes maintenance, repair or

dismantlement or buildings, utility lines, pipelines, wells, excavations, earthworks and other structures that do not constitute an emission unit.

4. Containers, reservoirs, or tanks used exclusively in dipping operations to coat objects with oils, waxes or greases.
5. Activities connected with industrial hygiene services.
6. Individual points of emissions or activities.
   i. Individual sampling points, analyzers, and process instrumentation, whose operation may result in emissions.
   ii. Individual features of an emission unit, such as each burner and sootblower in a boiler.
   iii. Individual equipment that is transportable or activities within a facility established for testing for purposes of research or certification.
   iv. Individual flanges, valves, pump seals, pressure relief valves and other individual components that have the potential for leaks.

9. Aerosol can usage.
10. Plastic pipe or liner welding.
11. Acetylene, butane and propane torches.
12. Blast-cleaning equipment using a suspension of abrasive in water or air and any exhaust system or collector serving them exclusively.
13. Surface impoundments, such as evaporation ponds, settling ponds, and storm water ponds.
    i. Reclaim water ponds and reservoirs
    ii. Stormwater catchment basins

18. Pump/motor oil reservoirs, such as gear box lubrication.
19. Transformer vents.
20. Lubricating system reservoirs.
21. Hydraulic system reservoirs.
22. Caulking operations which are not part of a production process.
23. Electric Motors.
24. Cathodic protection systems.
25. High Voltage induced corona.
26. Production of hot/chilled water for on-site use not related to any industrial process.
27. Safety devices, such as fire extinguishers, if associated with a permitted emission source, but not including sources or continuous emissions.
28. CFC recovery equipment.
29. Soil gas sampling.
30. Filter draining.
31. General vehicle maintenance and servicing activities at the source.
32. Circuit Breakers.
33. Station transformers.
34. Gas vent valve (an atmospheric vent, necessary as a safety precaution, anytime that maintenance is performed on a natural gas line).

36. Storage cabinets for flammable materials.
37. Fugitive emissions from landfill operations.
38. Welding, sandblasting, steam cleaning, painting and air compressor venting for line cleanup and startup protection. These activities involve the use of small, hand-held or manually operated equipment that is used only intermittently.
39. There are numerous mobile welders located throughout the property in the various maintenance shops and other welders utilized for field repair.
40. Welding fumes.

APPENDIX D

EMISSION CALCULATION METHODOLOGY

TABLE OF CONTENTS

LIST OF TABLES

D.1. INTRODUCTION

The RCP has the potential to emit the following regulated air pollutants: (a) particulate matter (PM), (b) particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), (c) particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), (d) carbon monoxide (CO), (e) nitrous oxides (NO_x), (f) sulfur dioxide (SO_2), (g) volatile organic compounds (VOCs), (h) sulfuric acid (H_2SO_4), and (i) hazardous air pollutants (HAPs).

Emissions of potential pollutants are calculated using emission unit process rates, emission factors, and pollution control efficiencies (if applicable). The emission factors are determined using: (a) emission factors and methods from the latest version of the *Compilation of Air Pollutant Emission Factors, Vol. I: Stationary, Point, and Area Sources* (AP-42); (b) emission limitations and standards; (c) material balances; (d) EPA Tanks Program 4.0; (e) Fugitive Dust Emission Factors for the Mining Industry from the American Mining Congress (07/83); and (f) emission rates from comparative equipment.

The methodology used to estimate emissions from the emission units described in this application is presented in Sections D.2 through D.12. Each section contains the emission units pertaining to a general operation. The calculation of process rates, determination of emission factors, and application of control efficiencies are discussed for each emission unit to fully explain how uncontrolled and controlled potential emissions are calculated.

Maximum emission rates at the RCP are calculated based upon Year 5 operations, the year when annual emissions are expected to be the greatest. The fifth year of operation will have expected maximum mining production capacity of 109,500,000 tons (concentrate ore, leach ore, and waste rock) and represent the largest hauling distance (2,796,622 vehicle miles traveled by the haul trucks). When combined, these two considerations result in the highest annual emissions in the life of the mine. The majority of emissions in Year 5 will be fugitive emissions from haul truck traffic on unpaved roads.

Complete facility-wide emissions for Year 5, calculated using the methods presented in this methodology, are presented in Appendix E.

D.2. MINING

D.2.1 Drilling (Unit ID: MN01)

<u>Process Rate</u>

The annual, maximum daily, and hourly process rates for drilling blasting holes are calculated based on the number of blasts that are performed either annually, daily, and hourly (see Section D.2.2) and a drilling rate of 80 holes/blast (see Appendix D1).

<u>Emission Factor</u>

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from drilling are calculated using the emission factor of 1.3 lb/hole, from AP-42, Table 11.9-4 (10/98) for total suspended particulates (TSP) from drilling of overburden at western surface coal mines. The TSP emission factor is assumed to be applicable for PM. PM_{10} and $PM_{2.5}$ emissions from drilling are not listed in Table 11.9-4. PM_{10} emissions are assumed equal to 33% of PM emissions based on the ratio of PM_{10} to PM emissions for tertiary crushing of high moisture ore in AP-42, Table 11.24-2 (08/82).

$PM_{2.5}$ emissions are estimated to be 18.5% of PM_{10} emissions based on the ratio of $PM_{2.5}$ to PM_{10} controlled emissions for tertiary crushing in AP-42, Table 11.19.2-2 (08/04). This is a higher than actual value because pollution control devices have a lower efficiency for smaller size particulates.

Control Efficiency

Potential fugitive particulate emissions from drilling may be controlled by the addition of water and by shrouds on an as needed basis in order to inhibit the escape of particulate emissions from the top of the hole during the drilling process. However, when calculating worst case potential emissions from drilling, no emission controls are applied.

D.2.2 Blasting (Unit ID: MN02)

Process Rate

The RCP is capable of performing 365 blasts/year. However, the annual process rate for blasting at the RCP in Year 5 is anticipated to be equal to 348 blasts/year (see Appendix D1). The maximum daily process rate is assumed to be 2 blasts per day, the maximum amount of blasts that are possible in one day at the RCP. The hourly process rate is equal to 1 blast per hour, the maximum blasts possible by the RCP in one hour.

The annual process rate for the amount of ANFO used for blasting is calculated by employing the ANFO usage rate for Rosemont, 0.65 tons of ANFO/drill hole, and multiplying it by the amount of holes drilled/year. The maximum daily and hourly process rates are calculated similarly based on the maximum daily and hourly drilling rates (see Section D.2.1).

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from blasting are calculated using the emission factor expression from AP-42, Table 11.9-1 (10/98) for blasting at western surface coal mines (Equation 1):

$$EF = (k)(0.000014)(A)^{1.5} \quad (1)$$

where:

EF	=	emission factor (lb/blast)
k	=	scaling factor (1 for TSP, assumed to be equivalent to PM, 0.52 for PM_{10}, 0.03 for $PM_{2.5}$)

A = horizontal area of the blast (ft^2; 81,920 maximum, calculated by multiplying the average amount of holes drilled per blast (80 holes) by the approximate spacing (32 ft) and burden (32 ft) of the drilling pattern)

Uncontrolled gaseous (CO, NO_x, and SO_2) emissions from blasting are calculated using the emission factors from AP-42, Table 13.3-1 (02/80) for the detonation of ANFO. These emission factors are presented in Table D.2.1.

Table D.2.1 Gaseous Emission Factors for Blasting

Regulated Pollutant	Emission Factor (lb/ton of ANFO)
CO	67.00
NO_x	17.00
SO_2	2.00

Control Efficiency

Besides good operating practices, other pollution control methods cannot be implemented during blasting.

D.2.3 Loading Concentrate Ore, Leach Ore, and Waste Rock (Unit IDs: MN03, MN04, and MN05)

Process Rate

The annual process rates for loading concentrate ore, leach ore, and waste rock into haul trucks are equal to the annual ore and waste rock mining rates at the RCP. The mining rates (see Appendix D1) are based on geologic and pit development studies completed at the RCP and presented in the mine plan of operations. The maximum daily process rates for loading ore and waste rock are calculated by dividing the annual loading rates by 365, the quantity of days per year when mining will be performed, and adding a 20% maximum capacity factor. The hourly process rates for loading ore and waste rock are calculated by dividing the maximum daily loading rates by 24 hours/day.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from loading concentrate ore, leach ore, and waste rock into haul trucks are calculated using the emission factor expression from AP-42, Section 13.2.4.3 (11/06) for aggregate drop processes. This expression (Equation 2) is:

$$EF = (k)(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \qquad (2)$$

where:

EF = emission factor (lb/ton)

k = particle size multiplier (0.74 for PM, 0.35 for PM_{10}, 0.053 for $PM_{2.5}$)

U = mean wind speed (The mean wind speed at the Rosemont site is 6.21 mph, the average value calculated from hourly data collected at the meteorological station at the RCP from April 2006 through May 2009. The effective wind speed within the pit will be reduced by a conservative estimate of 33%, or an average of 4.14 mph)

M = material moisture content (4% for concentrate ore, leach ore, and waste rock from the mine as determined by the mine plan of operations)

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented during concentrate ore, leach ore, and waste rock loading.

D.2.4 Hauling Concentrate Ore, Leach Ore, and Waste Rock (Unit IDs: MN06, MN07, and MN08)

Process Rate

The annual, daily, and hourly process rates for the amount of vehicle miles traveled (VMT) by the haul trucks in order to haul concentrate ore to the primary crusher/run of mine stockpile, leach ore to the leach pad, and waste rock to the waste rock storage area are calculated by multiplying the distance traveled (i.e. the distance from the mining location in the pit to the primary crusher dump hopper/run of mine stockpile, leach pad, or waste rock storage area) by the amount of truckloads needed to haul the material. The number of truckloads is determined by dividing the anticipated annual, daily, or hourly amount of material mined (see Section D.2.3) by the average haul truck load (250 tons) and multiplying this number by two to account for the haul trucks returning empty to the mining location. The distances traveled by the haul trucks in order to haul the concentrate ore to the primary crusher/run of mine stockpile, leach ore to the leach pad, and waste rock to the waste rock storage area are determined by the mine plan of operations and presented in Appendix D1.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions resulting from the use of haul trucks on unpaved roads at the RCP are calculated from the emission factor expression (Equation 3a) in AP-42, Section 13.2.2 (11/06):

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

where:

EF	=	emission factor (lb/VMT)
k	=	particle size multiplier (4.9 lb/VMT for PM_{30}, assumed to be equivalent to total suspended particulate matter and PM, 1.5 lb/VMT for PM_{10}, 0.15 lb/VMT for $PM_{2.5}$)
a	=	constant (0.7 for PM, 0.9 for PM_{10} and $PM_{2.5}$)
b	=	constant (0.45 for PM, PM_{10}, and $PM_{2.5}$)
s	=	surface material silt content (5.0%, a value consistent with recently permitted copper mines)
W	=	mean vehicle weight (305 tons, calculated by averaging the empty weight of the haul trucks (180 tons) and the loaded weight of the haul trucks (430 tons))

The emission factor for annual emissions is modified by the following precipitation factor to account for days when the roads are wet, and emissions are reduced:

$$EF_{annual} = (EF)\left(\frac{365 - p}{365}\right) \quad (3b)$$

where:

EF_{annual}	=	emission factor used to estimate annual emissions of particulate matter (lb/VMT)
EF	=	emission factor used to estimate hourly and daily emissions of particulate matter (lb/VMT, calculated by Equation 3a)
p	=	number of days per year with greater than 0.01 inch of precipitation (61 days/year, average data from 1950 – 2008 from the Western Region Climate Center, Santa Rita Experimental Range weather station located 8 miles southwest of the RCP at 4,300 feet above mean sea level)

Control Efficiency

Emissions of particulate matter resulting from haul truck traffic on haul roads at the RCP will be controlled by the application of water to the road surface. Based on the EPA document, "Control of Open Fugitive Dust Sources" from September 1988, sufficient watering of unpaved roads can result in a control efficiency up to 95%. At the RCP, the roads will be watered sufficiently to achieve a 90% control efficiency.

D.2.5 Unloading Concentrate Ore to Run of Mine Stockpile, Leach Ore to Leach Pad, and Waste Rock to Waste Rock Storage Area (Unit IDs: MN09, MN10, and MN11)

Process Rate

The annual, maximum daily, and hourly process rates for unloading leach ore to the leach pad and waste rock to the waste rock storage area are equal to the leach ore and waste rock loading rates (see Section D.2.3).

The annual process rate for unloading concentrate ore to the run of mine stockpile is estimated to be 10% of the annual concentrate ore loading rate (see Section D.2.3), as it is estimated that a worst case quantity of 10% of the mined concentrate ore will need to be stockpiled prior to primary crushing due to short-term operating disruptions in the crushing and conveying system. The remainder of the concentrate ore will be unloaded directly to the primary crusher dump hopper (see Section D.3.2). The maximum daily and hourly process rates are equal to the maximum daily and hourly concentrate ore loading rates (see Section D.2.3). This assumes that on a given day or hour, the primary crushing and conveying operations are inoperable and all the mined concentrate ore will be stockpiled.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from unloading leach ore to the leach pad, concentrate ore to the run of mine stockpile, and waste rock to the storage area are calculated using Equation 2. The material moisture content (M, 4%) is equal to the value used to calculate the emission factor in Section D.2.3. An explanation for how this value is determined is presented in Section D.2.3. The mean wind speed (6.21 mph) is determined from hourly data collected at the meteorological station at the RCP from April 2006 through May 2009. Since the unloading process at the RCP is unprotected from the wind, the unaltered wind speed is used in the emission factor equation presented in Equation 2.

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented while unloading concentrate ore to the run of mine stockpile, leach ore to the leach pad, and waste rock to the waste rock storage area.

D.2.6 Bulldozer Use (Unit ID: MN12)

Process Rate

The annual process rate for bulldozer use is calculated by summing the annual amount of hours each type of bulldozer will be used, as determined by mine plan of operations (see Appendix D1). The maximum daily process rate is calculated by dividing the annual hours by 365, the quantity of days per year the bulldozers will be used. The hourly process rate is calculated by dividing the maximum daily process rate by 24 hours/day.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from bulldozing operations are calculated from the emission factor expression in AP-42, Table 11.9-1 (10/98) for the bulldozing of overburden at western surface coal mines. This expression (Equation 4) is:

$$EF = (k)\left(\frac{s^a}{M^b}\right) \quad (4)$$

where:

EF	=	emission factor (lb/hr), the PM emission factor is assumed to be equal to the emission factor for TSP
k	=	particle size multiplier (5.7 for PM, 0.75 for PM_{10}, 0.60 for $PM_{2.5}$ (5.7*0.105))
s	=	material silt content (Bulldozing operations represent processing primarily of waste rock and ore with a bulldozer. The silt content of these materials is uncertain. AP-42, Table 13.2.4-1 (11/06) provides the silt content of various materials. The silt content of sand in this table is 2.6%. Therefore, as a worst case scenario, a value of 2.5% was assumed for the silt content of the material processed by bulldozers.)
M	=	material moisture content (4% for concentrate ore, leach ore, and waste rock from the mine as determined by the mine plan of operations)
a	=	constant (1.2 for PM and $PM_{2.5}$, 1.5 for PM_{10})
b	=	constant (1.3 for PM and $PM_{2.5}$, 1.4 for PM_{10})

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented during bulldozer use.

D.2.7 Water Truck Use (Unit ID: MN13)

Process Rate

The annual process rate for water truck use is calculated by multiplying the hours of operation of the water trucks, as determined by the mine plan of operations (see Appendix D1), by the average speed the water trucks will be traveling (11 mph). The maximum daily amount of VMT is calculated by dividing the annual VMT by 365, the quantity of days per year water trucks will be used and adding a 20% maximum capacity factor. The hourly process rate is calculated by dividing the maximum daily water truck use rate by 24 hours/day.

The process rates for water truck use is directly dependent on the ore and waste rock mining and hauling rates (i.e. the water trucks suppress the fugitive emissions from the haul trucks traveling on the haul roads). Therefore, an equivalent maximum capacity factor is added to the daily and hourly water truck usage rates to reflect increased usage during maximum daily and hourly mining and hauling.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions resulting from the use of water trucks on unpaved roads at the RCP are calculated using Equations 3a and 3b. The surface material silt content (s, 5.0%) and number of days per year with greater than 0.01 inches precipitation (p, 61 days/year) are equal to the values used to calculate the emission factor in Section D.2.4. Explanations for how these values are determined are presented in Section D.2.4.

The mean vehicle weight (W, 187.4 tons) is calculated by averaging the empty (125 tons) and loaded weights (249.8 tons) of the water trucks.

Control Efficiency

Emissions of particulate matter resulting from water truck use on haul roads at the RCP will be controlled by the application of water to the road surface. Based on the EPA document, "Control of Open Fugitive Dust Sources" from September 1988, sufficient watering of unpaved roads can result in a control efficiency up to 95%. At the RCP, the roads will be watered sufficiently to achieve a 90% control efficiency for vehicles traveling on the unpaved roads. However, since the water trucks distribute water onto the roads at the same time they are generating fugitive emissions, the control efficiency of the water application is at a maximum, as there has not been time for a reduction in the roads' moisture content by the time the water trucks have traveled on them. Therefore, a 95% control efficiency is assumed for haul truck use on the unpaved roads due to watering.

D.2.8 Grader Use (Unit ID: MN14)

Process Rate

The annual process rate for grader use is calculated by summing the annual amount of VMT for each type of grader. The VMT are calculated by multiplying the hours of operation of each grader, as determine by the mine plan of operations (see Appendix D1), by the average speed the graders will be traveling (5.3 mph and 4.6 mph for the two types of graders). The maximum daily amount of VMT by the graders is calculated by dividing the annual VMT by 365, the quantity of days per year graders will be used. The hourly process rate is calculated by dividing the daily grader use rate by 24 hours/day.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from grader use are calculated from the emission factor expression in AP-42, Table 11.9-1 (10/98) for grading at western surface coal mines. This expression (Equation 5) is:

$$EF = (k)(a)(S)^b \quad (5)$$

where:

EF	=	emission factor (lb/VMT), the PM emission factor is assumed to be equal to the emission factor for TSP
k	=	particle size multiplier (1 for PM, 0.60 for PM_{10}, 0.031 for $PM_{2.5}$)
S	=	mean vehicle speed (4.78 mph, weighted average value calculated from the hours of operation and average speed of each type of grader (5.3 mph and 4.6 mph))
a	=	constant (0.040 for PM, 0.051 for PM_{10}, 0.040 for $PM_{2.5}$)
b	=	constant (2.5 for PM, 2.0 for PM_{10}, 2.5 for $PM_{2.5}$)

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented during grader use.

D.2.9 Support Vehicle Use (Unit ID: MN15)

Process Rate

The annual, maximum daily, and hourly process rates for support vehicle use on the unpaved roads are calculated by summing the annual, maximum daily, and hourly amount of VMT for each type of support vehicle.

Except for the drills, the annual amount of VMT for each type of support vehicle is based on usage determinations, which are anticipated to be consistent throughout the life of the mine. The maximum daily amount of VMT for each support vehicle is determined by dividing the annual VMT by 365, the quantity of days per year the support vehicle will be used. The hourly process rate is determined by dividing the maximum daily support vehicle use rate by 24 hours/day. For the drills, the annual, maximum daily, and hourly amounts of VMT is determined by the distance traveled to prepare for a blast and the maximum number of blasts per year, day, or hour (see Section D.2.2).

The annual, maximum daily, and hourly VMT process rates, the support vehicle fleet size, and the support vehicle weight are presented in Table D.2.2.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions resulting from the use of support vehicles on unpaved roads at the RCP are calculated using Equations 3a and 3b. The surface material silt content (s, 5.0%) and number of days per year with greater than 0.01 inch of precipitation (p, 61 days/year) are equal to the values used to calculate the emission factor in Section D.2.4. Explanations for how these values are determined are presented in Section D.2.4.

The mean vehicle weight (W, tons) is the weighted average value for all of the support vehicles that will be used at the RCP, based upon the total vehicle miles traveled for each vehicle. Since equal scaling does not occur for all vehicles in the calculation of annual, maximum daily, and hourly vehicle miles traveled, the mean vehicle weight will vary for these time periods. The mean vehicle weight values are presented in Table D.2.2.

Control Efficiency

Emissions of particulate matter resulting from support vehicle use on haul roads at the RCP will be controlled by the application of water to the road surface. Based on the EPA document, "Control of Open Fugitive Dust Sources" from September 1988, sufficient watering of unpaved roads can result in a control efficiency up to 95%. At the RCP, the roads will be watered sufficiently to achieve a 90% control efficiency.

Table D.2.2 Support Vehicle Total VMT and Weighted Average								
Support Vehicle Description	**Fleet Size**	**Vehicle Weight (tons)**	**VMT Traveled (total)**			**Weight * VMT Traveled (total)**		
			Annual	**Daily**	**Hourly**	**Annual**	**Daily**	**Hourly**
Diesel Blasthole Drill, 12.25 inches	2	190.0	127	0.73	0.37	24,181	138.97	69.49
Electric Blasthole Drill, 12.25 inches	1	200.0	64	0.37	0.18	12,727	73.14	36.57
Hydraulic DML 45 Drill	1	50.0	64	0.37	0.18	3,182	18.29	9.14
Front End Loaders	2	253.0	41,391	113.40	4.73	10,471,923	28,690.20	1,195.43
Stemming Truck	2	20.0	5,000	13.70	0.57	100,000	273.97	11.42
ANFO/Slurry Truck, 20 tons	2	20.0	5,000	13.70	0.57	100,000	273.97	11.42
Powder Truck, 2 tons	2	10.0	5,000	13.70	0.57	50,000	136.99	5.71
Front End Loaders, 8 yd^3	2	26.1	8,000	21.92	0.91	209,016	572.65	23.86
Hydraulic Excavator, 385 Cat CL	2	93.7	22,075	60.48	2.52	2,068,005	5,665.77	236.07
Backhoe/Loader, 2 yd^3	1	12.1	1,500	4.11	0.17	18,106	49.60	2.07
All-Terrain Crane, 75 tons	1	36.0	2,000	5.48	0.23	72,000	197.26	8.22
Transporter with Tractor, 200 tons	1	98.4	2,000	5.48	0.23	196,800	539.18	22.47
Fuel/Lube Trucks, 6,000 gallons	2	73.1	30,000	82.19	3.42	2,193,990	6,010.93	250.46

Table D.2.2 Support Vehicle Total VMT and Weighted Average								
Support Vehicle Description	Fleet Size	Vehicle Weight (tons)	VMT Traveled (total)			Weight * VMT Traveled (total)		
			Annual	Daily	Hourly	Annual	Daily	Hourly
Mechanic Field Service Trucks	5	9.8	75,000	205.48	8.56	731,250	2,003.42	83.48
Tire Handler	1	8.0	1,000	2.74	0.11	8,000	21.92	0.91
Shop Forklift, 12,000 lbs	1	8.0	1,000	2.74	0.11	8,000	21.92	0.91
Integrated Tool Carrier, 140 hp	1	16.0	3,000	8.22	0.34	48,000	131.51	5.48
Primary Crushing Mobile Crane - 400 tons	1	225.0	92	0.25	0.01	20,700	56.71	2.36
Copper Concentrate Area Front End Loader - Cat 930	1	14.4	11,680	32.00	1.33	168,192	460.80	19.20
Molybdenum Packaging Forklift, 7,000 lbs	1	5.8	3,000	8.22	0.34	17,340	47.51	1.98
Copper Cathode Forklift	1	11.0	3,000	8.22	0.34	33,000	90.41	3.77
Boom Trucks 10 tons, 45 foot boom	1	13.0	3,000	8.22	0.34	39,000	106.85	4.45
Boom Trucks 15 tons, 60 foot boom	1	16.5	3,000	8.22	0.34	49,500	135.62	5.65
Front End Loader, 6 yd^3	1	33.6	6,000	16.44	0.68	201,882	553.10	23.05
Front End Loader, 5 yd^3	1	14.4	3,500	9.59	0.40	50,269	137.72	5.74
Bob Cats, 2,400 lbs	2	1.2	7,000	19.18	0.80	8,400	23.01	0.96

Table D.2.2 Support Vehicle Total VMT and Weighted Average								
Support Vehicle Description	**Fleet Size**	**Vehicle Weight (tons)**	**VMT Traveled (total)**			**Weight * VMT Traveled (total)**		
			Annual	**Daily**	**Hourly**	**Annual**	**Daily**	**Hourly**
Fork Lift, 2,000 lbs	1	3.0	3,000	8.22	0.34	9,000	24.66	1.03
Fork Lift, 5,000 lbs	1	4.0	3,000	8.22	0.34	12,000	32.88	1.37
Fork Lift, 3,000 lbs	2	3.0	6,000	16.44	0.68	18,000	49.32	2.05
Flat Bed Trucks, 10 tons	2	13.0	6,000	16.44	0.68	77,700	212.88	8.87
Dump Truck, 10 tons	1	25.7	3,000	8.22	0.34	77,220	211.56	8.82
Mobile Hydraulic Crane, 60 tons	1	47.9	2,000	5.48	0.23	95,800	262.47	10.94
CS683 Soil Compactor / Roller	2	20.4	60,000	164.38	6.85	1,223,550	3,352.19	139.67
246C Skid Steer Loader	2	3.7	131,400	360.00	15.00	491,436	1,346.40	56.10
Off-Road Tire Handling Truck	1	54.6	7,500	20.55	0.86	409,500	1,121.92	46.75
Contractor Haul Trucks, 25 tons	2	78.5	48,000	131.51	5.48	3,768,000	10,323.29	430.14
Total:	--	–	**512,393**	**1,404.58**	**59.19**	23,085,668	63,369	2,746
Weighted Average:						**45.05**	**45.12**	**46.39**

D.3. PRIMARY CRUSHING, CONVEYING, COARSE ORE STORAGE, AND RECLAIM CONVEYING

D.3.1 Wind Erosion of the Run of Mine Stockpile (Unit ID: PC01)

Process Rate

The annual, daily, and hourly process rates for wind erosion of the run of mine stockpile are equal to the maximum area of the land containing the stockpile (26 acres) and continuous operation of the stockpile (i.e. 8,760 hours/year, 24 hours/day, 1 hour/hour).

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions due to wind erosion of the run of mine stockpile are determined using the following MRI (1978b) equation from the American Mining Congress Report, Fugitive Dust Emission Factors for the Mining Industry (FDEMI) (07/83), Section 3.7:

$$EF = 3400\,(k)\frac{\left(\frac{e}{50}\right)\left(\frac{s}{15}\right)\left(\frac{f}{25}\right)}{\left(\frac{PE}{50}\right)^{2}}\left(\frac{1}{2000}\right) \qquad (6)$$

where:

EF	=	emission factor (tons/acre-year)
k	=	particle size multiplier (1 for PM, 0.5 for PM_{10}, 0.075 for $PM_{2.5}$ from AP-42, Section 13.2.5, Industrial Wind Erosion (11/06), page 3)
e	=	surface erodibility (tons/acre-year, 38 for concentrate ore, from page 52 of FDEMI)
s	=	silt content of surface material (The silt content of the concentrate ore is uncertain. AP-42, Table 13.2.4-1 (11/06) provides the silt content of various materials. The silt content of sand in this table is 2.6%. Therefore, as a worst case scenario, a value of 2.5% was assumed for the silt content of the concentrate ore in the run of mine stockpile.)
f	=	percentage of time the wind speed exceeds 12 mph (4.77%, value calculated from hourly data collected at the meteorological station at the RCP from April 2006 through May 2009)
PE	=	Thornthwaite's Precipitation-Evaporation Index (22 for the RCP, determined from Figure 14 of FDEMI)

The universal soil loss (USL) equation also presented in Section 3.7 of the FDEMI is modified to Equation 6 for use with fugitive dust sources at mines. It is analogous to the USL equation but eliminates all factors for agricultural crops.

Control Efficiency

Besides good operating practices, other pollution control methods are not used to control emissions from the run of mine stockpile.

D.3.2 Unloading to Primary Crusher Dump Hopper from Haul Trucks and the Run of Mine Stockpile (Unit ID: PC02)

Process Rate

The annual process rate for unloading concentrate ore to the primary crusher dump hopper is based on the concentrate ore mining rate (see Appendix D1). The hourly and maximum daily process rates are based on the maximum capacity of the equipment in the primary crushing plant (6,950 tons/hour) and continuous operation (6,950 tons/hour * 24 hours/day = 166,800 tpd).

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from unloading concentrate ore to the primary crusher dump hopper are calculated using Equation 2. The mean wind speed (U, 6.21 mph) and material moisture content (M, 4%) are equal to the values used to calculate the emission factors in Sections D.2.5 and D.2.3, respectively. Explanations for how these values are determined are presented in Sections D.2.5 and D.2.3.

Control Efficiency

Emissions of particulate matter resulting from unloading concentrate ore to the primary crusher will be controlled by water sprays. Based on the AP-42, Section 11.19.1, spray systems at transfer points and material handling operations are estimated to reduce emissions 70 to 95 percent. For unprotected transfer points, such as loading the concentrate ore to the dump hopper, the RCP estimates a mean control efficiency value of 82.5% will be able to be achieved with the use of water sprays.

D.3.3 Primary Crusher (Unit ID: PC03)

Process Rate

The annual process rate for the primary crusher is equal to the process rate for unloading to the primary crusher dump hopper (see Section D.3.2). The hourly and maximum daily process rates are based on the maximum capacity of the equipment in the primary crushing plant (6,950 tons/hour) and continuous operation (6,950 tons/hour * 24 hours/day = 166,800 tpd).

Emission Factor

Uncontrolled PM and PM_{10} emissions from primary crushing are calculated using the emission factors of 0.02 lb/ton and 0.009 lb/ton, respectively, from AP-42, Table 11.24-2 (08/82) for primary crushing of high moisture ore. The moisture content of the concentrate ore at the RCP is estimated to be 4%, which according to AP-42, Section 11.24.2 classifies the ore as high moisture. Uncontrolled $PM_{2.5}$ emissions are estimated to be 15% of PM emissions based on the information presented for Category 3, material handling and processing of unprocessed ore, in AP-42, Appendix B.2 (08/04).

Control Efficiency

Emissions of particulate matter resulting from primary crushing are controlled indirectly by the crushing area scrubber system. The primary crusher is designed in a conical shape such that crushing and particulate matter generation occurs near the bottom of the crusher and is emitted through the exit of the crusher. This point is controlled by the crushing area scrubber system (see Section D.3.4). The scrubber system has a 100% capture efficiency and picks up and delivers the particulate matter entrained air to the scrubber for processing. Emission calculations for the scrubber system are presented in Section D.10.

D.3.4 Material Transfers from the Primary Crusher to the Coarse Ore Stockpile and from the Coarse Ore Stockpile to the SAG Mill Feed Conveyor (Unit IDs: PC04 through PC08 and PC10 through PC12)

Process Rate

The annual process rate for the material transfers from the primary crusher to the coarse ore stockpile and from the coarse ore stockpile to the SAG mill feed conveyor is equal to the annual process rate for the primary crusher (see Section D.3.3). The hourly and maximum daily process rates are based on the maximum capacity of the equipment in the primary crushing plant (6,950 tons/hour) and continuous operation (6,950 tons/hour * 24 hours/day = 166,800 tpd).

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the material transfers from the primary crusher to the coarse ore stockpile and from the coarse ore stockpile to the SAG mill feed conveyor are calculated using Equation 2. The material moisture content (M, 4%) is equal to the value used to calculate the emission factor in Section D.2.3. The explanation for how this value is determined is presented in Section D.2.3.

The mean wind speed value (U) used in Equation 2 is determined from the anticipated speed of the wind at the material transfer points from the primary crusher to the coarse ore stockpile and from the coarse ore stockpile to the SAG mill feed conveyor. The wind speeds at the transfer points are considered to be 1.3 mph. A 1.3 mph wind speed, the lowest wind speed input for Equation 2 to remain valid, is used for the material transfer points where the point of transfer is constructed to be fully protected and shielded from the wind (e.g. chutes, covers, enclosures, etc.). At the material transfer points from the primary crusher to the coarse ore stockpile and from the coarse ore stockpile to the SAG mill feed conveyor, chutes and covers are used to facilitate material transfer and minimize the speed of the wind at the material transfer points.

Control Efficiency

Emissions of particulate matter resulting from the material transfers from the primary crusher to the coarse ore stockpile and from the coarse ore stockpile to the SAG mill feed conveyor are controlled by either being in an enclosed area, underground, or collected by scrubber systems. When process material is transferred to an enclosed piece of equipment or the equipment is located underground, particulate emissions are controlled due to the emissions not being able to escape and a 100% control efficiency is assumed. The scrubber systems used at the material transfer points have a 100% capture efficiency and pick up and deliver the particulate matter entrained air to the scrubbers for processing. The particulate matter control method used at each material transfer point from the primary crusher to the coarse ore stockpile and from the coarse ore stockpile to the SAG mill feed conveyor is presented in Table D.3.1. Emission calculations for the scrubber systems are presented in Section D.10.

Several of the material transfer points from the primary crusher to the coarse ore stockpile and from the coarse ore stockpile to the SAG mill feed conveyor also have water spray control for fugitive particulate emissions not captured by the scrubbers (see Figure B.2 in Appendix B). Furthermore, the material transfer point from the stockpile feed conveyor to the stockpile tripper conveyor is located inside the stockpile building in addition to being controlled by the stockpile area scrubber. However, emission calculations are based on 100% capture efficiency of the scrubber systems and do not incorporate the control efficiency of the water sprays or the enclosure within a building.

Table D.3.1 Wind Speeds and Control Methods for the Material Transfers from the Primary Crusher to the Coarse Ore Stockpile and from the Coarse Ore Stockpile to the SAG Mill Feed Conveyor

Unit ID	Unit Description	Wind Speed	Control Method
PC04	Primary Crusher (PCr) to Crusher Discharge Hopper (H-CDs)	1.3 mph	Enclosed
PC05	Crusher Discharge Hopper (H-CDs) to Crusher Discharge Feeder (F-CD)	1.3 mph	Crushing Area Scrubber (PC-CAS) [a]
PC06	Crusher Discharge Feeder (F-CD) to Stockpile Feed Conveyor (CV-SF)	1.3 mph	Crushing Area Scrubber (PC-CAS) [a]
PC07	Stockpile Feed Conveyor (CV-SF) to Stockpile Tripper Conveyor (CV-ST)	1.3 mph	Stockpile Area Scrubber (PC-SAS) [a,b]
PC08	Stockpile Tripper Conveyor (CV-ST) to Covered Coarse Ore Stockpile	1.3 mph	Stockpile Area Scrubber (PC-SAS) [b]
PC10	Coarse Ore Stockpile to Reclaim Feeders (F-R1/R4)	1.3 mph	Underground
PC11	Reclaim Feeders (F-R1/R4) to Reclaim Conveyor (CV-R)	1.3 mph	Reclaim Tunnel Scrubber (PC-RTS)
PC12	Reclaim Conveyor (CV-R) to SAG Mill Feed Conveyor (CV-SMF)	1.3 mph	Pebble Crusher Area Scrubber (PC-PCAS) [a]

[a] These emission units have water spray control for fugitive particulate emissions not captured by the scrubbers. Emission calculations in this permit application are based on 100% capture efficiency of the scrubbers.

[b] These emission units are located within the coarse ore stockpile building in addition to being controlled by the scrubbers. Emission calculations in this permit application are based on 100% capture efficiency of the scrubbers.

The stockpile area scrubber system controls particulate emissions within the stockpile building. Since the material transfer point from the stockpile tripper conveyor to the coarse ore stockpile occurs within the stockpile building, the particulate matter emissions resulting from the transfer are indirectly controlled by the stockpile area scrubber system.

D.3.5 Wind Erosion of the Coarse Ore Stockpile (Unit ID: PC09)

Process Rate

The annual, daily, and hourly process rates for wind erosion of the coarse ore stockpile are equal to the surface area of the stockpile building (5 acres) and continuous operation of the stockpile (i.e. 8,760 hours/year, 24 hours/day, 1 hour/hour).

Emission Factor

Due to the coarse ore stockpile being enclosed within the stockpile building, the PM, PM_{10}, and $PM_{2.5}$ emissions from wind erosion of the coarse ore stockpile are negligible. Therefore, a 0 ton/acre-year emission factor is assumed for PM, PM_{10}, and $PM_{2.5}$.

Control Efficiency

Particulate matter emissions in the stockpile building are controlled by the stockpile area scrubber system. The scrubber system picks up and delivers the particulate matter entrained air from the stockpile building to the scrubber for processing. Emission calculations for the scrubber system are presented in Section D.10.

D.3.6 Material Transfers from Pebble Conveyor No. 3 to the SAG Mill Feed Conveyor and from the SAG Mill Feed Conveyor to the SAG Mill (Unit IDs: PC13 and PC14)

Process Rate

The annual process rate for the material transfer from pebble conveyor No. 3 to the SAG mill feed conveyor is equal to the amount of material processed by the pebble crusher (see Section D.4.3). The hourly and maximum daily process rates are based on the maximum hourly amount of ore processed by the pebble crusher (1,771.15 tons/hour) and continuous operation (1,771.15 tons/hour * 24 hours/day = 42,508 tpd).

The annual, maximum daily, and hourly process rate for the material transfer from the SAG mill feed conveyor to the SAG mill is equal to the sum of the process rates of the three conveyors feeing the SAG mill feed conveyor, the reclaim conveyor (see Section D.3.4), Pebble Crusher No. 3 (described above), and Bulk Pebble Lime Silo Screw Conveyor (see Section D.9.2).

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from pebble conveyor No. 3 to the SAG mill feed conveyor and from the SAG mill feed conveyor to the SAG mill are calculated using Equation 2. The material moisture content (M, 4%) is equal to the value used to calculate the emission factor in Section D.2.3. The mean wind speed (U, 1.3 mph for protected transfer points) is equal to the value used to calculate the emission factor in Section D.3.4. The explanation for how the material moisture content and mean wind speed are determined is presented in Sections D.2.3 and D.3.4, respectively.

Control Efficiency

Emissions of particulate matter resulting from the material transfers from pebble conveyor No. 3 to the SAG mill feed conveyor and from the SAG mill feed conveyor to the SAG mill are controlled by the pebble crusher area scrubber system and the addition of process water, respectively. The scrubber system has a 100% capture efficiency and picks up and delivers the particulate matter entrained air to the scrubber for processing. Emission calculations for the scrubber system are presented in Section D.10. Additionally, when process material is transferred to a piece of equipment along with the addition of process water, particulate emissions are controlled due to the moisture that has been added and a 100% control efficiency is assumed.

D.4. MILLING

D.4.1 SAG Mill (Unit ID: M01)

Process Rate

The annual, daily, and hourly process rates for the SAG mill are equal to the process rates of the material transfers to the SAG mill (see Section D.3.6).

Emission Factor

Uncontrolled PM and PM_{10} emissions from the SAG mill are calculated using the emission factors of 0.05 lb/ton and 0.02 lb/ton, respectively, from AP-42, Table 11.24-2 (08/82) for secondary crushing of high moisture ore. The moisture content of the concentrate ore at the RCP is estimated to be 4%, which according to AP-42, Section 11.24.2 classifies the ore as high moisture. Additionally, the SAG mill is a wet process, which increases the moisture content of the ore. Uncontrolled $PM_{2.5}$ emissions are estimated to be 30% of PM emissions based on the information presented for Category 4, material handling and processing of processed ore, in AP-42, Appendix B.2 (08/04).

Control Efficiency

The SAG mill is a wet process where added moisture causes fine particles in the crushed ore to agglomerate such that no potential particulate emissions are formed and a 100% control efficiency is assumed.

D.4.2 Trommel Screen and Pebble Wash Screen (Unit IDs: M03 and M06)

Process Rate

The annual, daily, and hourly process rates for the trommel screen are equal to the process rates of the material transfer to the SAG mill (see Section D.3.6).

The pebble wash screen processes oversize material from the trommel screen. Therefore, the annual process rate for the pebble wash screen is based on the process rates of the trommel screen (see above) and the estimated fraction of oversize material from the trommel screen (21.2%). The hourly and maximum daily process rates are based on the maximum hourly amount of ore processed by the pebble wash screen (1,851.10 tons/hour) and continuous operation (1,851.10 tons/hour * 24 hours/day = 44,426 tpd).

Emission Factor

Uncontrolled PM and PM_{10} emissions from the trommel and pebble wash screens are calculated using the emission factors of 0.025 lb/ton and 0.0087 lb/ton, respectively, from AP-42, Table 11.19.2-2 (08/04) for screening. Uncontrolled $PM_{2.5}$ emissions are estimated to be 6.8% of PM_{10} emissions based on the ratio of $PM_{2.5}$ to PM_{10} controlled emissions for screening in AP-42, Table 11.19.2-2 (08/04). This is a higher than actual value because pollution control devices have a lower efficiency for smaller size particulates.

Control Efficiency

Both the trommel and pebble wash screens are wet processes. Process water sprays at the screens wash away and control all fine particle matter such that no potential particulate emissions are formed and a 100% control efficiency is assumed.

D.4.3 Pebble Crusher (Unit ID: M11)

Process Rate

The pebble crusher processes oversize material from the pebble wash screen. Therefore, the annual, maximum daily, and hourly process rates for the pebble crusher are based on the process rates of the pebble wash screen (see Section D.4.2) and the estimated fraction of oversize material from the pebble wash screen (95.5%). The hourly and maximum daily process rates are based on the maximum hourly amount of ore processed by the pebble crusher (1,771.15 tons/hour) and continuous operation (1,771.15 tons/hour * 24 hours/day = 42,508 tpd).

Emission Factor

Uncontrolled PM and PM_{10} emissions from the pebble crusher are calculated using the emission factors of 0.06 lb/ton and 0.02 lb/ton, respectively, from AP-42, Table 11.24-2 (08/82) for tertiary crushing of high moisture ore. The moisture content of the concentrate ore at the RCP is estimated to be 4%, which according to AP-42, Section 11.24.2 classifies the ore as high moisture. Additionally, the concentrate ore processed by the pebble crusher is previously processed by the SAG mill, a wet process, which increases the moisture content of the ore.

Uncontrolled $PM_{2.5}$ emissions are estimated to be 18.5% of PM_{10} emissions based on the ratio of $PM_{2.5}$ to PM_{10} controlled emissions for tertiary crushing in AP-42, Table 11.19.2-2 (08/04). This is a higher than actual value because pollution control devices have a lower efficiency for smaller size particulates.

Control Efficiency

Emissions of particulate matter resulting from pebble crushing are indirectly controlled by the pebble crusher area scrubber system. The pebble crusher is designed such that crushing and particulate matter generation that occurs within the crusher will be emitted through either the top entrance or bottom exit of the crusher. The bottom exit is controlled by the pebble crusher area scrubber system while the top entrance is enclosed by the pebble crusher feeder (the entrance to the pebble crusher feeder is controlled by the pebble crusher area scrubber). The scrubber system has a 100% capture efficiency and picks up and delivers the particulate matter entrained air to the scrubber for processing. Emission calculations for the scrubber system are presented in Section D.10.

D.4.4 Material Transfers from the SAG Mill to the Trommel Screen, from the Trommel Screen to the Pebble Wash Screen, from the Pebble Wash Screen to the Pebble Crusher, and from the Pebble Crusher to Pebble Conveyor No. 3 (Unit IDs: M02, M04 through M05, M07 through M10, and M12)

Process Rate

The annual, daily, and hourly process rates for the material transfer from the SAG mill to the trommel screen are equal to the process rates of the material transfer to the SAG mill (see Section D.3.6). The annual, daily, and hourly process rates for the material transfer from the trommel screen to the pebble wash screen are equal to the process rates of the pebble wash screen (see Section D.4.2). The annual, daily, and hourly process rates for the material transfers from the pebble wash screen to the pebble crusher and from the pebble crusher to pebble conveyor No. 3 are equal to the process rates of the pebble crusher (see Section D.4.3).

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the various material transfers during milling are calculated using Equation 2. Although the concentrate ore conveyed is previously processed by the SAG mill, a wet process that increases the moisture content of the ore, the material moisture content (M, 4%) is assumed to equal to the value used to calculate the emission factor in Section D.2.3 as a worst case estimate. The mean wind speed (U, 1.3 mph for protected transfer points) is equal to the value used to calculate the emission factor in Section D.3.4. The explanation for how the material moisture content and mean wind speed are determined is presented in Sections D.2.3 and D.3.4, respectively.

Control Efficiency

Emissions of particulate matter resulting from the material transfers during the milling process are controlled by being in an enclosed system, including only clean, wet ore, or collected by the pebble crusher area scrubber system. When process material is transferred to an enclosed piece of equipment, particulate emissions are controlled due to the emissions not being able to escape and a 100% control efficiency is assumed. The wet processes before the material transfer points during milling contain sufficient amount of moisture such that some fine particles agglomerate and all others are washed away. Therefore, at the material transfer points following the wet processes, the ore is considered cleaned and wet and no potential particulate emissions are formed. However, pebble conveyor No. 2 is a long transfer conveyor and the ore has the potential to dry before being discharged into the SAG oversize surge bin. Therefore, the material transfer points after pebble conveyor No. 2 have the potential to emit particulate emissions and are controlled by the pebble crusher area scrubber system. The scrubber system used at the material transfer points has a 100% capture efficiency and picks up and delivers the particulate matter entrained air to the scrubber for processing. Emission calculations for the scrubber system are presented in Section D.10. The particulate matter control method used at each material transfer point during milling is presented in Table D.4.1.

Table D.4.1 Wind Speeds and Control Methods for the Material Transfers from the SAG Mill to the Trommel Screen, from the Trommel Screen to the Pebble Wash Screen, from the Pebble Wash Screen to the Pebble Crusher, and from the Pebble Crusher to Pebble Conveyor No. 3

Unit ID	Unit Description	Wind Speed	Control Method
M02	SAG Mill (M-SAG) to Trommel Screen (Sn-T)	1.3 mph	Enclosed
M04	Trommel Screen (Sn-T) to Pebble Conveyor No. 1 (CV-Pb1)	1.3 mph	Clean, Wet Ore
M05	Pebble Conveyor No. 1 (CV-Pb1) to Pebble Wash Screen (Sn-PbW)	1.3 mph	Clean, Wet Ore
M07	Pebble Wash Screen (Sn-PbW) to Pebble Conveyor No. 2	1.3 mph	Clean, Wet Ore
M08	Pebble Conveyor No. 2 (CV-Pb2) to SAG Oversize Surge Bin (B-SAGOS)	1.3 mph	Pebble Crusher Area Scrubber (PC-PCAS)
M09	SAG Oversize Surge Bin (B-SAGOS) to Pebble Crusher Feeder (F-PbC)	1.3 mph	Pebble Crusher Area Scrubber (PC-PCAS)
M10	Pebble Crusher Feeder (F-PbC) to Pebble Crusher (PbC)	1.3 mph	Enclosed
M12	Pebble Crusher (PbC) to Pebble Conveyor No. 3 (CV-Pb3)	1.3 mph	Pebble Crusher Area Scrubber (PC-PCAS)

D.5. COPPER CONCENTRATE DEWATERING AND STACKING

D.5.1 Material Transfers from Copper Concentrate Filters to Copper Concentrate Loadout Stockpile and from the Copper Concentrate Loadout Stockpile to Shipment Trucks via Front End Loader (Unit IDs: CCD01 through CCD02 and CCD04)

Process Rate

The annual process rate for the material transfers from the copper concentrate filters to the copper concentrate loadout stockpile and from the copper concentrate loadout stockpile to the copper concentrate shipment trucks via front end loaders is based on the annual amount of copper concentrate produced by the concentrate ore processing equipment according to the concentrate ore mining rate. When the concentrate ore mining rate is at a maximum (in Year 5), 435,000 tons/year of copper concentrate can be produced. The hourly and maximum daily process rates are based on the maximum hourly quantity of copper concentrate produced (138 tons/hour) and continuous operation (138 tons/hour * 24 hours/day = 3,312 tpd).

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the material transfers from the copper concentrate filters to the copper concentrate loadout stockpile and from the copper concentrate loadout stockpile to the copper concentrate shipment trucks are calculated using Equation 2. The filters are designed to remove 90% of the water from the copper concentrate such that a 10% material moisture content is used in Equation 2. The mean wind speed (U, 1.3 mph for protected transfer points) is equal to the value used to calculate the emission factors in Section D.3.4. The explanation for how the mean wind speed is determined is presented in Section D.3.4. The mean wind speed value of 1.3 mph applies for the material transfers from the copper concentrate filters to the copper concentrate loadout stockpile and from the copper concentrate loadout stockpile to the copper concentrate shipment trucks due to the transfer points either being enclosed or located inside a building.

Control Efficiency

Emissions of particulate matter resulting from the material transfers from the copper concentrate filters to the copper concentrate loadout stockpile and from the copper concentrate loadout stockpile to the copper concentrate shipment trucks are controlled by either being in an enclosed system or indirectly collected by the copper concentrate scrubber systems. When process material is transferred to an enclosed piece of equipment, particulate emissions are controlled due to the emissions not being able to escape and a 100% control efficiency is assumed. The scrubber systems used at the material transfer points have a 100% capture efficiency and pick up and deliver the particulate matter entrained air to the scrubbers for processing. Emission calculations for the scrubber systems are presented in Section D.10. The particulate matter control method used at each material transfer point from the copper concentrate filters to the copper concentrate loadout stockpile and from the copper concentrate loadout stockpile to the copper concentrate shipment trucks is presented in Table D.5.1.

Table D.5.1 Wind Speeds and Control Methods for the Material Transfers from the Copper Concentrate Filters to the Copper Concentrate Loadout Stockpile and from the Copper Concentrate Loadout Stockpile to the Copper Concentrate Shipment Trucks

Unit ID	Unit Description	Wind Speed	Control Method
CCD01	Copper Concentrate Filters (Ft-CC1/CC4) to Copper Concentrate Conveyor (CV-CC)	1.3 mph	Enclosed
CCD02	Copper Concentrate Conveyor (CV-CC) to Copper Concentrate Loadout Stockpile	1.3 mph	Copper Concentrate Scrubbers (PC-CCS1/PC-CCS2)
CCD04	Copper Concentrate Loadout Stockpile to Shipment Trucks via Front End Loaders	1.3 mph	Copper Concentrate Scrubbers (PC-CCS1/PC-CCS2)

The copper concentrate scrubber systems control particulate emissions within the copper concentrate loadout building. Since the material transfer points from the copper concentrate conveyor to the copper concentrate loadout stockpile and from the copper concentrate loadout stockpile to the copper concentrate shipment trucks occur within the copper concentrate loadout building, the particulate matter emissions resulting from the transfer are indirectly controlled by the copper concentrate scrubber systems.

D.5.2 Copper Concentrate Loadout Stockpile (Unit ID: CCD03)

Process Rate

The annual, daily, and hourly process rates for wind erosion of the copper concentrate loadout stockpile are equal to the area of the copper concentrate loadout building (1.17 acres) and continuous operation of the stockpile (i.e. 8,760 hours/year, 24 hours/day, 1 hour/hour).

Emission Factor

Due to the copper concentrate loadout stockpile being enclosed within the copper concentrate loadout building, the PM, PM_{10}, and $PM_{2.5}$ emissions from wind erosion of the copper concentrate loadout stockpile are negligible. Therefore, a 0 ton/acre-year emission factor is assumed for PM, PM_{10}, and $PM_{2.5}$.

Control Efficiency

Particulate matter emissions in the copper concentrate loadout building are controlled by the copper concentrate scrubber systems. The scrubber systems pick up and deliver the particulate matter entrained air from the copper concentrate loadout building to the scrubbers for processing.

D.6. MOLYBDENUM DEWATERING AND PACKAGING

D.6.1 Material Transfers from the Molybdenum Concentrate Filter to the Molybdenum Dryer and from the Molybdenum Dryer to the Molybdenum Concentrate Packaging and Weigh System (Unit IDs: MD01 and MD03 through MD06)

Process Rate

The annual process rate for the material transfers from the molybdenum concentrate plate and frame filter to the molybdenum dryer and from the molybdenum dryer to the molybdenum concentrate packaging and weigh system is based on the annual amount of molybdenum concentrate produced by the concentrate ore processing equipment, according to the concentrate ore mining rate. When the concentrate ore mining rate is at a maximum (in Year 5), 6,000 tons/year of molybdenum concentrate can be produced. The hourly and maximum daily process rates are based on the maximum hourly quantity of molybdenum concentrate produced (1.90 tons/hour) and continuous operation (1.90 tons/hour * 24 hours/day = 45.6 tpd).

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the material transfers from the molybdenum concentrate filter to the molybdenum dryer and from the molybdenum dryer to the molybdenum concentrate packaging and weigh system are calculated using Equation 2. The plate and frame filter is designed to remove 85% of the water from the molybdenum concentrate such that a 15% material moisture content is used in Equation 2 for the material transfer before the dryer. The dryer removes an additional 3% to 5% of moisture and a material moisture content of 10% is used in Equation 2 for material transfers after the dryer as a worst case estimate.

The mean wind speeds (U, 1.3 mph for protected transfer points and 6.21 mph for unprotected transfer points) are equal to the value used to calculate the emission factors in Sections D.3.4 and D.2.5, respectively. The explanation for how the mean wind speeds are determined is presented in Sections D.3.4 and D.2.5.

Control Efficiency

Emissions of particulate matter resulting from the material transfers from the molybdenum concentrate filter to the molybdenum dryer and from the molybdenum dryer to the molybdenum concentrate packaging and weigh system are controlled by good operating practices, enclosures, or the molybdenum dust collection system. When process material is transferred to an enclosed piece of equipment, particulate emissions are controlled due to the emissions not being able to escape and a 100% control efficiency is assumed. The dust collection system has a 100% capture efficiency and picks up and delivers the particulate matter entrained air to the dust collector for processing. Emission calculations for the molybdenum dust collection system are presented in Section D.10. The wind speed and particulate matter control method used at each material transfer point from the molybdenum concentrate filter to the molybdenum concentrate packaging and weigh system is presented in Table D.6.1.

Table D.6.1 Material Moisture Contents, Wind Speeds, and Control Methods for the Material Transfers from the Molybdenum Concentrate Filter to the Molybdenum Dryer and from the Molybdenum Dryer to the Molybdenum Concentrate Supersacks or Drums

Unit ID	Unit Description	Material Moisture Content	Wind Speed	Control Method
MD01	Molybdenum Concentrate Filter (Ft-MC) to Molybdenum Concentrate Dryer (D-MC)	15%	1.3 mph	Enclosed
MD03	Molybdenum Concentrate Dryer (D-MC) to Molybdenum Concentrate Bin (B-MC)	6%	1.3 mph	Molybdenum Dust Collector (PC-MDC)
MD04	Molybdenum Concentrate Bin (B-MC) to Molybdenum Concentrate Hopper (H-MC)	6%	6.21 mph	Good Operating Practices
MD05	Molybdenum Concentrate Hopper (H-MC) to Molybdenum Concentrate Conveyor (CV-MC)	6%	1.3 mph	Enclosed
MD06	Molybdenum Concentrate Conveyor (CV-MC) to Molybdenum Concentrate Packaging and Weigh System (MPS)	6%	6.21 mph	Molybdenum Dust Collector (PC-MDC)

D.6.2 Molybdenum Drying (Unit ID: MD02)

Process Rate

The annual, maximum daily, and hourly process rates for the molybdenum dryer are equal to the molybdenum concentrate material transfer process rates (see Section D.6.1).

Emission Factor

Uncontrolled PM and PM_{10} emissions from the molybdenum dryer are calculated using the emission factors of 19.7 lb/ton and 12.0 lb/ton, respectively, from AP-42, Table 11.24-2 (08/82) for drying of all high moisture minerals except titanium/zirconium sands. The moisture content of the molybdenum concentrate is 15% prior to drying, which according to AP-42, Section 11.24.2 classifies the concentrate as high moisture. Uncontrolled $PM_{2.5}$ emissions are estimated to be 30% of PM emissions based on the information presented for Category 4, material handling and processing of processed ore, in AP-42, Appendix B.2 (08/04). Since the molybdenum dryer is heated using an electric hot oil heater, there are no combustion emissions from the molybdenum drying operations.

Control Efficiency

Emissions of particulate matter resulting from the molybdenum drying are collected and processed by the molybdenum scrubber system and electrostatic precipitator designed in series. The scrubber system has a 100% capture efficiency and picks up and delivers the particulate matter entrained air to the scrubber for processing. After processing by the scrubber system, the exhaust air from the scrubber is transferred to the electrostatic precipitator for further particulate matter removal before being exhaust to the atmosphere. Emission calculations for the molybdenum scrubber and electrostatic precipitator systems in series are presented in Section D.10.

D.7. TAILINGS DEWATERING AND PLACEMENT

D.7.1 Material Transfers from Tailings Filters to Tailings Storage (Unit IDs: TDS01 through TDS09)

Process Rate

The annual process rate for the material transfers from the from the tailings plate and frame filters to the tailings storage is based on the annual amount of tailings produced by the concentrate ore processing equipment, according to the concentrate ore mining rate. When the concentrate ore mining rate is at a maximum (in Year 5), 33,812,400 tons/year of tailings can be produced. The hourly and maximum daily process rates are based on the maximum hourly quantity of tailings produced (10,722 tons/hour) and continuous operation (10,722 tons/hour * 24 hours/day = 257,328 tpd).

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the material transfers from the tailings plate and frame filters to the tailings storage are calculated using Equation 2. The plate and frame filters remove 82-85% of the water from the tailings. The material moisture content value used in Equation 2 is determined to be 15% as a worst case estimate.

The mean wind speeds (U, 1.3 mph for protected (covered or enclosed) transfer points and 6.21 mph for unprotected transfer points) are equal to the value used to calculate the emission factors in Sections D.3.4 and D.2.5, respectively. The explanation for how the mean wind speeds are determined is presented in Sections D.3.4 and D.2.5, respectively. The fixed tailings conveyors and the relocatable conveyors in the tailings dewatering and placement system have covers on the discharge points and therefore a reduced wind speed of 1.3 mph can be used at the material transfer point.

There are two tailings conveying and placement systems at the RCP (see Figure B.11 in Appendix B). The primary system (System #1) has one more conveyor than the alternate system (System #2). Therefore, particulate emissions from the material transfers from the tailings plate and frame filters to the tailings storage assume all tailings are processed through System #1 as a worst case emission estimate.

Control Efficiency

Emissions of particulate matter resulting from the material transfers from the tailings plate and frame filters to the tailings storage are controlled by good operating practices and enclosures. When process material is transferred to an enclosed piece of equipment, particulate emissions are controlled due to the emissions not being able to escape and a 100% control efficiency is assumed. The wind speed and particulate matter control method used at each material transfer point from the tailings filters to the tailings storage is presented in Table D.7.1.

Table D.7.1 Wind Speeds and Control Methods for the Material Transfers from the Tailings Filters to the Tailings Storage

Unit ID	Unit Description	Wind Speed	Control Method
TDS01	Tailings Filters (Ft-T1/T14) to Tailings Belt Feeders (F-T1/T14)	1.3 mph	Enclosed
TDS02	Tailings Belt Feeders (F-T1/T14) to Fixed Tailings Conveyor No. 1 (CV-F1)	1.3 mph	Enclosed
TDS03	Fixed Tailings Conveyor No. 1 (CV-F1) to Fixed Tailings Conveyor No. 2 (CV-F2)	1.3 mph	Enclosed
TDS04	Fixed Tailings Conveyor No. 2 (CV-F2) to Fixed Tailings Conveyor No. 3 (CV-F3)	1.3 mph	Good Operating Practices
TDS05	Fixed Tailings Conveyor No. 3 (CV-F3) to Relocatable Conveyor (CV-R1)	1.3 mph	Good Operating Practices
TDS06	Relocatable Conveyors (CV-R1) to Shiftable Conveyor (CV-S1)	1.3 mph	Good Operating Practices
TDS07	Shiftable Conveyor (CV-S1) to Belt Wagon Conveyor (CV-BW1)	6.21 mph	Good Operating Practices
TDS08	Belt Wagon Conveyor (CV-BW1) to Spreader Crawler Mounted Conveyor (CV-SP1)	6.21 mph	Good Operating Practices
TDS09	Spreader Crawler Mounted Conveyor (CV-SP1) to Tailings Storage	6.21 mph	Good Operating Practices

D.7.2 Tailings Storage (Unit ID: TDS10)

Process Rate

The annual, daily, and hourly process rates for wind erosion of the tailings storage are equal to the maximum area of the land containing the tailings (1,500 acres) and continuous operation of the storage area (i.e. 8,760 hours/year, 24 hours/day, 1 hour/hour).

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the tailings storage are calculated using the methodology and equations from AP-42, Section 13.2.5 (11/06), including:

$$EF = (k)\left(\sum_{i=1}^{N} P_i\right)\left(\frac{1\,lb}{453.59\,g}\right)\left(\frac{4,4046.86\,m^2}{1\,acre}\right) \quad (7a)$$

$$P = (58)(u^* - u_t^*)^2 + (25)(u^* - u_t^*) \qquad \text{for } u^* > u_t^* \quad (7b)$$

$$P = 0 \qquad \text{for } u^* \leq u_t^* \quad (7c)$$

$$u^* = (0.053)(u_{10}^+) \quad (7d)$$

where:

EF	=	emission factor (lb/acre-year), the PM emission factor is assumed to be equal to the emission factor for PM_{30}
k	=	particle size multiplier (1 for PM, 0.5 for PM_{10}, 0.075 for $PM_{2.5}$)
P	=	erosion potential function
N	=	number of disturbances (1, the tailings storage area will only be disturbed when the tailings are added)
u^*	=	friction velocity (m/s)
u_t^*	=	threshold friction velocity (0.43 m/s, the smallest value from Table 13.2.5-1, assumed to approximate the tailings)
u_{10}^+	=	fastest mile for the time period between disturbances (10.70 m/s, the fastest mile recorded from hourly data collected at the meteorological station at the RCP from April 2006 through May 2009)

Control Efficiency

Emissions of particulate matter resulting from wind erosion of the tailings storage are controlled by constructing the tailings storage area using waste rock material. The waste rock breaks up the air flow and reduces exposure of the tailings storage area to windy conditions.

D.8. FUEL BURNING EQUIPMENT

D.8.1 Diesel Electrowinning Hot Water Generator (Unit ID: FB01)

Process Rate

The annual, daily, and hourly process rates for the diesel electrowinning hot water generator are based on the hot water generator heat input rate (6.0 MMBtu/hour) and continuous operation (8,760 hours/year, 24 hours/day, and 1 hour/hour).

Emission Factor

Uncontrolled filterable PM, condensable PM, CO, NO_x, SO_2, VOC, and HAP emissions resulting from the diesel electrowinning hot water generator are calculated using emission factors from AP-42, Tables 1.3-1, 1.3-2, 1.3-3, 1.3-8, 1.3-10, and 1.3-12 (09/98) for either distillate oil or No. 2 fuel oil fired boilers rated less than 100 MMBtu/hr (industrial boilers).

The total PM emission factor is calculated by summing the filterable and condensable emission factors. The uncontrolled PM_{10} and $PM_{2.5}$ emission factors are calculated using the particle size distribution data in AP-42 Table 1.3-6 (10/96) for uncontrolled industrial boilers firing distillate oil and applying it to the total PM emission factor.

The SO_2 emission factor includes an input for the sulfur content of the diesel fuel used in the electrowinning hot water generator. The electrowinning hot water generator operates on ultra low sulfur diesel fuel with a sulfur content of 0.0015%. The VOC emission factor is assumed to be equal to the non-methane total organic compound (TOC) emission factor. The formaldehyde emission factor is assumed to be equal to the high end value of the formaldehyde range as a worst case scenario.

The emission factors for the electrowinning hot water generator and the corresponding AP-42 reference tables are presented in Table D.8.1. A diesel heating value of 137,000 Btu/gallon (AP-42, Appendix A, page A-5 (09/85)) is used in the calculation of emissions from the electrowinning hot water generator.

Table D.8.1 Emission Factors for Diesel Electrowinning Hot Water Generator

Regulated Pollutant	Emission Factor	Units	AP-42 Table
PM	3.30	$lb/10^3$ gallons	1.3-1, 1.3-2
PM_{10}	1.65	$lb/10^3$ gallons	1.3-1, 1.3-2, 1.3-6
$PM_{2.5}$	0.40	$lb/10^3$ gallons	1.3-1, 1.3-2, 1.3-6
CO	5	$lb/10^3$ gallons	1.3-1
NO_x	20	$lb/10^3$ gallons	1.3-1
SO_2	0.21	$lb/10^3$ gallons	1.3-1
VOC	0.2	$lb/10^3$ gallons	1.3-3
Total HAPs	500.59	$lb/10^{12}$ Btu	1.3-8 and 1.3-10

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented during the use of the diesel electrowinning hot water generator.

D.8.2 *Thickener Area Emergency Generator, PLS Pond Area Emergency Generator, Main Substation Emergency Generator, and Administration Building Emergency Generator (Unit IDs: FB02 through FB05)*

<u>Process Rate</u>

The annual, daily, and hourly process rates for the diesel fueled emergency generators are based on the power ratings of the generators and the hours of operation. The thickener area emergency generator and PLS pond area emergency generator have power ratings of 1,000 kW. The main substation emergency generator and the administration building emergency generator have power ratings of 750 kW. All emergency generators will only be used in emergency power situations, estimated at 500 hours/year. However, the emergency generators are capable of operating 24 hours/day and 1 hour/hour.

<u>Emission Factor</u>

Uncontrolled PM, PM_{10}, $PM_{2.5}$, CO, NO_x, and VOC emissions from the emergency generators are calculated using the exhaust emission standards for nonroad engines from the new source performance standards (NSPS), 40 CFR 89, Section 112. The emission standards for the emergency generators with engines rated greater than 560 kW and manufactured after 2006 (Tier 2) are presented in Table D.8.2. PM_{10} and $PM_{2.5}$ emissions from internal combustion engines are not listed as emission standards and are assumed to be equal to PM emissions. The NO_x and VOC emission standards are combined in the NSPS as a single emission standard. Based on EPA documentation (*Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition*), NO_x and VOC emissions for engines greater than 560 kW are assumed to be equal to 93.75% and 6.25%, respectively, of the combined NO_x and VOC emission standard.

Uncontrolled SO_2 emissions are calculated assuming all the sulfur in the diesel fuel is converted to SO_2 emissions and the sulfur content of the diesel fuel is 0.0015%. This leads to an uncontrolled SO_2 emission factor of 0.00003 pound SO_2 per pound of diesel fuel (or 0.0066 grams of SO_2 per kW-hr). Uncontrolled HAP emissions are calculated using the emission factors from AP-42, Tables 3.4-3 and 3.4-4 (10/96) for large (> 600 hp) stationary, diesel engines.

A diesel heating value of 19,300 Btu/pound of diesel fuel and an average brake-specific fuel consumption value of 7,000 Btu/hp-hr were used to calculate the HAP emissions and the SO_2 emission factor in terms of g/kW-hr.

Table D.8.2 Emission Factors for Diesel Internal Combustion Engines (> 560 kW, Tier 2)		
Regulated Pollutant	Emission Factor	Units
PM	0.20	g/kW-hr
PM_{10}	0.20	g/kW-hr
$PM_{2.5}$	0.20	g/kW-hr
CO	3.5	g/kW-hr
NO_x + VOC	6.4	g/kW-hr

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented during the use of the diesel emergency generators.

D.8.3 Electrowinning Building Emergency Generator (Unit ID: FB06)

Process Rate

The annual, daily, and hourly process rates for the diesel fueled electrowinning building emergency generator are based on the power rating of the generator and the hours of operation. The electrowinning building emergency generator has a power rating of 50 kW and will only be used in emergency power situations, estimated at 500 hours/year. However, the emergency generator is capable of operating 24 hours/day and 1 hour/hour.

Emission Factor

Uncontrolled PM, PM_{10}, $PM_{2.5}$, CO, NO_x, and VOC emissions from the electrowinning building emergency generator are calculated using the exhaust emission standards for nonroad engines from NSPS, 40 CFR 89, Section 112. The emission standards for engines rated between 37 and 75 kW and manufactured after 2008 (Tier 3) are presented in Table D.8.3. PM_{10} and $PM_{2.5}$ emissions from internal combustion engines are not listed as emission standards and are assumed to be equal to PM emissions. The NO_x and VOC emission standards are combined in the NSPS as a single emission standard. Based on EPA documentation (*Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition*), NO_x and VOC emissions for engines between 37.3 and 74.6 kW are assumed to be equal to 94.29% and 5.71%, respectively, of the combined NO_x and VOC emission standard.

Uncontrolled SO_2 emissions are calculated assuming all the sulfur in the diesel fuel is converted to SO_2 emissions and the sulfur content of the diesel fuel is 0.0015%. This leads to an uncontrolled SO_2 emission factor of 0.00003 pound SO_2 per pound of diesel fuel (or 0.0066 grams of SO_2 per kW-hr). Uncontrolled HAP emissions are calculated using the emission factors from AP-42, Table 3.3-2 (10/96) for industrial diesel engines.

A diesel heating value of 19,300 Btu/pound of diesel fuel and an average brake-specific fuel consumption value of 7,000 Btu/hp-hr were used to calculate the HAP emissions and the SO_2 emission factor in terms of g/kW-hr.

Table D.8.3 Emission Factors for Diesel Internal Combustion Engines (37 ≤ kW < 75, Tier 3)

Regulated Pollutant	Emission Factor	Units
PM	0.40	g/kW-hr
PM_{10}	0.40	g/kW-hr
$PM_{2.5}$	0.40	g/kW-hr
CO	5.0	g/kW-hr
NO_x + VOC	4.7	g/kW-hr

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented during the use of the electrowinning building emergency generator.

D.8.4 Primary Crusher Fire Water Pump and SX/EW Fire Water Pump (Unit IDs: FB07 and FB08)

Process Rate

The annual, daily, and hourly process rates for the diesel fueled primary crusher fire water pump and the diesel fueled SX/EW fire water pump are based on the power ratings of the fire pumps and the hours of operation. Both fire water pumps have power ratings of 400 hp (298.4 kW) and will only be used in emergency situations, estimated at 500 hours/year. However, the fire water pumps are capable of operating 24 hours/day and 1 hour/hour.

Emission Factor

Uncontrolled PM, PM_{10}, $PM_{2.5}$, CO, NO_x, and VOC emissions from the fire water pumps are calculated using the emission standards for stationary fire pump engines from NSPS, 40 CFR 60, Subpart IIII, Table 4. The emission standards for fire pump engines rated between 225 and 450 kW and manufactured after 2009 are presented in Table D.8.4. PM_{10} and $PM_{2.5}$ emissions from fire pump engines are not listed as emission standards and are assumed to be equal to PM emissions. The NO_x and VOC emission standards are combined in the NSPS as a single emission standard. Based on EPA documentation (*Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition*), NO_x and VOC emissions for engines between 300 and 600 hp are assumed to be equal to 93.33% and 6.67%, respectively, of the combined NO_x and VOC emission standard.

Uncontrolled SO_2 emissions are calculated assuming all the sulfur in the diesel fuel is converted to SO_2 emissions and the sulfur content of the diesel fuel is 0.0015%. This leads to an uncontrolled SO_2 emission factor of 0.00003 pound SO_2 per pound of diesel fuel (or 0.0066 grams of SO_2 per kW-hr). Uncontrolled HAP emissions are calculated using the emission factors from AP-42, Table 3.3-2 (10/96) for industrial diesel engines.

A diesel heating value of 19,300 Btu/pound of diesel fuel and an average brake-specific fuel consumption value of 7,000 Btu/hp-hr were used to calculate the HAP emissions and the SO_2 emission factor in terms of g/kW-hr.

Table D.8.4 Emission Factors for Stationary Fire Pump Engines (225 ≤ kW < 450, Tier 3)

Regulated Pollutant	Emission Factor	Units
PM	0.20	g/kW-hr
PM_{10}	0.20	g/kW-hr
$PM_{2.5}$	0.20	g/kW-hr
CO	3.5	g/kW-hr
NO_x + VOC	4.0	g/kW-hr

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented during the use of the fire water pumps.

D.9. MISCELLANEOUS SOURCES

D.9.1 Lime Loading (Unit IDs: MS01 and MS04)

Process Rate

The annual and hourly process rates for the lime loading are based on the lime usage rates presented in Table 5.3. The maximum daily process rate is calculated from the annual usage rate divided by 365 days/year, the quantity of days per year lime will be used at the RCP and adding a 20% maximum capacity factor. Lime is loaded into two different storage vessels at the RCP, the bulk pebble lime silo (Unit ID MS01) and the lime storage bin (Unit ID MS05). The annual, daily, and hourly process rates for loading lime into each of the two storage vessels are assumed to be 2/3 and 1/3 of the total lime usage rate for the bulk pebble lime silo and lime storage bin, respectively.

Emission Factor

Uncontrolled PM emissions from the lime loading are calculated using the emission factor of 0.61 lb/ton, from AP-42, Table 11.17-4 (02/98) for lime product loading, enclosed truck. PM_{10} and $PM_{2.5}$

emission factors for lime product loading are not listed in Table 11.17-4, but are assumed to be equal to PM emissions as a worst case scenario.

Control Efficiency

Emissions of particulate matter resulting from loading lime into the storage vessels are controlled by bin vent systems. The bulk pebble lime silo is controlled by the bulk pebble lime silo bin vent and the lime storage bin is controlled by the lime storage bin vent. The bin vent systems treat the dust entrained displacement air generated during the loading process. The bin vent systems have a pick up efficiency of 100% (they are located directly on the storage containers) and a 90% control efficiency, as determined by the bin vent vendors.

D.9.2 Reagent Material Transfer Points (Unit IDs: MS02 through MS03 and MS05 through MS08)

Process Rate

The annual and hourly process rates for the reagent material transfer points are based on the reagent usage rates presented in Table 5.3. The maximum daily process rates are calculated from the annual usage rates divided by 365 days/year, the quantity of days per year reagents will be used at the RCP, and adding a 20% maximum capacity factor. The lime usage rate in Table 5.3 is for two different lime systems. The division of the usage rate between the two systems is described in Section D.9.1.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the reagent material transfer points are calculated using Equation 2. The mean wind speed (U, 6.21 mph for unprotected transfer points) is equal to the used to calculate the emission factor in Sections D.2.5. The explanation for how the mean wind speed is determined is presented in Section D.2.5. The material moisture content value used in Equation 2 is unknown for the different chemicals. A 1% material moisture content is used as a worst case scenario.

Control Efficiency

Emissions of particulate matter resulting from the reagent material transfer points are controlled by good operating practices, enclosures, or bin vent systems. When process material is transferred to an enclosed piece of equipment, particulate emissions are controlled due to the emissions not being able to escape and a 100% control efficiency is assumed. The bin vent systems provide a 100% pick up efficiency (as explained in Section 9.1) and a 90% control efficiency of particulate emissions (as determined by the bin vent vendors). The particulate matter control method used at each reagent material transfer point is presented in Table D.9.1.

Table D.9.1 Control Methods for the Reagent Material Transfer Points		
Unit ID	Unit Description	Control Method
MS02	Bulk Pebble Lime Silo (S-BPL) to Bulk Pebble Lime Silo Screw Conveyor (CV-BPLS)	Enclosed
MS03	Bulk Pebble Lime Silo Screw Conveyor (CV-BPLS) to SAG Mill Feed Conveyor (CV-SMF)	Good Operating Practices
MS05	Transfer of Sodium Metasilicate to the Sodium Metasilicate Storage Bin (B-SM)	Sodium Metasilicate Storage Bin Vent
MS06	Transfer of Flocculant from Supersacks to Flocculant Storage Bins (B-F1/F2)	Good Operating Practices
MS07	Transfer of Guar from Bags to Guar Feeder (F-Gu)	Good Operating Practices
MS08	Transfer of Granular Cobalt Sulfate from Bags to Cobalt Sulfate Feeder (F-CoS)	Good Operating Practices

D.10. PARTICULATE MATTER POLLUTION CONTROL EQUIPMENT WITH EMISSION LIMITATIONS (UNIT IDS: PCL01 THROUGH PCL11)

Process Rate

The annual, daily, and hourly process rates for the particulate matter pollution control equipment with emission limitations are based on the exhaust flow rate of the equipment and/or the hours of operation. The exhaust flow rate and the operating hours for each piece of pollution control equipment is presented in Table D.10.1. The particulate matter pollution control equipment is assumed to operate at maximum capacity and continuous operation even if the processes being controlled are operating at less than maximum capacity.

Table D.10.1 Process Rates for Particulate Matter Pollution Control Equipment

Unit ID	Pollution Control Equipment	Exhaust Flow Rate	Operating Hours	
			Annual	Daily
PCL01	Crushing Area Scrubber (PC-CAS)	18,000 acfm	8,760	24
PCL02	Stockpile Area Scrubber (PC-SAS)	36,500 acfm	8,760	24
PCL03	Reclaim Tunnel Scrubber (PC-RTS)	15,000 acfm	8,760	24
PCL04	Pebble Crusher Area Scrubber (PC-PCAS)	22,000 acfm	8,760	24
PCL05	Copper Concentrate Scrubber 1 (PC-CCS1)	50,000 acfm	8,760	24
PCL06	Copper Concentrate Scrubber 2 (PC-CCS2)	50,000 acfm	8,760	24
PCL07	Molybdenum Scrubber (PC-MS) / Electrostatic Precipitator (PC-EP)	500 acfm	8,760	24
PCL08	Molybdenum Dust Collector (PC-MDC)	1,500 acfm	8,760	24
PCL09	Laboratory Dust Collector 1 (PC-L1)	10,000 acfm	8,760	24
PCL10	Laboratory Dust Collector 2 (PC-L2)	10,000 acfm	8,760	24
PCL11	Laboratory Dust Collector 3 (PC-L3)	10,000 acfm	8,760	24

Emission Factor

Particulate matter emissions from the pollution control devices are based on lb/hour emission limits or PM_{10} outlet grain loadings voluntarily accepted by the RCP. The PM and $PM_{2.5}$ fractions of PM_{10} emissions are estimated based on the control efficiencies of the pollution control equipment in each particulate size range (from AP-42, Appendix B.2 and manufacturer's information) and the emission units being controlled. The voluntarily accepted emission limits and outlet grain loadings and the parameters needed to calculate the appropriate exhaust flow rate for each piece of pollution control device with a voluntarily accepted grain loading is presented in Table D.10.2. The PM and $PM_{2.5}$ fraction of PM_{10} emissions for each pollution control devices is presented in Table D.10.3. The following equations are used to calculate the appropriate exhaust flow rate:

$$Q_{dscfm} = \frac{(Q_{acfm})(460 + T_{st})(P_{PC})}{(460 + T_{PC})(P_{st})}\left(1 - \frac{x_m}{100}\right) \qquad (8a)$$

$$P_{PC} = \left(P_{MSL} - \frac{GE - SH}{1000}\right)\left(\frac{1\,psi}{2.036\text{ inches of Hg}}\right) \quad (8b)$$

where:

Q_{dscfm}	=	exhaust flow rate of the pollution control device at dry, standard conditions (dscfm)
Q_{acfm}	=	actual exhaust flow rate of the pollution control device
T_{st}	=	standard temperature (68°F, definition in 40 CFR 60.2)
T_{PC}	=	temperature of the pollution control device exhaust (see Table D.10.2)
P_{st}	=	standard pressure (14.7 psi, definition in 40 CFR 60.2)
P_{PC}	=	pressure of the dust collector exhaust (psi)
x_m	=	percent of moisture in the exhaust flow (The moisture percentages are uncertain. As a worst case scenario, a moisture content of 0% is assumed.)
P_{MSL}	=	pressure at mean sea level (29.92 in. Hg)
GE	=	ground elevation (5,350 feet at the RCP)
SH	=	stack height (see Table D.10.2)

Equation 8b is based on the estimate that for every 1,000 feet above sea level, the pressure decreases by 1 inch of mercury.

Table D.10.2 Voluntarily Accepted PM_{10} Emission Limits and Outlet Grain Loadings and Particulate Matter Pollution Control Equipment Properties

Unit ID	Pollution Control Equipment	PM_{10} Outlet Grain Loading / Emission Limit	Exhaust Temperature (°F)	Stack Height (ft)
PCL01	Crushing Area Scrubber (PC-CAS)	1.28 lb/hr	Ambient [a]	24
PCL02	Stockpile Area Scrubber (PC-SAS)	2.59 lb/hr	Ambient [a]	24
PCL03	Reclaim Tunnel Scrubber (PC-RTS)	1.07 lb/hr	Ambient [a]	24
PCL04	Pebble Crusher Area Scrubber (PC-PCAS)	1.56 lb/hr	Ambient [a]	24
PCL05	Copper Concentrate Scrubber 1 (PC-CCS1)	3.55 lb/hr	Ambient [a]	24
PCL06	Copper Concentrate Scrubber 2 (PC-CCS2)	3.55 lb/hr	Ambient [a]	24
PCL07	Molybdenum Scrubber (PC-MS) / Electrostatic Precipitator (PC-EP)	0.02 lb/hr	500	55
PCL08	Molybdenum Dust Collector (PC-MDC)	0.010 grains/dscf	Ambient [a]	20
PCL09	Laboratory Dust Collector 1 (PC-L1)	0.005 grains/dscf	Ambient [a]	20
PCL10	Laboratory Dust Collector 2 (PC-L2)	0.005 grains/dscf	Ambient [a]	20
PCL11	Laboratory Dust Collector 3 (PC-L3)	0.005 grains/dscf	Ambient [a]	20

[a] The average ambient temperature at the RCP is 62.43 °F (calculated from hourly data collected at the meteorological station at the RCP from April 2006 through May 2009).

The molybdenum scrubber and electrostatic precipitator are designed to operate in series. Therefore, they are treated as a single emission point. The pollution control equipment properties listed in the above tables are for the electrostatic precipitator, since it is the final piece of pollution control equipment exhausted to the atmosphere.

Table D.10.3 PM and $PM_{2.5}$ Fractions of PM_{10} Emissions from the Particulate Matter Pollution Control Equipment			
Unit ID	Pollution Control Equipment	PM Fraction	$PM_{2.5}$ Fraction
PCL01	Crushing Area Scrubber (PC-CAS)	1.23	0.63
PCL02	Stockpile Area Scrubber (PC-SAS)	1.27	0.36
PCL03	Reclaim Tunnel Scrubber (PC-RTS)	1.27	0.36
PCL04	Pebble Crusher Area Scrubber (PC-PCAS)	1.47	0.44
PCL05	Copper Concentrate Scrubber 1 (PC-CCS1)	1.27	0.36
PCL06	Copper Concentrate Scrubber 2 (PC-CCS2)	1.27	0.36
PCL07	Molybdenum Scrubber (PC-MS) / Electrostatic Precipitator (PC-EP)	1.01	0.95
PCL08	Molybdenum Dust Collector (PC-MDC)	2.11	0.15
PCL09	Laboratory Dust Collector 1 (PC-L1)	1.43	0.66
PCL10	Laboratory Dust Collector 2 (PC-L2)	1.43	0.66
PCL11	Laboratory Dust Collector 3 (PC-L3)	1.43	0.66

D.11. SOLVENT EXTRACTION AND ELECTROWINNING

D.11.1 Solvent Extraction Mix Tanks and Settlers (Unit IDs: SXE01)

Process Rate

The annual, daily, and hourly process rates for the solvent extraction mix tanks and settlers are equal to the surface area of the tanks and continuous operation of the solvent extraction system (i.e. 8,760 hours/year, 24 hours/day, 1 hour/hour). The surface area of the solvent extraction mix tanks and settlers is presented in Table D.11.1.

Table D.11.1 Surface Area of the Solvent Extraction Mix Tanks and Settlers	
Solvent Extraction Mix Tank or Settler	Surface Area (ft^2)
E1 Primary Mix Tank - 7.75' D x 9.75' H	47.2
E1 Secondary Mix Tank - 9.5' D x 9.75' H	70.9
E1 Tertiary Mix Tank - 9.5' D x 9.75' H	70.9
E1 Extraction Settler - 64' L x 33' W x 3.33' H	2,112
E1-P Primary Mix Tank - 7.75' D x 9.75' H	47.2
E1-P Secondary Mix Tank - 9.5' D x 9.75' H	70.9
E1-P Tertiary Mix Tank - 9.5' D x 9.75' H	70.9
E1-P Extraction Settler - 64' L x 33' W x 3.33' H	2,112
E2 Primary Mix Tank - 7.75' D x 9.75' H	47.2
E2 Secondary Mix Tank - 9.5' D x 9.75' H	70.9
E2 Tertiary Mix Tank - 9.5' D x 9.75' H	70.9
E2 Extraction Settler - 64' L x 33' W x 3.33' H	2,112
S1 Primary Mix Tank - 7.75' D x 9.75' H	47.2
S1 Secondary Mix Tank - 9.5' D x 9.75' H	70.9
S1 Strip Settler - 64' L x 33' W x 3.33' H	2,112
Total	**9,132.9**

<u>Emission Factor</u>

Uncontrolled VOC and HAP emissions from the solvent extraction tanks are calculated using the methodology and equations from the *Hydrometallurgy of Copper*, presented at an international copper mining convention in 1999. The methodology presented in the paper is a more accurate way to estimate the evaporative loss of diluent than using the EPA Tanks program to model the mixers and settlers as tanks. The following equations (Equations 9a and 9b) and data (Table D.11.2) are used to calculate VOC and HAP emissions from the solvent extraction mix tanks and settlers. The full paper is presented in Appendix D2.

$$F_i = \frac{\left(C_i^o - C_i^H\right)\left(\frac{D_i}{100^2}\right)}{(H)}\left(\frac{60\,\text{sec}}{1\,\text{min}}\right)\left(\frac{60\,\text{min}}{1\,\text{hr}}\right)\left(\frac{1\,\text{lb}}{453.59\,\text{g}}\right)\left(\frac{1\,\text{m}^2}{(3.2808\,\text{ft})^2}\right) \qquad (9a)$$

$$D_i = (10^{-3})(T^{1.75})\left(\frac{\left(\frac{(M_i + M_A)}{(M_i)(M_A)}\right)^{1/2}}{\left((P)\left(V_i^{1/3} + V_A^{1/3}\right)\right)^2}\right) \quad (9b)$$

where:

F_i	=	diffusive flux of component i in the air (lb/ft^2-hr)
C_i^0	=	component concentration at the surface (g/m^3, see Table D.11.2)
C_i^H	=	component concentration at the measured height (g/m^3, see Table D.11.2)
H	=	height at which concentration measurement was taken (1 m)
D_i	=	diffusivity of component i in the air (m^2/s)
T	=	temperature (335.6 K, the average value calculated from hourly data collected at the meteorological station at the RCP from April 2006 through May 2009)
M_i	=	molecular weight of the component in the air (gram/gram-mole, see Table D.11.2)
M_A	=	molecular weight of the air (28.97 gram/gram-mole)
P	=	pressure (0.8 atm, calculated based on the elevation at the RCP (5,350 ft) and the estimate that for every 1,000 feet above sea level, the pressure decreases by 1 inch of mercury.)
V_i	=	sum of atmospheric diffusion volume increments by atom and structure for the component in the air (see Table D.11.2)
V_A	=	sum of atmospheric diffusion volume increments by atom and structure for air (20.10)

Table D.11.2 Data Used to Calculate VOC and HAP Emissions from the Solvent Extraction Mix Tanks and Settlers

Data	Benzene	Toluene	Ethylbenzene	Xylenes	others (including Hexane) [a]
C_i^0 (ppm_v)	25	350	1400	1912	2500
C_i^H (ppm_v)	0.0018	0.0668	0.0568	0.0371	16.9210
M_i (g/g-mole)	78.11	92.13	106.16	106.16	--
V_i	90.68	111.14	131.6	131.6	--

[a] The diffusivity of the "other" component (D_{other}) is given in the *Hydrometallurgy of Copper* as 0.07. It is corrected for the temperature and pressure at the RCP to be 0.10.

Control Efficiency

Emissions of VOCs and HAPs resulting from the mix tanks and settlers used in the solvent extraction system are controlled by the use of covers. As described in the *Hydrometallurgy of Copper*, it is estimated that the use of covers allows 33% of the potential emissions to be released to the atmosphere. Therefore, a 67% control efficiency is assumed for the solvent extraction mix tanks and settlers.

D.11.2 Electrowinning Commercial Cells (Unit ID: SXE02)

Process Rate

The annual, daily, and hourly process rates for the electrowinning commercial cells are equal to the surface area of the cells and continuous operation of the electrowinning system (i.e. 8,760 hours/year, 24 hours/day, 1 hour/hour). There are 30 electrowinning cells each with a length of 22 feet and a width of 4 feet. Therefore the total surface area of the electrowinning cells is 2,640 ft^2.

Emission Factor

Uncontrolled H_2SO_4 emissions from electrowinning are calculated using the emission factor of 0.000157 lb/hr-ft^2, from a report entitled "Measurement of Sulfuric Acid Mist Emissions from the Cyprus Twin Buttes Copper Company Electrowinning Tankhouse" (02/98) produced by Applied Environmental Consultants, Inc. The emission factor includes the control efficiency from dispersion balls used in the electrowinning tankhouse at the Copper Twin Buttes facility. At the RCP, an acid mist suppressant is used during electrowinning, which has a greater control efficiency than the use of dispersion balls. Therefore, as a worst case scenario, it is assumed that the measurements found at the Cyprus Twin Buttes Copper Company Electrowinning Tankhouse apply to the RCP electrowinning cells.

Uncontrolled cobalt compound emissions from electrowinning are determined by calculating the fraction of cobalt sulfate in the electrolyte solution sent to the electrowinning cells (approximated by

150 ppm). It is assumed that the H_2SO_4 mist emissions from the electrowinning cells contain the same fraction of cobalt compounds.

Control Efficiency

Emissions of H_2SO_4 and cobalt compounds resulting from electrowinning are controlled by five cell ventilation scrubber systems. The scrubber systems have a 100% capture efficiency and control the H_2SO_4 and cobalt compound emissions with a 99% efficiency.

D.12. TANKS

D.12.1 Significant Storage Tanks (Unit IDs: T01 through T04)

Process Rate

There are four storage tanks at the RCP that have the potential to emit VOC and HAP emissions:

- C7 Distribution Tank
- MIBC Storage Tank
- Diesel Fuel Storage Tank – Heavy Vehicles 1
- Diesel Fuel Storage Tank – Heavy Vehicles 2

The annual, daily, and hourly process rates for the tanks are equal to the operating hours of the tanks, or continuous operation (i.e. 8,760 hours/year, 24 hours/day, 1 hour/hour).

Emission Factor

Uncontrolled VOC and HAP emissions from the tanks are calculated using the EPA's TANKS program for vertical fixed roof tanks. The following information was used in the program to calculate the emissions from the tanks. The other tank parameters needed to execute the EPA TANKS program are presented in Table D.12.1.

(a) The tanks are not heated;

(b) The paint characteristics include white color paint and good paint conditions;

(c) The tank roofs are flat (cone roof type with a height of 0 ft and slope of 0 ft/ft);

(d) The vacuum and pressure settings are 0 psig; and

(e) The meteorological data corresponds to Tucson, Arizona;

The EPA TANKS output files showing the annual emission from the tanks are presented in Appendix D3. Hourly and daily emission rates were estimated from the annual emission values of the EPA TANKS program by assuming continuous operation (24 hours/day and 8,760 hours/year).

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented on the tanks.

Table D.12.1 Tank Parameters for the EPA TANKS Program

Unit ID	Tank	Shell Height (ft)	Shell Diameter (ft)	Liquid Height (ft) [a]	Average Liquid Height (ft) [a]	Turnovers/ year [b]	Tanks Contents
T01	C7 Distribution Tank (T-C7D)	14.00	12.00	13.50	13.50	37.71 [b]	Sodium Akylmonothio-phosphate Collector
T02	MIBC Storage Tank (T-MIBCS)	14.00	12.00	13.50	13.50	15.54 [b]	Methyl Isobutyl Carbinol
T03	Diesel Fuel Storage Tank - Heavy Vehicles 1 (T-DFS-HV1)	20.00	30.00	19.00	19.00	67.19 [b]	Distillate Fuel Oil No. 2
T04	Diesel Fuel Storage Tank - Heavy Vehicles 2 (T-DFS-HV2)	20.00	30.00	19.00	19.00	67.19 [b]	Distillate Fuel Oil No. 2

[a] The liquid height and average liquid height are either determined by using the shell diameter and calculating the height of the liquid needed to equal the capacity of the tank or assuming the tank contents will average 0.5 feet less than the tank shell height (the tank capacities are presented in Appendix D3).

[b] The turnovers per year are calculated based on the capacity of the tanks (presented in Appendix D3) and the chemical usage rates. Chemical usage rates for C7 and MIBC are presented in Table 5.3. The diesel fuel usage rates for heavy vehicles are estimated to be 13,500,000 gallons/year, equally divided between the two storage tanks.

APPENDIX D1

PROCESS RATES

Annual Process Rates at the RCP Determined by the Mine Plan of Operations	
Process Category	Year 5
Mining	
Concentrate Ore Mined (tons)	27,375,000
Leach Ore Mined (tons)	1,825,000
Waste Mined (tons)	80,300,000
Total Material Mined (tons)	109,500,000
Drilling and Blasting	
Number of Holes Drilled	27,840
ANFO Usage (tons)	18,096
Blasts	348
Bulldozer Use	
D11T Crawler Dozers (hours)	12,000
D10T Crawler Dozers (hours)	18,000
D8T Crawler Dozer (hours)	6,570
834H Rubber Tired Dozers (hours)	18,600
Total all Bulldozers (hours)	55,170
Motor Grader Use	
24M Motor Grader (5.3 mph) (hours)	6,000
16M Motor Graders (4.6 mph) (hours)	12,000
Total all Graders (hours)	18,000
Water Truck Use	
Total all Water Trucks (hours)	13,000
Haul Truck Use	
Distance from Mining Location to Primary Crusher / Run of Mine Stockpile (feet)	14,205
Distance from Mining Location to Leach Pad (feet)	10,574
Distance from Mining Location to Waste Rock Storage Area (feet)	17,903
Concentrate Ore (VMT)	589,185
Leach Ore (VMT)	29,239
Waste (VMT)	2,178,198
Total (VMT)	2,796,622

APPENDIX D2

HYDROMETALLURGY OF COPPER

PROCEEDINGS OF THE COPPER 99 – COBRE 99
INTERNATIONAL CONFERENCE — VOLUME IV
OCTOBER 10-13, 1999, PHOENIX, ARIZONA, USA

Hydrometallurgy of Copper

Edited by:

S.K. Young
Versitech, Incorporated
Tucson, Arizona, USA

D.B. Dreisinger
University of British Columbia
Department of Metals and Materials Engineering
Vancouver, British Columbia, Canada

R.P. Hackl
Placer Dome Incorporated
Vancouver, British Columbia, Canada

D.G. Dixon
University of British Columbia
Department of Metals and Materials Engineering
Vancouver, British Columbia, Canada

International conference organized by the Chilean Institute of Mining Engineers, The Metallurgical Society of the Canadian Institute of Mining, Metallurgy and Petroleum, and The Minerals, Metals and Materials Society.

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Investigation of evaporative losses in solvent extraction circuits

M. D. Bishop and L. A. Gray
Phillips Mining Chemicals
1768 Highway 123
Bartlesville, OK 74004

M.G. Greene, K. Bauer and T. L. Young
Versitech, Inc.
1438 W. San Lucas Drive
Tucson, AZ 85704

J. May
BHP Copper Company
200 Reddington Road
San Manuel, AZ 85631

K.E. Evans
EnviroNet, Inc.
7776 S. Pointe Parkway W. Suite 160
Phoenix, AZ 85044

Illa Amerson-Treat
Department of Environmental Science and Engineering
Oregon Graduate Institute
P.O. Box 91000
Portland, OR 97291-1000

ABSTRACT

Loss of organic solvent extraction circuits occurs through several accepted methods. Losses are commonly attributed to entrainment of the plant organic and evaporative loss of diluent. Evaporative losses of diluent have been estimated using various models or by considering all losses over and above entrainment to be due to evaporation. Other possible loss mechanisms are discussed and data on losses during weather conditions are presented.

Accurate estimation of evaporative loss is vitally important to the industry due to both cost factors and environmental concerns. Data for and description of the Diffusive Flux Model arc presented as an improved method of estimating evaporative losses.

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INTRODUCTION

Currently operational solvent extraction plants use organic compounds to extract copper, nickel, cobalt, zinc, beryllium, and other metals from an impure leach solution, concentrating and purifying it for electrowinning or other recovery techniques. The active chemical in the extraction of the metal, the extractant, is typically dissolved in a non-reactive carrier organic, the diluent, in a 1 to 30% by volume ratio forming the plant organic. The organic phase is lost over time and must be replenished. Yearly organic usage varies with operating conditions and the experience of the operators. In general, operators reduce consumption of organic as they gain experience running their particular operation. Improved plant design has also contributed to reduced organic loss.

The barren or lean (containing low concentrations of metal species) organic phase in a solvent extraction plant is vigorously mixed with the solution containing the species to be extracted (the pregnant solution). Through the process of ion exchange, the extractant exchanges a hydrogen ion with a metal ion from the aqueous phase, chelating the metal of interest. The metal ion is thus extracted into the organic phase. This loaded organic is then contacted with a higher acid content (lower pH) aqueous phase in the stripper section. This reverses the process in the extraction stage, the extractant gives up the metal ion and takes up an hydrogen ion. While individual plants vary the most typical arrangement is two extraction stages and one stripper stage.

Loss of organic in solvent extraction circuits occurs through several accepted methods. Losses are commonly attributed to entrainment of the plant organic and evaporative loss of diluent. Evaporative losses of diluent have been estimated using various models or by considering all losses over and above entrainment levels to be due to evaporation.

All commercial diluents currently used by the industry are hydrocarbons and, as such, are classified as volatile organic compounds (VOCs). Accurate estimation of evaporative loss is vitally important to the industry due to both cost factors and environmental concerns. This paper discusses additional mechanisms of diluent loss and proposes data and models which support an improved method of estimating evaporative losses.

LOSS MECHANISMS FOR EXTRACTANTS

The extractant in copper solvent extraction is based on oxime chemistry (R-CNOH-R' where R' is either H or a short carbon chain). While the chemistry of extractants for other metals varies from diethyl hexyl phosphoric acid (DEHPA) to quaternary amines, the same basic loss mechanisms still apply. The extractant can be lost from chemical attack, entrainment into an aqueous stream, dissolution into an aqueous stream, or evaporation.

Chemical attack mechanisms for oximes include attack from oxygen, acid, nitrates, or ultraviolet radiatoion. Attack by oxygen and ultraviolet will usually leave the oxime as a water-soluble species such as an alcohol, amine, semicarbazone or carboxylic acid. Strongly acid solutions can convert the oxime into an aldehyde or ketone as described in Beyer and Walter (1). The acid strength to do this at a high reaction rate is normally 4 or 6 times the normal operating plant's g/l acid value. However, a small percentage (probably 1% or less) of the oxime can be expected to be converted each year. All of the breakdown products can be surface-active reagents that will either cause a froth, decrease surface tension, or both. Frothiness or decreased surface tension promotes entrainment and increases break times.

Another form of chemical attack is the failure to uncouple from some metal species in the strip stage. Generally, this occurs at some fixed ratio with the metal being extracted. This creates a fixed ratio of "active" to "inactive" extractant. Thus, this ratio will not effect the extractant usage once the plant reaches equilibrium after the initial fill. For some extractants, a contaminant species exists that may tie up the extractant. Unless such contaminants exist in very small amounts, there will probably be excessive extractant usage.

Extractants can also be lost by aqueous entrainment to the depleted aqueous phase (raffinate) or in the strip stage. Extractant entrained in the raffinate will generally separate in the raffinate storage pond. A thin layer of organic is often seen on many raffinate ponds. This layer is very susceptible to chemical attack mechanisms and should be recovered promptly. This layer often contains breakdown products. It should be clay treated prior to introduction to the circuit in order to remove surface-active agents (polar compounds) which contribute to additional losses. In heap leach operations entrained organic not recovered from the raffinate is lost in the heaps.

The solubilities of extractants in water are often less than 1 ppm. Surface active agents from the breakdown of oxime and diluent can promote solubility. Soluble organic will not be recovered in filters or in the organic layer of the raffinate pond. In heap leach operations, molds, fungi or bacteria living in the heaps may utilize such organic species. Extractants may also come out of solution in the heaps due to the change in pH and total dissolved solids that occurs in the leach process. If either is the case, the heaps represent a possible sink for the organic phase over and above that represented by entrainment losses.

Extractants can be lost by being tied up in a solid-organic-aqueous phase that is politely called a "gunk" or "crud" layer. This layer represents a loss of organic to the circuit until it is recovered. Some of the organic loss in this layer may never be recovered. Organic recovered from a gunk layer should be clay treated to remove degradation products before it is returned to the circuit.

Extractants generally have very low vapor pressures at room temperature. Extractant losses from evaporation should be small to negligible.

LOSS MECHANISMS FOR DILUENTS

Losses for diluent are very similar in nature to losses in extractant. All commercially used diluents, regardless of manufacturer, are very similar chemically. They are mixtures of aromatic and aliphatic hydrocarbons having carbon numbers in the range of 8 to 20 (C8 to C20) with the majority of the diluent in the C12 to C16 range. All commercial diluents are hydrogenated to eliminate any reactive double bonds.

Oxygen and strong oxidizing agents will attack many organics including diluents. They can attack the end of alkane chains to form carboxylic acids or alcohols. Bacteria, fungi, and molds are known to feed on and degrade hydrocarbons resulting in shorter chain alkanes, alcohols, ketones, aldehydes, and carboxylic acids as described in Atlas (2). With the exception of shorter alkane chains, all of the products of biological degradation are surface-active agents. Biological degradation is believed to be a significant source of diluent loss. This is evidenced by the large amounts of biological material found in plant crud.

Diluents can be entrained in either the raffinate or the strip phase. Entrainment is not known to be selective to any one component of the organic phase Thus, entrainment should remove organic that is similar in composition to the overall organic phase rather than enrich or deplete any one particular molecule.

The overall solubility of all commercial diluents is typically less than 5 ppm. Shorter alkane chain components of the diluent are more water-soluble than longer chains. As the organic phase ages in a plant, more surface-active agents will be formed by chemical and biological means. This will tend to increase the overall solubility of the organic phase. Also, degradation of diluent can result in shorter alkane chain length.

Diluents are trapped in the solid-organic-aqueous gunk layer along with the extractant. As mentioned above, organic phase material from this layer must be treated before being put back into the circuit. Some losses must be expected.

Diluent is composed of lower molecular weight compounds and has a lower boiling point than an extractant. It has been common practice to assign any losses of diluent above that needed to form a solution with the lost extractant as loss to evaporation. For example, if a plant using a 10% solution of extractant requires an annual make-up of 200,000 gallons of plant organic it would consume 180,000 gallons of diluent and 20,000 gallons of extractant provided there were no differential loss. If it actually consumed 200,000 gallons of diluent and 20,000 gallons of extractant, it would assign 20,000 gallons of diluent to evaporation loss. This assumes that the only other major loss mechanism was entrainment. As already pointed out, chemical attack and solubility mechanisms also exist which can promote differential loss rates between diluent and extractant.

EVAPORATIVE LOSS

All commercial diluents are hydrocarbons and as such are classified as volatile organic compounds (VOCs). Environmental regulations may consider diluents as a source of VOC emissions. Therefore, accurate estimation of evaporative loss is vitally important to the industry due to cost factors and environmental concerns.

Solvent extraction settling tanks appear at first glance to be an ideal situation to promote evaporation. They are large areas with a proportionally thin layer of volatile organic. However, there are some factors that mitigate evaporation. All commercial plants have walls higher than the organic level promoting a relatively still air space layer. This stillness of this air space is enhanced, in most commercial plants, by a cover. The diluent vapors are relatively heavy compared to air and tend to stratify very close to the liquid surface. If the layer of air and vapor immediately over the settler is stagnant VOCs emissions will be minimized.

WEATHER DATA

The simplest model of organic losses says that organics, especially diluent, are lost mainly to evaporation. If this model was true, one would expect that the copper solvent extraction plants of the Southwest would experience significantly higher losses in the hot summer months than in the cool winter months. Data for six major copper SX-EW plants in the southern Arizona – eastern New Mexico region from the year 1995 were examined. Plotting the total diluent usage of these plants along with the average mean temperature and average mean high temperature for each month yielded Figure 1. There is some correlation between the temperature and usage. However, the relatively cool month of December had the third highest usage, while the hot months of June and July were barely over the monthly average usage. The upward spike in the month of May and downward spike in the month of September are also hard to explain.

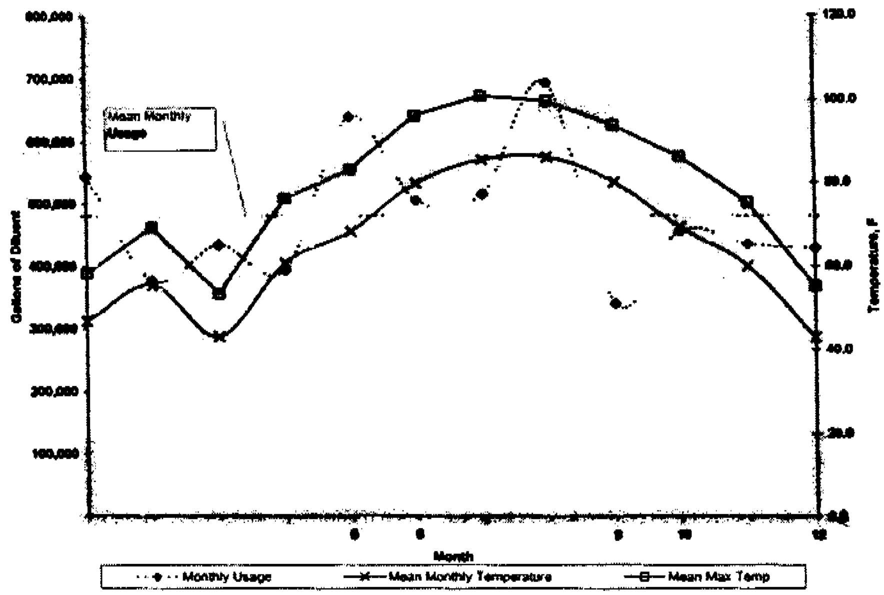

Figure 1 – Monthly Diluent Usage, Mean Temperature and Mean Maximum Temperature for Selected Copper SX-EW Plants

The other possible weather related loss mechanism is the effect of rainfall. Rain can promote organic losses through introduction of solids into the circuit. These solids promote gunk layer formation. The excess water introduced by the rainfall can increase overall aqueous stream flows promoting losses due to entrainment and organic solubility. The monthly diluent usage, total monthly rainfall, and maximum single day rainfall for the same 6 mines are plotted in Figure 2. This graph suggests that some of the high usage is probably due to rainfall. However, the spikes in May and September are still hard to explain. The above data do not appear to support attributing all differential diluent loss to evaporation as higher summer temperatures should increase evaporative losses.

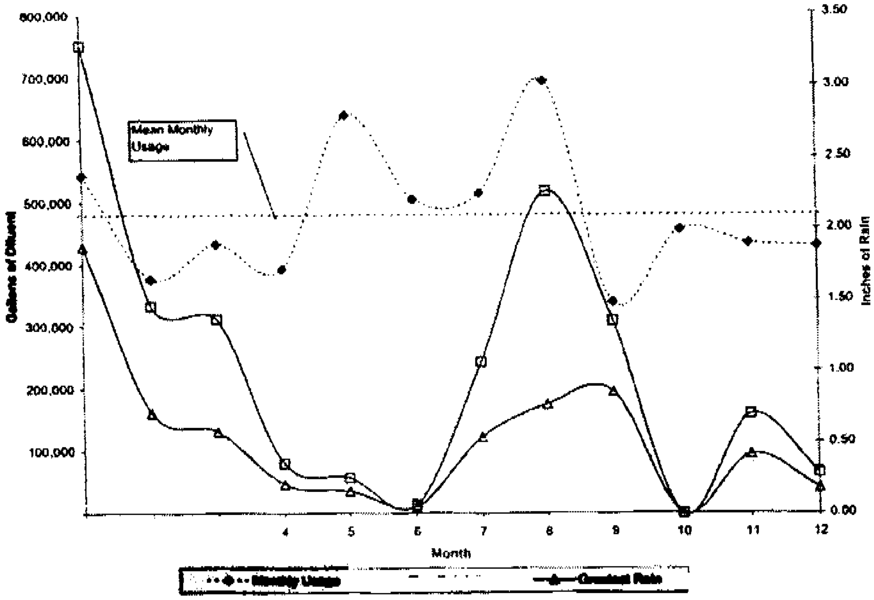

Figure 2 – Monthly Usage, Total Rainfall and Highest Single Day Rainfall for Selected Mines

DIFFUSIVE FLUX MODEL

Various models including the EPA Tanks model have been used to estimate emissions from SX operations. The validity of using these models for SX operations is debatable as the factors used in the model do not necessarily correspond to the factors present in SX operations. For example, the Tanks model is based on losses from closed tanks and incorporates tank breathing losses, tank headspace, tank cycling, etc. These conditions are not found in SX plants. These models tend to overestimate emissions based on plant experience.

Consideration of the above factors led BHP to enlist the services of Emcon to evaluate alternate modeling methods. They determined that a Diffusive Flux Model may be more suitable for modeling SX operations and more accurately reflect evaporative losses.

Phillips Mining Chemicals was concurrently investigating methods to evaluate evaporative losses. A method based on the ASTM Standard Test Method for Evaporation Loss of Lubricating Greases and Oils (ASTM D 972) was evaluated. This method incorporates controlled temperature and airflow over a sample of diluent. The loss per air exchange can be calculated based on the air flow rate. Discussions between representatives from BHP, Emcon, and Phillips indicated general agreement between the Diffusivity model and data obtained using a modification of ASTM D 972. (3)

Diluent left in a open container with some positive airflow over the container will, of course, eventually evaporate. Diluent kept in a closed container will never evaporate. Diluent kept in an open top container with little to no airflow across the surface will slowly evaporate, dependent on the diffusion of the vapor into the open air.

The solvent extraction tanks of most plants are essentially enclosed by a cover, and walls on three sides, while the fourth side (weir side) is normally left open. Most plants' raffinate ponds have high side walls, have a protective berm, or are situated in a natural valley. This minimizes air movement across the surface of the pond. This was confirmed by the measurement of little of no wind speed within the enclosed headspace. Thus, diffusion should be the major factor influencing diluent loss.

The driving force behind diffusion is the concentration gradient between a given VOC at the surface of the liquid and the same vapor at a given height above the surface. Standard chemical calculation techniques can be used to determine the loss due to diffusion if these concentrations are known. Fick's First Law can be written as

$$F_i = (C_i^0 - C_i^H)D_i/H \quad (1)$$

where:
F_i = Diffusive flux of component 'i' in air (g/m^2-s)
C_i^0 = Component concentration at the surface (g/m^3)
C_i^H = Component concentration at the measured height
D_i = Diffusivity of the chemical 'i' in air (m^2/s)
H = Height at which concentration measurement was taken (m)

The diffusivity of a given species in air (D_i) can be calculated by a number of different methods. The Fuller, Schettler, and Giddings (FSG) method was selected for this project. This method was selected over the more compound-specific Chapman-Enskog model due to a lack of parameter data for several constituents. Diffusivities were calculated using the following formula.

$$Di = 10^{-3} * T^{1.75} * [(M_i + M_A)/(M_i * M_A)]^{1/2}/[P(V_i^{1/3} + V_A^{1/3})]^2 \quad (2)$$

where:
D_i = Diffusivity of the chemical 'i' in air (m^2/s)
T = Temperature (K)
M_i = Molecular weight of the species (gram/gram-mole)
M_A = Molecular weight of the air (gram/gram-mole)
P = Pressure (atmosphere)
V_i = Sum of atomic diffusion volume increments by atom and structure for species
V_A = Sum of atomic diffusion volume increments by atom and structure for air

Diffusivities (D_i) of components of a diluent can be determined from fundamental considerations. One can use concentration data from the solvent in the solution to generate the C_i^0 numbers for Fick's Law, Equation 1. The C_i^H can be determined by physical measurement and the diffusive flux determined by Equation 1. Yearly emissions can then be estimated by multiplying the diffusive flux (F_i) of a component by the square meters of surface area and by the number of seconds in a year.

PROCEDURE

Given the concentration data, the diffusive flux calculation technique can be used to estimate the amount of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs). These were determined at San Manuel over both the settling tanks and raffinate ponds by a combination of Tedlar® bags sampling with offsite gas chromatography-mass spectrometry (GC-MS) and on site analysis by Fourier transform infrared spectrometry (FTIR). The FTIR system employed used an open path configuration consisting of optical components, a computer, special software, and spectral references against which field measurements were compared. FTIR data points were taken at the same time as Tedlar® bag samples for comparison purposes.

Concurrent with the FTIR sampling, climate data was collected. The climate data collected included air temperature (dry bulb), wet bulb temperature, solution temperature, wind speed and direction, and solar radiation. Statistical analyses were performed to determine whether the concentrations of VOCs over the settlers were dependent on climatological conditions. This study indicated no dependence exists.

Assumptions

Several assumptions were made in performing these calculations. The list of potential chemicals that can potentially volatilize from the tanks were limited to those with a significant vapor pressure. A list of concentrations and vapor pressures of HAPs components of the diluent are listed in Table I. Napthalene's low vapor pressure eliminated it from further consideration in this study.

Table I – Concentration and Vapor Pressure of San Manuel Diluent Constituents

Component	Concentration (ppm)	Vapor Pressure (mm Hg)
Benzene	25	77.2
Toluene	350	22.4
Ethylbenzene	1,400	7.5
m-Xylene	410	6.4
o-Xylene	770	4.97
p-Xylene	732	6.9
Octane	2,300	10.6
Heptane	67	36.4
Hexane	67	126.6
Pentane	67	430.7
Napthalene	1,000	0.054
1,2,4 trimethylbenzene	385	2.04
1,3,5 trimethylbenzene	385	7.34

A second assumption was that the initial concentration at the surface of the liquid in the headspace was equal to the initial concentration of the component in the diluent. This is likely to overpredict the flux of VOCs from the surface. This assumption can be tested in future work by careful sampling of the air just above the organic phase. Careful experimental design will be necessary to ensure the exclusion of organic phase droplets in the surface air phase sample.

Calculation of Diffusivities

The diffusivities, calculated by the use of Equation (2) for the selected species, are shown in Table II. Because the GC-MS could not differentiate between higher molecular weight hydrocarbons, these were reported as GC-MS kerosene. For this analysis any constituent component listed by Phillips as being in the diluent but not reported specifically on the GC-MS analysis was in this category. These are noted as 'others' throughout this analysis. The diffusivity for each of these constituents listed by Phillips in this category was calculated, and a weighted average diffusivity for this category was derived, based on the concentration of the component in the diluent. The calculated diffusivities are shown in Table II.

Table II – Calculated Chemical Diffusivities

Component	Molecular Weight (M_i)	Diffusion Volume (V_i)	Diffusivity (D_i)
Air	28.97	20.1	
Benzene	78.11	90.68	0.0894
Toluene	92.13	111.14	0.0804
Ethylbenzene	106.16	131.6	0.0736
m-Xylene	106.16	131.6	0.0736
o-Xylene	106.16	131.6	0.0736
p-Xylene	106.16	131.6	0.0736
Octane	114.22	167.64	0.0656
Heptane	100.2	147.18	0.0705
Hexane	86.17	129.72	0.0758
Pentane	72.15	106.26	0.0846
1,2,4 trimethylbenzene	120.19	172.26	0.0645
1,3,5 trimethylbenzene	120.19	172.26	0.0645
Others			0.07

Typically, single components will behave differently in a mixture than they do in a binary system. The diffusivities for three chemicals were calculated to determine the effects of the mixture on the binary system calculations. The diffusivities in the mixture were not significantly different than those for the binary system. Thus, the binary calculated diffusivities were used.

Calculation of Diffusive Fluxes

The calculated diffusivities shown in Table II above were then plugged into Equation (1) along with the average concentrations by GC-MS of the constituents at one meter. This gave the diffusive flux for each constituent as shown in Table III for the solvent extraction settlers. Table IV shows the diffusive fluxes for the raffinate pond.

Table III – Settler Tanks Concentration Data and Calculated Chemical Diffusive Fluxes

Component	cm^2/s Diffusivity (D_i)	ppmv Concentration at Surface (C_i^0)	ppmv Concentration at 1-meter (C_i^1)	G/m^2-s Diffusive Flux (F_i)
Benzene	0.0894	25	0.0018	7.15×10^{-7}
Toluene	0.0804	350	0.0668	1.06×10^{-5}
Ethylbenzene	0.0736	1400	0.0568	4.48×10^{-5}
Xylenes	0.0736	1912	0.0371	6.12×10^{-5}
1,2,4 trimethylbenzene	0.0645	385	0.0230	1.22×10^{-5}
1,3,5 trimethylbenzene	0.0645	385	0.0101	1.22×10^{-5}
Others	0.07	2500	16.921	7.98×10^{-5}

Table IV – Raffinate Pond Data and Calculated Chemical Diffusive Fluxes

Component	cm^2/s Diffusivity (D_i)	ppmv Concentration at Surface (C_i^0)	ppmv Concentration at 1-meter (C_i^1)	G/m^2-s Diffusive Flux (F_i)
Benzene	0.0894	25	0.0011	7.15×10^{-7}
Toluene	0.0804	350	0.0645	1.06×10^{-5}
Ethylbenzene	0.0736	1400	0.001	4.48×10^{-5}
Xylenes	0.0736	1912	0.00198	6.12×10^{-5}
1,2,4 trimethylbenzene	0.0645	385	0.0022	1.22×10^{-5}
1,3,5 trimethylbenzene	0.0645	385	0.00103	1.22×10^{-5}
Others	0.07	2500	3.983	8.02×10^{-5}

These calculated annual fluxes would produce the emissions shown in Table V per year for San Manuel. The emissions per year for the settler ponds are calculated for 12 ponds of 298.8 square meters. In considering the effect of partial enclosure on the evaporative loss rate of VOCs from the settler tanks, it was conservatively estimated that approximately 66 percent of the headspace in each tank is affected by the enclosure. It was also assumed that the enclosure allows only 50 percent of the affected headspace to vent to the atmosphere. Thus, it was assumed that only 33 percent of the potential-to-emit occurs from the partially enclosed tanks. The raffinate pond has a surface area of 447 square meters.

Table V – Yearly Emissions at San Manuel

Component	G/m^2-s Diffusive Flux (F_i)	Settler Tanks Uncontrolled Tons/Year	Settler Tanks Controlled Tons/Year	Raffinate Pond Uncontrolled Tons/Year
Benzene	7.15×10^{-7}	0.09	0.03	0.011
Toluene	1.06×10^{-5}	1.32	0.44	0.164
Ethylbenzene	4.48×10^{-5}	5.31	1.77	0.662
Xylenes	6.12×10^{-5}	7.25	2.42	0.904
1,2,4 trimethylbenzene	1.22×10^{-5}	1.42	0.47	0.177
1,3,5 trimethylbenzene	1.22×10^{-5}	1.42	0.47	0.177
Others	8.02×10^{-5}	9.94	3.31	1.246
	Total:	26.74	2.23	3.341

The raffinate pond, since it is an uncontrolled source, would appear to be a major source of emissions. However, the number shown above may be an overstatement of the raffinate pond emissions since it assumes that the diluent in the raffinate pond has the same composition as fresh diluent. This may not be the case since it is known that raffinate reclaim must be treated before it can be reused. Analyses for the constituents of interest on representative samples of raffinate organic could be conducted to test the hypothesis.

CONCLUSIONS

There are many possible loss mechanisms for organic phases from SX plants besides evaporative losses. Chemical and biological degradation will not only destroy diluent and extractant molecules but also enhance losses due to entrainment and solubility of the organic phase into the aqueous phase. Formation of the solid-aqueous-organic gunk phase is also a loss mechanism.

From the examination of monthly use versus weather data, evaporative losses do not appear to be a linked to climatological changes. This suggests that diluent losses are not linked to evaporation. Despite an approximately 30° C (60° F) difference in temperature between the average temperature from winter to summer, no obvious trend between usage and mean daily temperature appears to exist for dessert Southwest SX plants. Nor did air samples taken from above the settlers show a correlation between temperature and quantity.

The Diffusive Flux Model should be considered as a method to quantify evaporative losses for any VOC. With diffusivity numbers and concentration data, diffusive fluxes can be determined for chemical species of interest. Such methods as the Fuller, Schettler, and Giddings Method can derive the diffusivity for a particular chemical from fundamental numbers. Careful sampling and analyses of the air above a settler tank can provide the needed concentration data. The Diffusive Flux number obtained can then be used to calculate emissions for a given chemical.

REFERENCES

1. H. Beyer and W. Walter, Handbook of Organic Chemistry, Prentice Hall, New York, NY, USA, 1996, 197.

2. Ronald M. Atlas, Ed., Petroleum Microbiology, Macmillan Publishing Company, New York, NY, USA, 1984, 20-26.

3. M.D. Bishop, "Solvent Extraction Diluents What Are They And How Do They Affect SX Plant Costs?", Paper Presented at Randall Hydromet Roundtable, November 1998, Vancouver, B.C., Canada

APPENDIX D3

EPA TANKS PROGRAM OUTPUT FILES

C7 DISTRIBUTION TANK

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Rosemont - C7 Distribution Tank
City:	
State:	Arizona
Company:	Rosemont Copper Company
Type of Tank:	Vertical Fixed Roof Tank
Description:	

Tank Dimensions

Shell Height (ft):		14.00
Diameter (ft):		12.00
Liquid Height (ft) :		13.50
Avg. Liquid Height (ft):		13.50
Volume (gallons):		11,421.40
Turnovers:		37.71
Net Throughput(gal/yr):		430,735.25
Is Tank Heated (y/n):	N	

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone	
Height (ft)		0.00
Slope (ft/ft) (Cone Roof)		0.00

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig)	0.00

Meterological Data used in Emissions Calculations: Tucson, Arizona (Avg Atmospheric Pressure = 13.41 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Rosemont - C7 Distribution Tank - Vertical Fixed Roof Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
C7 - Flomin C4343 Collector	All	70.84	63.74	77.95	68.42	0.3752	0.2962	0.4775	248.2550			248.26	Option 1: VP70 = .3631005 VP80 = .507017

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Rosemont - C7 Distribution Tank - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
C7 - Flomin C4343 Collector	919.17	22.57	941.73

MIBC STORAGE TANK

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	Rosemont - MIBC Storage Tank
City:	
State:	Arizona
Company:	Rosemont Copper Company
Type of Tank:	Vertical Fixed Roof Tank
Description:	
Tank Dimensions	
Shell Height (ft):	14.00
Diameter (ft):	12.00
Liquid Height (ft) :	13.50
Avg. Liquid Height (ft):	13.50
Volume (gallons):	11,421.40
Turnovers:	15.54
Net Throughput(gal/yr):	177,488.55
Is Tank Heated (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good
Roof Characteristics	
Type:	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.00
Breather Vent Settings	
Vacuum Settings (psig):	0.00
Pressure Settings (psig)	0.00

Meterological Data used in Emissions Calculations: Tucson, Arizona (Avg Atmospheric Pressure = 13.41 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Rosemont - MIBC Storage Tank - Vertical Fixed Roof Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methyl Isobutyl Carbinol	All	70.84	63.74	77.95	68.42	0.0682	0.0514	0.0911	102.1760			102.18	Option 1: VP70 = .065495 VP80 = .097729

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Rosemont - MIBC Storage Tank - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl Isobutyl Carbinol	29.45	1.43	30.88

DIESEL FUEL STORAGE TANK – HEAVY VEHICLES 1 AND 2

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Rosemont - Diesel Fuel ST - Heavy Vehicles
City:	
State:	Arizona
Company:	Rosemont Copper Company
Type of Tank:	Vertical Fixed Roof Tank
Description:	

Tank Dimensions

Shell Height (ft):		20.00
Diameter (ft):		30.00
Liquid Height (ft) :		19.00
Avg. Liquid Height (ft):		19.00
Volume (gallons):		100,466.02
Turnovers:		67.19
Net Throughput(gal/yr):		6,750,010.33
Is Tank Heated (y/n):	N	

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone	
Height (ft)		0.00
Slope (ft/ft) (Cone Roof)		0.00

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig)	0.00

Meterological Data used in Emissions Calculations: Tucson, Arizona (Avg Atmospheric Pressure = 13.41 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Rosemont - Diesel Fuel ST - Heavy Vehicles - Vertical Fixed Roof Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	70.84	63.74	77.95	68.42	0.0093	0.0074	0.0114	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
1,2,4-Trimethylbenzene						0.0312	0.0237	0.0407	120.1900	0.0100	0.0488	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.5658	1.2942	1.8828	78.1100	0.0000	0.0020	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Ethylbenzene						0.1568	0.1235	0.1975	106.1700	0.0001	0.0032	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.5196	2.1071	2.9958	86.1700	0.0000	0.0004	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4589	0.3705	0.5644	92.1300	0.0003	0.0229	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						0.0079	0.0071	0.0075	134.5118	0.9866	0.8634	189.60	
Xylene (-m)						0.1310	0.1029	0.1655	106.1700	0.0029	0.0594	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Rosemont - Diesel Fuel ST - Heavy Vehicles - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	118.54	2.94	121.47
Hexane (-n)	0.05	0.00	0.05
Benzene	0.23	0.01	0.24
Toluene	2.72	0.07	2.79
Ethylbenzene	0.38	0.01	0.39
Xylene (-m)	7.04	0.17	7.21
1,2,4-Trimethylbenzene	5.78	0.14	5.92
Unidentified Components	102.34	2.53	104.88

APPENDIX E

EMISSION TABLES

Process Code	Process Description	SCC Code	Emission Factors				Prod. Rate Units	Particulate Matter Emission Factor Inputs *																					Reference
			PM	PM_{10}	$PM_{2.5}$	Units		k (PM)	k (PM_{10})	k ($PM_{2.5}$)	A (ft^2)	U (mph)	M (%)	W (tons)	s (%)	S (mph)	P (days/yr)	a (PM)	a (PM_{10})	a ($PM_{2.5}$)	b (PM)	b (PM_{10})	b ($PM_{2.5}$)	u^*	u^*_t	e	f (%)	PE	
Drilling	Drilling	3-05-020-10	1.30	0.43	0.08	lb/hole	holes	1	0.33	0.06																			AP-42, Section 11.9, Table 11.9-4 (10/98)
Blast	Blasting	3-05-020-09	328.26	170.69	9.85	lb/blast	blasts	1	0.52	0.03	81,920																		AP-42, Section 11.9, Table 11.9-1 (10/98)
Loading	Loading	3-03-024-08	0.0007	0.0003	0.00005	lb/ton	tons	0.74	0.35	0.053		4.14	4																AP-42, Section 13.2.4, Expression 1 (11/06)
HaulingHD	Haul Trucks - Hourly/Daily	3-05-020-11	21.25	5.46	0.55	lb/VMT	VMT	4.9	1.5	0.15				305	5.0			0.7	0.9	0.9	0.45	0.45	0.45						AP-42, Section 13.2.2, Expression 1a (11/06)
HaulingA	Haul Trucks - Annual	3-05-020-11	17.70	4.55	0.45	lb/VMT	VMT	4.9	1.5	0.15				305	5.0		61	0.7	0.9	0.9	0.45	0.45	0.45						AP-42, Section 13.2.2, Expressions 1a and 2 (11/06)
Bldzrs	Bulldozers	3-05-010-99	2.82	0.43	0.30	lb/hr	hrs	5.7	0.75	0.60			4		2.5			1.2	1.5	1.2	1.3	1.4	1.3						AP-42, Section 11.9, Table 11.9-1 (10/98)
SupVehH	Support Vehicular Traffic - Hourly	3-05-010-99	9.10	2.34	0.23	lb/VMT	VMT	4.9	1.5	0.15				46.4	5.0			0.7	0.9	0.9	0.45	0.45	0.45						AP-42, Section 13.2.2, Expression 1a (11/06)
SupVehD	Support Vehicular Traffic - Daily	3-05-010-99	8.99	2.31	0.23	lb/VMT	VMT	4.9	1.5	0.15				45.1	5.0			0.7	0.9	0.9	0.45	0.45	0.45						AP-42, Section 13.2.2, Expression 1a (11/06)
SupVehA	Support Vehicular Traffic - Annual	3-05-010-99	7.48	1.92	0.19	lb/VMT	VMT	4.9	1.5	0.15				45.1	5.0		61	0.7	0.9	0.9	0.45	0.45	0.45						AP-42, Section 13.2.2, Expressions 1a and 2 (11/06)
WtrTrksHD	Water Trucks - Hourly/Daily	3-05-010-99	17.06	4.38	0.44	lb/VMT	VMT	4.9	1.5	0.15				187.4	5.0			0.7	0.9	0.9	0.45	0.45	0.45						AP-42, Section 13.2.2, Expression 1a (11/06)
WtrTrksA	Water Trucks - Annual	3-05-010-99	14.21	3.65	0.37	lb/VMT	VMT	4.9	1.5	0.15				187.4	5.0		61	0.7	0.9	0.9	0.45	0.45	0.45						AP-42, Section 13.2.2, Expressions 1a and 2 (11/06)
Graders	Graders	3-05-010-99	1.99	0.70	0.06	lb/VMT	VMT	1	0.60	0.031						4.78		0.040	0.051	0.040	2.5	2.0	2.5						AP-42, Section 11.9, Table 11.9-1 (10/98)
TrMlyCncPrt	Molybdnum Concentrate Transfer (Protected)	3-03-024-08	0.00002	0.00001	0.000002	lb/ton	tons	0.74	0.35	0.053		1.3	15																AP-42, Section 13.2.4, Expression 1 (11/06)
DTrMlyCncPrt	Dried Molybdenum Concentrate Transfer (Protected)	3-03-024-08	0.00004	0.00002	0.000003	lb/ton	tons	0.74	0.35	0.053		1.3	10																AP-42, Section 13.2.4, Expression 1 (11/06)
DTrMlyCnc	Dried Molybdenum Concentrate Transfer (Unprotected)	3-03-024-08	0.0003	0.0002	0.00002	lb/ton	tons	0.74	0.35	0.053		6.21	10																AP-42, Section 13.2.4, Expression 1 (11/06)
TrCuCncPrt	Copper Concentrate Transfer (Protected)	3-03-024-08	0.00004	0.00002	0.000003	lb/ton	tons	0.74	0.35	0.053		1.3	10																AP-42, Section 13.2.4, Expression 1 (11/06)
TrCuCnc	Copper Concentrate Loadout	3-03-024-08	0.0003	0.0002	0.00002	lb/ton	tons	0.74	0.35	0.053		6.21	10																AP-42, Section 13.2.4, Expression 1 (11/06)
FiltTailPrt	Filtered Tailings Transfer (Protected)	3-03-024-08	0.00002	0.00001	0.000002	lb/ton	tons	0.74	0.35	0.053		1.3	15																AP-42, Section 13.2.4, Expression 1 (11/06)
FiltTail	Filtered Tailings Transfer (Unprotected)	3-03-024-08	0.0002	0.00009	0.00001	lb/ton	tons	0.74	0.35	0.053		6.21	15																AP-42, Section 13.2.4, Expression 1 (11/06)
CrushP	Primary Crushing - High Moisture Ore	3-03-024-05	0.02	0.009	0.003	lb/ton	tons			0.15																			AP-42, Section 11.24, Table 11.24-2 (08/82) and Appendix B.2 (09/96)
CrushS	Secondary Crushing - High Moisture Ore	3-03-024-06	0.05	0.02	0.015	lb/ton	tons			0.30																			AP-42, Section 11.24, Table 11.24-2 (08/82) and Appendix B.2 (09/96)
CrushT	Tertiary Crushing - High Moisture Ore	3-03-024-07	0.06	0.02	0.004	lb/ton	tons			0.185																			AP-42, Section 11.24, Table 11.24-2 (08/82) and 11.19.2-2 (08/04)
Screen	Screening	3-05-020-02	0.025	0.0087	0.0006	lb/ton	tons			0.068																			AP-42, Section 11.19, Table 11.19.2-2 (08/04)
MolyDry	Drying of High Moisture Ore	3-03-024-11	19.70	12.00	5.91	lb/ton	tons			0.30																			AP-42, Section 11.24, Table 11.24-2 (08/82) and Appendix B.2 (09/96)
TrStnPrt	Material Transfer (Protected)	3-03-024-08	0.0002	0.00007	0.00001	lb/ton	tons	0.74	0.35	0.053		1.3	4																AP-42, Section 13.2.4, Expression 1 (11/06)
TrStnUnp	Material Transfer (Unprotected)	3-03-024-08	0.001	0.0006	0.00009	lb/ton	tons	0.74	0.35	0.053		6.21	4																AP-42, Section 13.2.4, Expression 1 (11/06)
LimeLd	Lime Product Loading, Enclosed Truck	3-05-016-26	0.61	0.61	0.61	lb/ton	tons																						AP-42, Section 11.17, Table 11.17-4 (02/98)
ReagTr	Miscellaneous Reagent Material Transfer	3-03-024-04	0.008	0.004	0.0006	lb/ton	tons	0.74	0.35	0.053		6.21	1																AP-42, Section 13.2.4, Expression 1 (11/06)
ICDE1	Internal Combustion Diesel Engine 37 ≤ kW > 75	2-02-001-02	0.40	0.40	0.40	g/kW-hr	hours	1	1	1																			NSPS Emission Standard
ICDE2	Internal Combustion Diesel Engine 225 ≤ kW > 450	2-02-001-02	0.20	0.20	0.20	g/kW-hr	hours	1	1	1																			NSPS Emission Standard

Table E.1 Particulate Matter Emission Factors

Table E.1 Particulate Matter Emission Factors																													
Process Code	Process Description	SCC Code	Emission Factors				Prod. Rate Units	Particulate Matter Emission Factor Inputs [a]																					Reference
			PM	PM_{10}	$PM_{2.5}$	Units		k (PM)	k (PM_{10})	k ($PM_{2.5}$)	A (ft^2)	U (mph)	M (%)	W (tons)	s (%)	S (mph)	P (days/yr)	a (PM)	a (PM_{10})	a ($PM_{2.5}$)	b (PM)	b (PM_{10})	b ($PM_{2.5}$)	u^*	u_t^*	e	f (%)	PE	
ICDE3	Internal Combustion Diesel Engine > 560 kW	2-02-001-02	0.20	0.20	0.20	g/kW-hr	hours	1	1	1																			NSPS Emission Standard
DFB	Diesel (Distillate Oil) Fired Boiler <100 MMBtu/hr	1-02-005-03	3.30	1.65	0.40	lb/1000 gal	hours	1	0.5	0.12																			AP-42, Section 1.3, Tables 1.3-1 and 1.3-6 (09/98)
CAS	Crushing Area Scrubber	none	1.57	1.28	0.81	lb/hr	hours	1.23	1.00	0.63																			Voluntarily Accepted PM_{10} Emission Limit, PM and $PM_{2.5}$ fractions of PM_{10} emissions
SAS	Stockpile Area Scrubber	none	3.29	2.59	0.93	lb/hr	hours	1.27	1.00	0.36																			Voluntarily Accepted PM_{10} Emission Limit, PM and $PM_{2.5}$ fractions of PM_{10} emissions
RTS	Reclaim Tunnel Scrubber	none	1.36	1.07	0.39	lb/hr	hours	1.27	1.00	0.36																			Voluntarily Accepted PM_{10} Emission Limit, PM and $PM_{2.5}$ fractions of PM_{10} emissions
PCAS	Pebble Crusher Area Scrubber	none	2.29	1.56	0.69	lb/hr	hours	1.47	1.00	0.44																			Voluntarily Accepted PM_{10} Emission Limit, PM and $PM_{2.5}$ fractions of PM_{10} emissions
CCS	Copper Concentrate Scrubbers	none	4.51	3.55	1.28	lb/hr	hours	1.27	1.00	0.36																			Voluntarily Accepted PM_{10} Emission Limit, PM and $PM_{2.5}$ fractions of PM_{10} emissions
MS/EP	Molybdenum Scrubber / Electrostatic Precipitator	none	0.02	0.02	0.02	lb/hr	hours	1.01	1.00	0.95																			Voluntarily Accepted PM_{10} Emission Limit, PM and $PM_{2.5}$ fractions of PM_{10} emissions
MDC	Molybdenum Dust Collector	none	0.021	0.010	0.002	gr/dscf	dscf	2.11	1.00	0.15																			Voluntarily Accepted PM_{10} Emission Limit, PM and $PM_{2.5}$ fractions of PM_{10} emissions
LDC	Laboratory Dust Collectors	none	0.007	0.005	0.003	gr/dscf	dscf	1.43	1.00	0.66																			Voluntarily Accepted PM_{10} Emission Limit, PM and $PM_{2.5}$ fractions of PM_{10} emissions
WindROM	Wind Erosion - Run of Mine Stockpile	3-03-888-01	0.21	0.11	0.02	ton/acre-yr	acres	1	0.5	0.075					2.5											38	4.77	22	FDEMI[b] (07/83), p. 51-57, MRI Equation, AP-42, Section 13.2.5 (11/06) and Table 13.2.4-1 (11/06)
WindCvd	Wind Erosion - Covered Stockpile	3-03-888-01	0	0	0	ton/acre-yr	acres																						Assumed
TailStrg	Wind Erosion - Tailings Storage	3-03-888-01	0.02	0.01	0.002	ton/acre-yr	acres	1	0.5	0.075														0.57	0.43				AP-42, Section 13.2.5 (11/06)

[a] k = particle size multiplier, A = horizontal area of blasting surface, U = mean wind speed, M = material moisture content, W = mean vehicle weight, s = surface material silt content, S = mean vehicle speed, P = number of days per year with at least 0.01 inches of precipitation, a = constant based on particle size, b = constant based on particle size, u^* = friction velocity, u_t^* = threshold friction velocity, e = surface erodibility, f = percentage of time the wind speed exceeds 12 mph, PE = Thornthwaite's Precipitation-Evaporation Index

[b] FDEMI = *Fugitive Dust Emission Factors for the Mining Industry*

Table E.2 Gaseous Emission Factors

Process Code	Process Description	SCC Code	Emission Factor						Prod. Rate Units	Reference
			CO	NO_X	SO_2	VOC	H_2SO_4	Units		
Blast	Blasting	3-05-020-09	67.00	17.00	2.00	0	0	lb/tons ANFO	tons ANFO	AP-42 Section 13.3, Table 13.3-1 (02/80)
SX	Solvent Extraction Mixers and Settlers	4-90-001-99	0	0	0	9.43E-05	0	lb/hr-ft^2	hours	Hydrometallurgy of Copper (Control Efficiency of 66%)
EW	Electrowining Tankhouse	none	0	0	0	0	1.57E-04	lb/hr-ft^2	hours	Applied Environmental Consultants - Report[a]
ICDE1	Internal Combustion Diesel Engine 37 ≤ kW > 75	2-02-001-02	5.0	4.4	0.0066	0.3	0	g/kW-hr	hours	NSPS Emission Standard, Complete Sulfur Conversion[b]
ICDE2	Internal Combustion Diesel Engine 225 ≤ kW > 450	2-02-001-02	3.5	3.7	0.0066	0.3	0	g/kW-hr	hours	NSPS Emission Standard, Complete Sulfur Conversion[b]
ICDE3	Internal Combustion Diesel Engine > 560 kW	2-02-001-02	3.5	6.0	0.0066	0.40	0	g/kW-hr	hours	NSPS Emission Standard, Complete Sulfur Conversion[b]
DFB	Diesel (Distillate Oil) Fired Boiler <100 MMBtu/hr	1-02-005-03	5.00	20.00	0.21	0.20	0	lb/1000 gal	hours	AP-42, Section 1.3 Tables 1.3-1 and 1.3-3 (09/98)[b]
C7DT	C7 Distribution Tank	4-03-010-19	0	0	0	1.08E-01	0	lb/hr	hours	EPA Tanks Program 4.0[c]
MST	MIBC Storage Tank	4-90-999-98	0	0	0	3.53E-03	0	lb/hr	hours	EPA Tanks Program 4.0[c]
DFSTHV	Diesel Fuel Storage Tank - Heavy Vehicles	4-03-010-19	0	0	0	1.39E-02	0	lb/hr	hours	EPA Tanks Program 4.0[c]

[a] "Measurement of Sulfuric Acid Mist Emissions from the Cyprus Twin Buttes Copper Company Electrowinning Tankhouse" (02/93).

[b] SO_2 emissions are calculated using a sulfur content of 0.0015% for diesel fuel.

[c] Assumes continuous operation.

Table E.3 Particulate Matter Control Efficiencies				
Control Code	Control Description	Pick-up Efficiency (%)	Control Efficiency (%)	Reference
CAS	Crushing Area Scrubber (PC-CAS)	100.0%	--	Assumed
SAS	Stockpile Area Scrubber (PC-SAS)	100.0%	--	Assumed
RTS	Reclaim Tunnel Scrubber (PC-RTS)	100.0%	--	Assumed
PCAS	Pebble Crusher Area Scrubber (PC-PCAS)	100.0%	--	Assumed
CCS	Copper Concentrate Scrubbers (PC-CCS1/CCS2)	100.0%	--	Assumed
MS/EP	Molybdenum Scrubber (PC-MS) / Electrostatic Precipitator (PC-EP)	100.0%	--	Assumed
BPLSV	Bulk Pebble Lime Silo Bin Vent (PC-BPLBV)	100.0%	90%	Vendor Specification
LSV	Lime Storage Bin Vent (PC-LSBV)	100.0%	90%	Vendor Specification
SMSV	Sodium Metasilicate Storage Bin Vent (PC-SMSBV)	100.0%	90%	Vendor Specification
CVS	EW Cell Ventilation Scrubbers (PC-CVS)	100.0%	99%	Engineering Design
MDC	Molybdenum Dust Collector (PC-MDC)	100.0%	--	Assumed
HaulRdU	Road Watering	N/A	90.0%	*Control of Open Fugitive Dust Sources* (09/88) [a]
HaulRdWT	Road Watering - Water Trucks	N/A	95.0%	*Control of Open Fugitive Dust Sources* (09/88) [a]
Water	Addition of Process Water	N/A	100.0%	Assumed
WSpry	Water Spray at Unprotected Points	N/A	82.5%	Average Value of AP-42, p. 11.19.1-5 (11/95)
Wet	Wet Process	N/A	100%	Assumed
Clean	Wet, Cleaned Ore (no fines)	N/A	100%	Assumed
Enclosed	Totally Enclosed Transfer Point	N/A	100%	Assumed
UndrGrd	Underground Transfer Point	N/A	100%	Assumed
None	No Pollution Controls	0.0%	0.0%	Assumed

[a] EPA Document gives methods for calculating efficiencies - pages 5-9 to 5-14

Table E.4 Annual Particulate Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors			EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (tpy)		PM_{10} Emissions (tpy)		$PM_{2.5}$ Emissions (tpy)	
							PM	PM_{10}	$PM_{2.5}$				Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
Mining																		
MN01	Drilling	Drilling	3-05-020-10	F	27,840	holes	1.30	0.43	0.08	lb/hole	None	0%	18.10	18.10	6.03	6.03	1.12	1.12
MN02	Blasting	Blast	3-05-020-09	F	348	blasts	328.26	170.69	9.85	lb/blast	None	0%	57.12	57.12	29.70	29.70	1.71	1.71
MN03	Loading Concentrate Ore	Loading	3-03-024-08	F	27,375,000	tons	0.0007	0.0003	0.00005	lb/ton	None	0%	9.60	9.60	4.54	4.54	0.69	0.69
MN04	Loading Leach Ore	Loading	3-03-024-08	F	1,825,000	tons	0.0007	0.0003	0.00005	lb/ton	None	0%	0.64	0.64	0.30	0.30	0.05	0.05
MN05	Loading Waste Rock	Loading	3-03-024-08	F	80,300,000	tons	0.0007	0.0003	0.00005	lb/ton	None	0%	28.16	28.16	13.32	13.32	2.02	2.02
MN06	Hauling Concentrate Ore to Primary Crusher Dump Hopper / Run of Mine Stockpile	HaulingA	3-05-020-11	F	589,185	VMT	17.70	4.55	0.45	lb/VMT	HaulRdU	90%	5,212.92	521.29	1,339.47	133.95	133.95	13.39
MN07	Hauling Leach Ore to Leach Pad	HaulingA	3-05-020-11	F	29,239	VMT	17.70	4.55	0.45	lb/VMT	HaulRdU	90%	258.69	25.87	66.47	6.65	6.65	0.66
MN08	Hauling Waste Rock to Waste Rock Storage Area	HaulingA	3-05-020-11	F	2,178,198	VMT	17.70	4.55	0.45	lb/VMT	HaulRdU	90%	19,272.00	1,927.20	4,951.99	495.20	495.20	49.52
MN09	Unloading Concentrate Ore to Run of Mine Stockpile	TrStnUnp	3-03-024-06	F	2,737,500	tons	0.001	0.0006	0.00009	lb/ton	None	0%	1.63	1.63	0.77	0.77	0.12	0.12
MN10	Unloading Leach Ore to Leach Pad	TrStnUnp	3-03-024-06	F	1,825,000	tons	0.001	0.0006	0.00009	lb/ton	None	0%	1.08	1.08	0.51	0.51	0.08	0.08
MN11	Unloading Waste Rock to Waste Rock Storage Area	TrStnUnp	3-03-024-06	F	80,300,000	tons	0.001	0.0006	0.00009	lb/ton	None	0%	47.71	47.71	22.57	22.57	3.42	3.42
MN12	Bulldozer Use	Bldzrs	3-05-010-99	F	55,170	hrs	2.82	0.43	0.30	lb/hr	None	0%	77.87	77.87	11.74	11.74	8.18	8.18
MN13	Water Truck Use	WtrTrksA	3-05-010-99	F	143,000	VMT	14.21	3.65	0.37	lb/VMT	HaulRdWT	95%	1,016.19	50.81	261.11	13.06	26.11	1.31
MN14	Grader Use	Graders	3-05-010-99	F	87,000	VMT	1.99	0.70	0.06	lb/VMT	None	0%	86.69	86.69	30.35	30.35	2.69	2.69
MN15	Support Vehicle Use	SupVehA	3-05-010-99	F	512,393	VMT	7.48	1.92	0.19	lb/VMT	HaulRdU	90%	1,917.26	191.73	492.64	49.26	49.26	4.93
Primary Crushing, Conveying, Coarse Ore Storage, and Reclaim Conveying																		
PC01	Wind Erosion of the Run of Mine Stockpile	WindROM	3-03-888-01	F	26	acres	0.21	0.11	0.02	ton/acre-yr	None	0%	5.43	5.43	2.72	2.72	0.41	0.41
PC02	Unloading to Primary Crusher Dump Hopper (H-CDp) from Haul Trucks or Run of Mine Stockpile	TrStnUnp	3-03-024-08	F	27,375,000	tons	0.001	0.0006	0.00009	lb/ton	WSpry	82.5%	16.27	2.85	7.69	1.35	1.16	0.20
PC03	Primary Crusher (PCr)	CrushP	3-03-024-05	NF	27,375,000	tons	0.02	0.009	0.003	lb/ton	CAS	100.0%	273.75	0	123.19	0	41.06	0
PC04	Primary Crusher (PCr) to Crusher Discharge Hopper (H-CDs)	TrStnPrt	3-03-024-06	NF	27,375,000	tons	0.0002	0.00007	0.00001	lb/ton	Enclosed	100%	2.13	0	1.01	0	0.15	0
PC05	Crusher Discharge Hopper (H-CDs) to Crusher Discharge Feeder (F-CD)	TrStnPrt	3-03-024-06	NF	27,375,000	tons	0.0002	0.00007	0.00001	lb/ton	CAS	100%	2.13	0	1.01	0	0.15	0
PC06	Crusher Discharge Feeder (F-CD) to Stockpile Feed Conveyor (CV-SF)	TrStnPrt	3-03-024-08	NF	27,375,000	tons	0.0002	0.00007	0.00001	lb/ton	CAS	100%	2.13	0	1.01	0	0.15	0
PC07	Stockpile Feed Conveyor (CV-SF) to Stockpile Tripper Conveyor (CV-ST)	TrStnPrt	3-03-024-08	NF	27,375,000	tons	0.0002	0.00007	0.00001	lb/ton	SAS	100%	2.13	0	1.01	0	0.15	0
PC08	Stockpile Tripper Conveyor (CV-ST) to Covered Coarse Ore Stockpile	TrStnPrt	3-03-024-06	F	27,375,000	tons	0.0002	0.00007	0.00001	lb/ton	SAS	100%	2.13	0	1.01	0	0.15	0
PC09	Wind Erosion of the Coarse Ore Stockpile	WindCvd	3-03-888-01	F	5	acres	0	0	0	ton/acre-yr	Enclosed	100%	0	0	0	0	0	0
PC10	Coarse Ore Stockpile to Reclaim Feeders (F-R1/R4)	TrStnPrt	3-03-024-08	NF	27,375,000	tons	0.0002	0.00007	0.00001	lb/ton	UndrGrd	100%	2.13	0	1.01	0	0.15	0
PC11	Reclaim Feeders (F-R1/R4) to Reclaim Conveyor (CV-R)	TrStnPrt	3-03-024-08	NF	27,375,000	tons	0.0002	0.00007	0.00001	lb/ton	RTS	100%	2.13	0	1.01	0	0.15	0
PC12	Reclaim Conveyor (CV-R) to SAG Mill Feed Conveyor (CV-SMF)	TrStnPrt	3-03-024-08	NF	27,375,000	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	2.13	0	1.01	0	0.15	0
PC13	Pebble Conveyor No. 3 (CV-Pb3) to SAG Mill Feed Conveyor (CV-SMF)	TrStnPrt	3-03-024-08	NF	6,979,913	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.54	0	0.26	0	0.04	0

Table E.4 Annual Particulate Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors			EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (tpy)		PM_{10} Emissions (tpy)		$PM_{2.5}$ Emissions (tpy)	
							PM	PM_{10}	$PM_{2.5}$				Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
PC14	SAG Mill Feed Conveyor (CV-SMF) to SAG Mill (M-SAG)	TrStnPrt	3-03-024-08	NF	34,392,713	tons	0.0002	0.00007	0.00001	lb/ton	Water	100%	2.68	0	1.27	0	0.19	0
Milling																		
M01	SAG Mill (M-SAG)	CrushS	3-03-024-06	NF	34,392,713	tons	0.05	0.02	0.015	lb/ton	Wet	100%	859.82	0	343.93	0	257.95	0
M02	SAG Mill (M-SAG) to Trommel Screen (Sn-T)	TrStnPrt	3-03-024-08	NF	34,392,713	tons	0.0002	0.00007	0.00001	lb/ton	Enclosed	100%	2.68	0	1.27	0	0.19	0
M03	Trommel Screen (Sn-T)	Screen	3-05-020-02	NF	34,392,713	tons	0.025	0.0087	0.0006	lb/ton	Wet	100%	429.91	0	149.61	0	10.11	0
M04	Trommel Screen (Sn-T) to Pebble Conveyor No. 1 (CV-Pb1)	TrStnPrt	3-03-024-08	NF	7,308,034	tons	0.0002	0.00007	0.00001	lb/ton	Clean	100%	0.57	0	0.27	0	0.04	0
M05	Pebble Conveyor No. 1 (CV-Pb1) to Pebble Wash Screen (Sn-PbW)	TrStnPrt	3-03-024-08	NF	7,308,034	tons	0.0002	0.00007	0.00001	lb/ton	Clean	100%	0.57	0	0.27	0	0.04	0
M06	Pebble Wash Screen (Sn-PbW)	Screen	3-05-020-02	NF	7,308,034	tons	0.025	0.0087	0.0006	lb/ton	Wet	100%	91.35	0	31.79	0	2.15	0
M07	Pebble Wash Screen (Sn-PbW) to Pebble Conveyor No. 2	TrStnPrt	3-03-024-08	NF	6,979,913	tons	0.0002	0.00007	0.00001	lb/ton	Clean	100%	0.54	0	0.26	0	0.04	0
M08	Pebble Conveyor No. 2 (CV-Pb2) to SAG Oversize Surge Bin (B-SAGOS)	TrStnPrt	3-03-024-08	NF	6,979,913	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.54	0	0.26	0	0.04	0
M09	SAG Oversize Surge Bin (B-SAGOS) to Pebble Crusher Feeder (F-PbC)	TrStnPrt	3-03-024-08	NF	6,979,913	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.54	0	0.26	0	0.04	0
M10	Pebble Crusher Feeder (F-PbC) to Pebble Crusher (PbC)	TrStnPrt	3-03-024-08	NF	6,979,913	tons	0.0002	0.00007	0.00001	lb/ton	Enclosed	100%	0.54	0	0.26	0	0.04	0
M11	Pebble Crusher (PbC)	CrushT	3-03-024-07	NF	6,979,913	tons	0.06	0.02	0.004	lb/ton	PCAS	100%	209.40	0	69.80	0	12.93	0
M12	Pebble Crusher (PbC) to Pebble Conveyor No. 3 (CV-Pb3)	TrStnPrt	3-03-024-08	NF	6,979,913	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.54	0	0.26	0	0.04	0
Copper Concentrate Dewatering and Stacking																		
CCD01	Copper Concentrate Filters (Ft-CC1/CC4) to Copper Concentrate Conveyor (CV-CC)	TrCuCncPrt	3-03-024-08	NF	435,200	tons	0.00004	0.00002	0.000003	lb/ton	Enclosed	100%	0.009	0	0.004	0	0.0007	0
CCD02	Copper Concentrate Conveyor (CV-CC) to Copper Concentrate Loadout Stockpile	TrCuCncPrt	3-03-024-08	F	435,200	tons	0.00004	0.00002	0.000003	lb/ton	CCS	100%	0.009	0	0.004	0	0.0007	0
CCD03	Wind Erosion of Copper Concentrate Loadout Stockpile	WindCvd	3-03-888-01	F	1.17	acres	0	0	0	ton/acre-yr	Enclosed	100%	0	0	0	0	0	0
CCD04	Copper Concentrate Loadout Stockpile to Shipment Truck via Front End Loaders	TrCuCncPrt	3-03-024-08	F	435,200	tons	0.00004	0.00002	0.000003	lb/ton	CCS	100%	0.009	0	0.004	0	0.0007	0
Molybdenum Dewatering and Packaging																		
MD01	Molybdenum Concentrate Filter (Ft-MC) to Molybdenum Concentrate Dryer (D-MC)	TrMlyCncPrt	3-03-024-08	NF	6,000	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.00007	0	0.00003	0	0.000005	0
MD02	Molybdenum Concentrate Dryer	MolyDry	3-03-024-11	NF	6,000	tons	19.70	12.00	5.91	lb/ton	MS/EP	100%	59.10	0	36.00	0	17.73	0
MD03	Molybdenum Concentrate Dryer (D-MC) to Molybdenum Concentrate Bin (B-MC)	DTrMlyCncPrt	3-03-024-08	NF	6,000	tons	0.00004	0.00002	0.000003	lb/ton	MDC	100%	0.0001	0	0.00006	0	0.000009	0
MD04	Molybdenum Concentrate Bin (B-MC) to Molybdenum Concentrate Hopper (H-MC)	DTrMlyCnc	3-03-024-08	NF	6,000	tons	0.0003	0.0002	0.00002	lb/ton	None	0%	0.001	0.001	0.0005	0.0005	0.00007	0.00007
MD05	Molybdenum Concentrate Hopper (H-MC) to Molybdenum Concentrate Conveyor (CV-MC)	DTrMlyCncPrt	3-03-024-08	NF	6,000	tons	0.00004	0.00002	0.000003	lb/ton	Enclosed	100%	0.0001	0	0.00006	0	0.000009	0
MD06	Molybdenum Concentrate Conveyor (CV-MC) to Molybdenum Packaging and Weigh System (MPS)	DTrMlyCnc	3-03-024-08	NF	6,000	tons	0.0003	0.0002	0.00002	lb/ton	MDC	100%	0.001	0	0.0005	0	0.00007	0
Tailings Dewatering and Placement																		
TDS01	Tailings Filters (Ft-T1/T14) to Tailings Belt Feeders (F-T1/T14)	FltTailPrt	3-03-024-08	NF	33,812,400	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.41	0	0.20	0	0.03	0
TDS02	Tailings Belt Feeders (F-T1/T14) to Fixed Tailings Conveyor No. 1 (CV-F1)	FltTailPrt	3-03-024-08	NF	33,812,400	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.41	0	0.20	0	0.03	0
TDS03	Fixed Tailings Conveyor No. 1 (CV-F1) to Fixed Tailings Conveyor No. 2 (CV-F2)	FltTailPrt	3-03-024-08	NF	33,812,400	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.41	0	0.20	0	0.03	0

Table E.4 Annual Particulate Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors PM	Emission Factors PM_{10}	Emission Factors $PM_{2.5}$	EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (tpy) Uncontrolled	PM Emissions (tpy) Controlled	PM_{10} Emissions (tpy) Uncontrolled	PM_{10} Emissions (tpy) Controlled	$PM_{2.5}$ Emissions (tpy) Uncontrolled	$PM_{2.5}$ Emissions (tpy) Controlled
TDS04	Fixed Tailings Conveyor No. 2 (CV-F2) to Fixed Tailings Conveyor No. 3 (CV-F3)	FiltTailPrt	3-03-024-08	NF	33,812,400	tons	0.00002	0.00001	0.000002	lb/ton	None	0%	0.41	0.41	0.20	0.20	0.03	0.03
TDS05	Fixed Tailings Conveyor No. 3 (CV-F3) to Relocatable Conveyor (CV-R1)	FiltTailPrt	3-03-024-08	F	33,812,400	tons	0.00002	0.00001	0.000002	lb/ton	None	0%	0.41	0.41	0.20	0.20	0.03	0.03
TDS06	Relocatable Conveyor (CV-R1) to Shiftable Conveyor (CV-S1)	FiltTailPrt	3-03-024-08	F	33,812,400	tons	0.00002	0.00001	0.000002	lb/ton	None	0%	0.41	0.41	0.20	0.20	0.03	0.03
TDS07	Shiftable Conveyor (CV-S1) to Belt Wagon Conveyor (CV-BW1)	FiltTail	3-03-024-08	F	33,812,400	tons	0.0002	0.00009	0.00001	lb/ton	None	0%	3.16	3.16	1.49	1.49	0.23	0.23
TDS08	Belt Wagon Conveyor (CV-BW1) to Spreader Crawler Mounted Conveyor (CV-SP1)	FiltTail	3-03-024-08	F	33,812,400	tons	0.0002	0.00009	0.00001	lb/ton	None	0%	3.16	3.16	1.49	1.49	0.23	0.23
TDS09	Spreader Crawler Mounted Conveyor (CV-SP1) to Tailings Storage	FiltTail	3-03-024-08	F	33,812,400	tons	0.0002	0.00009	0.00001	lb/ton	None	0%	3.16	3.16	1.49	1.49	0.23	0.23
TDS10	Wind Erosion of Tailings Storage	TailStrg	3-03-888-01	F	1,500	acres	0.02	0.01	0.002	ton/acre-yr	None	0%	30.23	30.23	15.11	15.11	2.27	2.27
Fuel Burning Equipment																		
FB01	Diesel Electrowinning Hot Water Generator (HWG)	DFB	1-02-005-03	NF	8,760	hours	3.30	1.65	0.40	lb/1000 gal	None	0%	0.63	0.63	0.32	0.32	0.08	0.08
					6.0	MMBtu/hr												
FB02	Thickener Area Emergency Generator (TEG)	ICDE3	2-02-001-02	NF	500	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.11	0.11	0.11	0.11	0.11	0.11
					1,000	kW												
FB03	PLS Pond Area Emergency Generator (PEG)	ICDE3	2-02-001-02	NF	500	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.11	0.11	0.11	0.11	0.11	0.11
					1,000	kW												
FB04	Main Substation Emergency Generator (MEG)	ICDE3	2-02-001-02	NF	500	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.08	0.08	0.08	0.08	0.08	0.08
					750	kW												
FB05	Administration Building Emergency Generator (AEG)	ICDE3	2-02-001-02	NF	500	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.08	0.08	0.08	0.08	0.08	0.08
					750	kW												
FB06	Electrowinning Building Emergency Generator (EWEG)	ICDE1	2-02-001-02	NF	500	hours	0.40	0.40	0.40	g/kW-hr	None	0%	0.01	0.01	0.01	0.01	0.01	0.01
					50	kW												
FB07	Primary Crusher Fire Water Pump (PCFWP)	ICDE2	2-02-001-02	NF	500	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.03	0.03	0.03	0.03	0.03	0.03
					400	hp												
FB08	SX/EW Fire Water Pump (SXFWP)	ICDE2	2-02-001-02	NF	500	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.03	0.03	0.03	0.03	0.03	0.03
					400	hp												
Miscellaneous Sources																		
MS01	Transfer of Bulk Pebble Lime to the Bulk Pebble Lime Silo (S-BPL)	LimeLd	3-05-016-26	NF	37,800	tons	0.61	0.61	0.61	lb/ton	BPLSV	90%	11.53	1.15	11.53	1.15	11.53	1.15
MS02	Bulk Pebble Lime Silo (S-BPL) to Bulk Pebble Lime Silo Screw Conveyor (CV-BPLS)	ReagTr	3-03-024-04	NF	37,800	tons	0.008	0.004	0.0006	lb/ton	Enclosed	100%	0.16	0	0.07	0	0.01	0
MS03	Bulk Pebble Lime Silo Screw Conveyor (CV-BPLS) to SAG Mill Feed Conveyor (CV-SMF)	ReagTr	3-03-024-04	NF	37,800	tons	0.008	0.004	0.0006	lb/ton	None	0%	0.16	0.16	0.07	0.07	0.01	0.01
MS04	Transfer of Lime to the Lime Storage Bin (B-L)	LimeLd	3-05-016-26	NF	18,900	tons	0.61	0.61	0.61	lb/ton	LSV	90%	5.76	0.58	5.76	0.58	5.76	0.58
MS05	Transfer of Sodium Metasilicate to the Sodium Metasilicate Storage Bin (B-SM)	ReagTr	3-03-024-04	NF	3,000	tons	0.008	0.004	0.0006	lb/ton	SMSV	90%	0.01	0.001	0.006	0.0006	0.0009	0.00009

Table E.4 Annual Particulate Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors			EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (tpy)		PM_{10} Emissions (tpy)		$PM_{2.5}$ Emissions (tpy)	
							PM	PM_{10}	$PM_{2.5}$				Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
MS06	Transfer of Flocculant from Supersacks to Flocculant Storage Bins (B-F1/F2)	ReagTr	3-03-024-04	NF	1,100	tons	0.008	0.004	0.0006	lb/ton	None	0%	0.005	0.005	0.002	0.002	0.0003	0.0003
MS07	Transfer of Guar from Bags to Guar Feeder (F-Gu)	ReagTr	3-03-024-04	NF	150	tons	0.008	0.004	0.0006	lb/ton	None	0%	0.0006	0.0006	0.0003	0.0003	0.00004	0.00004
MS08	Transfer of Granular Cobalt Sulfate from Bags to Cobalt Sulfate Feeder (F-CoS)	ReagTr	3-03-024-04	NF	6	tons	0.008	0.004	0.0006	lb/ton	None	0%	0.00002	0.00002	0.00001	0.00001	0.000002	0.000002
Particulate Matter Pollution Control Equipment with Emission Limits																		
PCL01	Crushing Area Scrubber (PC-CAS)	CAS	none	NF	8,760	hours	1.57	1.28	0.81	lb/hr	None	0%	6.90	6.90	5.61	5.61	3.53	3.53
PCL02	Stockpile Area Scrubber (PC-SAS)	SAS	none	NF	8,760	hours	3.29	2.59	0.93	lb/hr	None	0%	14.41	14.41	11.34	11.34	4.08	4.08
PCL03	Reclaim Tunnel Scrubber (PC-RTS)	RTS	none	NF	8,760	hours	1.36	1.07	0.39	lb/hr	None	0%	5.95	5.95	4.69	4.69	1.69	1.69
PCL04	Pebble Crusher Area Scrubber (PC-PCAS)	PCAS	none	NF	8,760	hours	2.29	1.56	0.69	lb/hr	None	0%	10.04	10.04	6.83	6.83	3.01	3.01
PCL05	Copper Concentrate Scrubber 1 (PC-CCS1)	CCS	none	NF	8,760	hours	4.51	3.55	1.28	lb/hr	None	0%	18.75	19.75	15.55	15.55	5.60	5.60
PCL06	Copper Concentrate Scrubber 2 (PC-CCS2)	CCS	none	NF	8,760	hours	4.51	3.55	1.28	lb/hr	None	0%	19.75	19.75	15.55	15.55	5.60	5.60
PCL07	Molybdenum Scrubber (PC-MS) / Electrostatic Precipitator (PC-EP)	MS/EP	none	NF	8,760	hours	0.02	0.02	0.02	lb/hr	None	0%	0.09	0.09	0.09	0.09	0.08	0.08
PCL08	Molybdenum Dust Collector (PC-MDC)	MDC	none	NF	653,597,276	dscf	0.02	0.010	0.002	gr/dscf	None	0%	0.99	0.99	0.47	0.47	0.07	0.07
PCL09	Laboratory Dust Collector 1 (PC-L1)	LDC	none	NF	2,904,876,784	dscf	0.007	0.005	0.003	gr/dscf	None	0%	1.48	1.48	1.04	1.04	0.66	0.66
PCL10	Laboratory Dust Collector 2 (PC-L2)	LDC	none	NF	2,904,876,784	dscf	0.007	0.005	0.003	gr/dscf	None	0%	1.48	1.48	1.04	1.04	0.66	0.66
PCL11	Laboratory Dust Collector 3 (PC-L3)	LDC	none	NF	2,904,876,784	dscf	0.007	0.005	0.003	gr/dscf	None	0%	1.48	1.48	1.04	1.04	0.66	0.66
Total Emissions From Non-Fugitive Sources:													**2,050.71**	**65.72**	**848.24**	**66.02**	**387.38**	**28.02**
Total Emissions From Fugitive Sources:													**28,070.04**	**3,094.31**	**7,262.94**	**842.00**	**735.96**	**93.48**
Total Emissions:													**30,120.75**	**3,160.03**	**8,111.16**	**908.02**	**1,123.33**	**121.51**

Table E.5 Maximum Daily Particulate Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	Emission Factors			EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (tpd)		PM_{10} Emissions (tpd)		$PM_{2.5}$ Emissions (tpd)	
							PM	PM_{10}	$PM_{2.5}$				Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
Mining																		
MN01	Drilling	Drilling	3-05-020-10	F	160	holes	1.30	0.43	0.08	lb/hole	None	0%	0.10	0.10	0.03	0.03	0.006	0.006
MN02	Blasting	Blast	3-05-020-09	F	2	blasts	328.26	170.69	9.85	lb/blast	None	0%	0.33	0.33	0.17	0.17	0.01	0.01
MN03	Loading Concentrate Ore	Loading	3-03-024-08	F	90,000	tons	0.0007	0.0003	0.00005	lb/ton	None	0%	0.03	0.03	0.01	0.01	0.002	0.002
MN04	Loading Leach Ore	Loading	3-03-024-08	F	6,000	tons	0.0007	0.0003	0.00005	lb/ton	None	0%	0.002	0.002	0.001	0.001	0.0002	0.0002
MN05	Loading Waste Rock	Loading	3-03-024-08	F	264,000	tons	0.0007	0.0003	0.00005	lb/ton	None	0%	0.09	0.09	0.04	0.04	0.007	0.007
MN06	Hauling Concentrate Ore to Primary Crusher Dump Hopper / Run of Mine Stockpile	HaulingHD	3-05-020-11	F	1,937	VMT	21.25	5.46	0.55	lb/VMT	HaulRdU	90%	20.58	2.06	5.29	0.53	0.53	0.05
MN07	Hauling Leach Ore to Leach Pad	HaulingHD	3-05-020-11	F	96	VMT	21.25	5.46	0.55	lb/VMT	HaulRdU	90%	1.02	0.10	0.26	0.03	0.03	0.003
MN08	Hauling Waste Rock to Waste Rock Storage Area	HaulingHD	3-05-020-11	F	7,161	VMT	21.25	5.46	0.55	lb/VMT	HaulRdU	90%	76.07	7.61	19.55	1.95	1.95	0.195
MN09	Unloading Concentrate Ore to Run of Mine Stockpile	TrStnUnp	3-03-024-08	F	90,000	tons	0.001	0.0006	0.00009	lb/ton	None	0%	0.05	0.05	0.03	0.03	0.004	0.004
MN10	Unloading Leach Ore to Leach Pad	TrStnUnp	3-03-024-08	F	6,000	tons	0.001	0.0006	0.00009	lb/ton	None	0%	0.004	0.004	0.002	0.002	0.0003	0.0003
MN11	Unloading Waste Rock to Waste Rock Storage Area	TrStnUnp	3-03-024-08	F	264,000	tons	0.001	0.0006	0.00009	lb/ton	None	0%	0.16	0.16	0.07	0.07	0.01	0.01
MN12	Bulldozer Use	Bldzrs	3-05-010-99	F	151	hrs	2.82	0.43	0.30	lb/hr	None	0%	0.21	0.21	0.03	0.03	0.02	0.02
MN13	Water Truck Use	WtrTrksHD	3-05-010-99	F	470	VMT	17.06	4.38	0.44	lb/VMT	HaulRdWT	95%	4.01	0.20	1.03	0.05	0.10	0.005
MN14	Grader Use	Graders	3-05-010-99	F	238	VMT	1.99	0.70	0.06	lb/VMT	None	0%	0.24	0.24	0.08	0.08	0.007	0.007
MN15	Support Vehicle Use	SupVehD	3-05-010-99	F	1,405	VMT	8.99	2.31	0.23	lb/VMT	HaulRdU	90%	6.31	0.63	1.62	0.16	0.16	0.02
Primary Crushing, Conveying, Coarse Ore Storage, and Reclaim Conveying																		
PC01	Wind Erosion of the Run of Mine Stockpile	WindROM	3-03-888-01	F	26	acres	0.21	0.11	0.02	ton/acre-yr	None	0%	0.01	0.01	0.007	0.007	0.001	0.001
PC02	Unloading to Primary Crusher Dump Hopper (H-CDp) from Haul Trucks or Run of Mine Stockpile	TrStnUnp	3-03-024-08	F	166,800	tons	0.001	0.0006	0.00009	lb/ton	WSpry	82.5%	0.10	0.02	0.05	0.008	0.007	0.001
PC03	Primary Crusher (PCr)	CrushP	3-03-024-05	NF	166,800	tons	0.02	0.009	0.003	lb/ton	CAS	100%	1.67	0	0.75	0	0.25	0
PC04	Primary Crusher (PCr) to Crusher Discharge Hopper (H-CDs)	TrStnPrt	3-03-024-08	NF	166,800	tons	0.0002	0.00007	0.00001	lb/ton	Enclosed	100%	0.01	0	0.006	0	0.0009	0
PC05	Crusher Discharge Hopper (H-CDs) to Crusher Discharge Feeder (F-CD)	TrStnPrt	3-03-024-08	NF	166,800	tons	0.0002	0.00007	0.00001	lb/ton	CAS	100%	0.01	0	0.006	0	0.0009	0
PC06	Crusher Discharge Feeder (F-CD) to Stockpile Feed Conveyor (CV-SF)	TrStnPrt	3-03-024-08	NF	166,800	tons	0.0002	0.00007	0.00001	lb/ton	CAS	100%	0.01	0	0.006	0	0.0009	0
PC07	Stockpile Feed Conveyor (CV-SF) to Stockpile Tripper Conveyor (CV-ST)	TrStnPrt	3-03-024-08	NF	166,800	tons	0.0002	0.00007	0.00001	lb/ton	SAS	100%	0.01	0	0.006	0	0.0009	0
PC08	Stockpile Tripper Conveyor (CV-ST) to Covered Coarse Ore Stockpile	TrStnPrt	3-03-024-08	F	166,800	tons	0.0002	0.00007	0.00001	lb/ton	SAS	100%	0.01	0	0.006	0	0.0009	0
PC09	Wind Erosion of the Coarse Ore Stockpile	WindCvd	3-03-888-01	F	5	acres	0	0	0	ton/acre-yr	Enclosed	100%	0	0	0	0	0	0
PC10	Coarse Ore Stockpile to Reclaim Feeders (F-R1/R4)	TrStnPrt	3-03-024-08	NF	166,800	tons	0.0002	0.00007	0.00001	lb/ton	UndrGrd	100%	0.01	0	0.006	0	0.0009	0
PC11	Reclaim Feeders (F-R1/R4) to Reclaim Conveyor (CV-R)	TrStnPrt	3-03-024-08	NF	166,800	tons	0.0002	0.00007	0.00001	lb/ton	RTS	100%	0.01	0	0.006	0	0.0009	0
PC12	Reclaim Conveyor (CV-R) to SAG Mill Feed Conveyor (CV-SMF)	TrStnPrt	3-03-024-08	NF	166,800	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.01	0	0.006	0	0.0009	0
PC13	Pebble Conveyor No. 3 (CV-Pb3) to SAG Mill Feed Conveyor (CV-SMF)	TrStnPrt	3-03-024-08	NF	42,508	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.003	0	0.002	0	0.0002	0

Table E.5 Maximum Daily Particulate Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	Emission Factors			EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (tpd)		PM_{10} Emissions (tpd)		$PM_{2.5}$ Emissions (tpd)	
							PM	PM_{10}	$PM_{2.5}$				Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
PC14	SAG Mill Feed Conveyor (CV-SMF) to SAG Mill (M-SAG)	TrStnPrt	3-03-024-08	NF	209,432	tons	0.0002	0.00007	0.00001	lb/ton	Water	100%	0.02	0	0.008	0	0.001	0
Milling																		
M01	SAG Mill (M-SAG)	CrushS	3-03-024-06	NF	209,432	tons	0.05	0.02	0.015	lb/ton	Wet	100%	5.24	0	2.09	0	1.57	0
M02	SAG Mill (M-SAG) to Trommel Screen (Sn-T)	TrStnPrt	3-03-024-08	NF	209,432	tons	0.0002	0.00007	0.00001	lb/ton	Enclosed	100%	0.02	0	0.008	0	0.001	0
M03	Trommel Screen (Sn-T)	Screen	3-05-020-02	NF	209,432	tons	0.025	0.0087	0.0006	lb/ton	Wet	100%	2.62	0	0.91	0	0.06	0
M04	Trommel Screen (Sn-T) to Pebble Conveyor No. 1 (CV-Pb1)	TrStnPrt	3-03-024-08	NF	44,426	tons	0.0002	0.00007	0.00001	lb/ton	Clean	100%	0.003	0	0.002	0	0.0002	0
M05	Pebble Conveyor No. 1 (CV-Pb1) to Pebble Wash Screen (Sn-PbW)	TrStnPrt	3-03-024-08	NF	44,426	tons	0.0002	0.00007	0.00001	lb/ton	Clean	100%	0.003	0	0.002	0	0.0002	0
M06	Pebble Wash Screen (Sn-PbW)	Screen	3-05-020-02	NF	44,426	tons	0.025	0.0087	0.0006	lb/ton	Wet	100%	0.56	0	0.19	0	0.01	0
M07	Pebble Wash Screen (Sn-PbW) to Pebble Conveyor No. 2	TrStnPrt	3-03-024-08	NF	42,508	tons	0.0002	0.00007	0.00001	lb/ton	Clean	100%	0.003	0	0.002	0	0.0002	0
M08	Pebble Conveyor No. 2 (CV-Pb2) to SAG Oversize Surge Bin (B-SAGOS)	TrStnPrt	3-03-024-08	NF	42,508	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.003	0	0.002	0	0.0002	0
M09	SAG Oversize Surge Bin (B-SAGOS) to Pebble Crusher Feeder (F-PbC)	TrStnPrt	3-03-024-08	NF	42,508	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.003	0	0.002	0	0.0002	0
M10	Pebble Crusher Feeder (F-PbC) to Pebble Crusher (PbC)	TrStnPrt	3-03-024-08	NF	42,508	tons	0.0002	0.00007	0.00001	lb/ton	Enclosed	100%	0.003	0	0.002	0	0.0002	0
M11	Pebble Crusher (PbC)	CrushT	3-03-024-07	NF	42,508	tons	0.06	0.02	0.004	lb/ton	PCAS	100%	1.28	0	0.43	0	0.08	0
M12	Pebble Crusher (PbC) to Pebble Conveyor No. 3 (CV-Pb3)	TrStnPrt	3-03-024-08	NF	42,508	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.003	0	0.002	0	0.0002	0
Copper Concentrate Dewatering and Stacking																		
CCD01	Copper Concentrate Filters (Ft-CC1/CC4) to Copper Concentrate Conveyor (CV-CC)	TrCuCncPrt	3-03-024-08	NF	3,312	tons	0.00004	0.00002	0.000003	lb/ton	Enclosed	100%	0.00007	0	0.00003	0	0.000005	0
CCD02	Copper Concentrate Conveyor (CV-CC) to Copper Concentrate Loadout Stockpile	TrCuCncPrt	3-03-024-08	F	3,312	tons	0.00004	0.00002	0.000003	lb/ton	CCS	100%	0.00007	0	0.00003	0	0.000005	0
CCD03	Wind Erosion of Copper Concentrate Loadout Stockpile	WindCvd	3-03-888-01	F	1.17	acres	0	0	0	ton/acre-yr	Enclosed	100%	0	0	0	0	0	0
CCD04	Copper Concentrate Loadout Stockpile to Shipment Truck via Front End Loaders	TrCuCncPrt	3-03-024-08	F	3,312	tons	0.00004	0.00002	0.000003	lb/ton	CCS	100%	0.00007	0	0.00003	0	0.000005	0
Molybdenum Dewatering and Packaging																		
MD01	Molybdenum Concentrate Filter (Ft-MC) to Molybdenum Concentrate Dryer (D-MC)	TrMlyCncPrt	3-03-024-08	NF	45.6	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.0000006	0	0.0000003	0	0.00000004	0
MD02	Molybdenum Concentrate Dryer	MolyDry	3-03-024-11	NF	45.6	tons	19.70	12.00	5.91	lb/ton	MS/EP	100%	0.45	0	0.27	0	0.13	0
MD03	Molybdenum Concentrate Dryer (D-MC) to Molybdenum Concentrate Bin (B-MC)	DTrMlyCncPrt	3-03-024-08	NF	45.6	tons	0.00004	0.00002	0.000003	lb/ton	MDC	100%	0.000001	0	0.0000005	0	0.00000007	0
MD04	Molybdenum Concentrate Bin (B-MC) to Molybdenum Concentrate Hopper (H-MC)	DTrMlyCnc	3-03-024-08	NF	45.6	tons	0.0003	0.0002	0.00002	lb/ton	None	0%	0.000008	0.000008	0.000004	0.000004	0.0000005	0.0000005
MD05	Molybdenum Concentrate Hopper (H-MC) to Molybdenum Concentrate Conveyor (CV-MC)	DTrMlyCncPrt	3-03-024-08	NF	45.6	tons	0.00004	0.00002	0.000003	lb/ton	Enclosed	100%	0.000001	0	0.0000005	0	0.00000007	0
MD06	Molybdenum Concentrate Conveyor (CV-MC) to Molybdenum Packaging and Weigh System (MPS)	DTrMlyCnc	3-03-024-08	NF	45.6	tons	0.0003	0.0002	0.00002	lb/ton	MDC	100%	0.000008	0	0.000004	0	0.0000005	0
Tailings Dewatering and Placement																		
TDS01	Tailings Filters (Ft-T1/T14) to Tailings Belt Feeders (F-T1/T14)	FiltTailPrt	3-03-024-08	NF	257,328	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.003	0	0.001	0	0.0002	0
TDS02	Tailings Belt Feeders (F-T1/T14) to Fixed Tailings Conveyor No. 1 (CV-F1)	FiltTailPrt	3-03-024-08	NF	257,328	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.003	0	0.001	0	0.0002	0
TDS03	Fixed Tailings Conveyor No. 1 (CV-F1) to Fixed Tailings Conveyor No. 2 (CV-F2)	FiltTailPrt	3-03-024-08	NF	257,328	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.003	0	0.001	0	0.0002	0

Table E.5 Maximum Daily Particulate Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	Emission Factors PM	Emission Factors PM_{10}	Emission Factors $PM_{2.5}$	EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (tpd) Uncontrolled	PM Emissions (tpd) Controlled	PM_{10} Emissions (tpd) Uncontrolled	PM_{10} Emissions (tpd) Controlled	$PM_{2.5}$ Emissions (tpd) Uncontrolled	$PM_{2.5}$ Emissions (tpd) Controlled
TDS04	Fixed Tailings Conveyor No. 2 (CV-F2) to Fixed Tailings Conveyor No. 3 (CV-F3)	FiltTailPrt	3-03-024-08	NF	257,328	tons	0.00002	0.00001	0.000002	lb/ton	None	0%	0.003	0.003	0.001	0.001	0.0002	0.0002
TDS05	Fixed Tailings Conveyor No. 3 (CV-F3) to Relocatable Conveyor (CV-R1)	FiltTailPrt	3-03-024-08	F	257,328	tons	0.00002	0.00001	0.000002	lb/ton	None	0%	0.003	0.003	0.001	0.001	0.0002	0.0002
TDS06	Relocatable Conveyor (CV-R1) to Shiftable Conveyor (CV-S1)	FiltTailPrt	3-03-024-08	F	257,328	tons	0.00002	0.00001	0.000002	lb/ton	None	0%	0.003	0.003	0.001	0.001	0.0002	0.0002
TDS07	Shiftable Conveyor (CV-S1) to Belt Wagon Conveyor (CV-BW1)	FiltTail	3-03-024-08	F	257,328	tons	0.0002	0.00009	0.00001	lb/ton	None	0%	0.02	0.02	0.01	0.01	0.002	0.002
TDS08	Belt Wagon Conveyor (CV-BW1) to Spreader Crawler Mounted Conveyor (CV-SP1)	FiltTail	3-03-024-08	F	257,328	tons	0.0002	0.00009	0.00001	lb/ton	None	0%	0.02	0.02	0.01	0.01	0.002	0.002
TDS09	Spreader Crawler Mounted Conveyor (CV-SP1) to Tailings Storage	FiltTail	3-03-024-08	F	257,328	tons	0.0002	0.00009	0.00001	lb/ton	None	0%	0.02	0.02	0.01	0.01	0.002	0.002
TDS10	Wind Erosion of Tailings Storage	TailStrg	3-03-888-01	F	1,500	acres	0.02	0.01	0.002	ton/acre-yr	None	0%	0.08	0.08	0.04	0.04	0.006	0.006
Fuel Burning Equipment																		
FB01	Diesel Electrowinning Hot Water Generator (HWG)	DFB	1-02-005-03	NF	24	hours	3.30	1.65	0.40	lb/1000 gal	None	0%	0.002	0.002	0.0009	0.0009	0.0002	0.0002
					6.0	MMBtu/hr												
FB02	Thickener Area Emergency Generator (TEG)	ICDE3	2-02-001-02	NF	24	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.005	0.005	0.005	0.005	0.005	0.005
					1,000	kW												
FB03	PLS Pond Area Emergency Generator (PEG)	ICDE3	2-02-001-02	NF	24	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.005	0.005	0.005	0.005	0.005	0.005
					1,000	kW												
FB04	Main Substation Emergency Generator (MEG)	ICDE3	2-02-001-02	NF	24	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.004	0.004	0.004	0.004	0.004	0.004
					750	kW												
FB05	Administration Building Emergency Generator (AEG)	ICDE3	2-02-001-02	NF	24	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.004	0.004	0.004	0.004	0.004	0.004
					750	kW												
FB06	Electrowinning Building Emergency Generator (EWEG)	ICDE1	2-02-001-02	NF	24	hours	0.40	0.40	0.40	g/kW-hr	None	0%	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
					50	kW												
FB07	Primary Crusher Fire Water Pump (PCFWP)	ICDE2	2-02-001-02	NF	24	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.002	0.002	0.002	0.002	0.002	0.002
					400	hp												
FB08	SX/EW Fire Water Pump (SXFWP)	ICDE2	2-02-001-02	NF	24	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.002	0.002	0.002	0.002	0.002	0.002
					400	hp												
Miscellaneous Sources																		
MS01	Transfer of Bulk Pebble Lime to the Bulk Pebble Lime Silo (S-BPL)	LimeLd	3-05-016-26	NF	124.27	tons	0.61	0.61	0.61	lb/ton	BPLSV	90%	0.04	0.004	0.04	0.004	0.04	0.004
MS02	Bulk Pebble Lime Silo (S-BPL) to Bulk Pebble Lime Silo Screw Conveyor (CV-BPLS)	ReagTr	3-03-024-04	NF	124.27	tons	0.008	0.004	0.0006	lb/ton	Enclosed	100%	0.0005	0	0.0002	0	0.00004	0
MS03	Bulk Pebble Lime Silo Screw Conveyor (CV-BPLS) to SAG Mill Feed Conveyor (CV-SMF)	ReagTr	3-03-024-04	NF	124.27	tons	0.008	0.004	0.0006	lb/ton	None	0%	0.0005	0.0005	0.0002	0.0002	0.00004	0.00004
MS04	Transfer of Lime to the Lime Storage Bin (B-L)	LimeLd	3-05-016-26	NF	62.14	tons	0.61	0.61	0.61	lb/ton	LSV	90%	0.02	0.002	0.02	0.002	0.02	0.002
MS05	Transfer of Sodium Metasilicate to the Sodium Metasilicate Storage Bin (B-SM)	ReagTr	3-03-024-04	NF	9.88	tons	0.008	0.004	0.0006	lb/ton	SMSV	90%	0.00004	0.000004	0.00002	0.000002	0.000003	0.0000003

Table E.5 Maximum Daily Particulate Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	Emission Factors			EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (tpd)		PM_{10} Emissions (tpd)		$PM_{2.5}$ Emissions (tpd)	
							PM	PM_{10}	$PM_{2.5}$				Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
MS06	Transfer of Flocculant from Supersacks to Flocculant Storage Bins (B-F1/F2)	ReagTr	3-03-024-04	NF	3.62	tons	0.006	0.004	0.0006	lb/ton	None	0%	0.00001	0.00001	0.000007	0.000007	0.000001	0.000001
MS07	Transfer of Guar from Bags to Guar Feeder (F-Gu)	ReagTr	3-03-024-04	NF	0.49	tons	0.006	0.004	0.0006	lb/ton	None	0%	0.000002	0.000002	0.000001	0.000001	0.0000001	0.0000001
MS08	Transfer of Granular Cobalt Sulfate from Bags to Cobalt Sulfate Feeder (F-CoS)	ReagTr	3-03-024-04	NF	0.02	tons	0.006	0.004	0.0006	lb/ton	None	0%	0.00000008	0.00000008	0.00000004	0.00000004	0.000000006	0.000000006
Particulate Matter Pollution Control Equipment with Emission Limits																		
PCL01	Crushing Area Scrubber (PC-CAS)	CAS	none	NF	24	hours	1.57	1.28	0.81	lb/hr	None	0%	0.02	0.02	0.02	0.02	0.01	0.01
PCL02	Stockpile Area Scrubber (PC-SAS)	SAS	none	NF	24	hours	3.29	2.59	0.93	lb/hr	None	0%	0.04	0.04	0.03	0.03	0.01	0.01
PCL03	Reclaim Tunnel Scrubber (PC-RTS)	RTS	none	NF	24	hours	1.36	1.07	0.39	lb/hr	None	0%	0.02	0.02	0.01	0.01	0.005	0.005
PCL04	Pebble Crusher Area Scrubber (PC-PCAS)	PCAS	none	NF	24	hours	2.29	1.56	0.69	lb/hr	None	0%	0.03	0.03	0.02	0.02	0.008	0.008
PCL05	Copper Concentrate Scrubber 1 (PC-CCS1)	CCS	none	NF	24	hours	4.51	3.55	1.28	lb/hr	None	0%	0.05	0.05	0.04	0.04	0.02	0.02
PCL06	Copper Concentrate Scrubber 2 (PC-CCS2)	CCS	none	NF	24	hours	4.51	3.55	1.28	lb/hr	None	0%	0.05	0.05	0.04	0.04	0.02	0.02
PCL07	Molybdenum Scrubber (PC-MS) / Electrostatic Precipitator (PC-EP)	MS/EP	none	NF	24	hours	0.02	0.02	0.02	lb/hr	None	0%	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
PCL08	Molybdenum Dust Collector (PC-MDC)	MDC	none	NF	1,790,677	dscf	0.02	0.010	0.002	gr/dscf	None	0%	0.003	0.003	0.001	0.001	0.0002	0.0002
PCL09	Laboratory Dust Collector 1 (PC-L1)	LDC	none	NF	7,958,567	dscf	0.007	0.005	0.003	gr/dscf	None	0%	0.004	0.004	0.003	0.003	0.002	0.002
PCL10	Laboratory Dust Collector 2 (PC-L2)	LDC	none	NF	7,958,567	dscf	0.007	0.005	0.003	gr/dscf	None	0%	0.004	0.004	0.003	0.003	0.002	0.002
PCL11	Laboratory Dust Collector 3 (PC-L3)	LDC	none	NF	7,958,567	dscf	0.007	0.005	0.003	gr/dscf	None	0%	0.004	0.004	0.003	0.003	0.002	0.002
Total Emissions From Non-Fugitive Sources:													**12.27**	**0.26**	**4.88**	**0.20**	**2.27**	**0.10**
Total Emissions From Fugitive Sources:													**109.51**	**12.02**	**28.37**	**3.30**	**2.87**	**0.36**
Total Emissions:													**121.78**	**12.27**	**33.35**	**3.50**	**5.14**	**0.46**

Table E.6 Maximum Hourly Particulate Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors PM	Emission Factors PM_{10}	Emission Factors $PM_{2.5}$	EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (lb/hr) Uncontrolled	PM Emissions (lb/hr) Controlled	PM_{10} Emissions (lb/hr) Uncontrolled	PM_{10} Emissions (lb/hr) Controlled	$PM_{2.5}$ Emissions (lb/hr) Uncontrolled	$PM_{2.5}$ Emissions (lb/hr) Controlled
Mining																		
MN01	Drilling	Drilling	3-05-020-10	F	80	holes	1.30	0.43	0.08	lb/hole	None	0%	104.00	104.00	34.67	34.67	6.42	6.42
MN02	Blasting	Blast	3-05-020-09	F	1.00	blasts	328.26	170.69	9.85	lb/blast	None	0%	328.26	328.26	170.69	170.69	9.85	9.85
MN03	Loading Concentrate Ore	Loading	3-03-024-08	F	3,750	tons	0.0007	0.0003	0.00005	lb/ton	None	0%	2.63	2.63	1.24	1.24	0.19	0.19
MN04	Loading Leach Ore	Loading	3-03-024-08	F	250	tons	0.0007	0.0003	0.00005	lb/ton	None	0%	0.18	0.18	0.08	0.08	0.01	0.01
MN05	Loading Waste Rock	Loading	3-03-024-08	F	11,000	tons	0.0007	0.0003	0.00005	lb/ton	None	0%	7.72	7.72	3.65	3.65	0.55	0.55
MN06	Hauling Concentrate Ore to Primary Crusher Dump Hopper / Run of Mine Stockpile	HaulingHD	3-05-020-11	F	81	VMT	21.25	5.46	0.55	lb/VMT	HaulRdU	90%	1714.78	171.48	440.62	44.06	44.06	4.41
MN07	Hauling Leach Ore to Leach Pad	HaulingHD	3-05-020-11	F	4	VMT	21.25	5.46	0.55	lb/VMT	HaulRdU	90%	85.10	8.51	21.87	2.19	2.19	0.22
MN08	Hauling Waste Rock to Waste Rock Storage Area	HaulingHD	3-05-020-11	F	298	VMT	21.25	5.46	0.55	lb/VMT	HaulRdU	90%	6,339.47	633.95	1,628.94	162.89	162.89	16.29
MN09	Unloading Concentrate Ore to Run of Mine Stockpile	TrStnUnp	3-03-024-08	F	3,750	tons	0.001	0.0006	0.00009	lb/ton	None	0%	4.46	4.46	2.11	2.11	0.32	0.32
MN10	Unloading Leach Ore to Leach Pad	TrStnUnp	3-03-024-08	F	250	tons	0.001	0.0006	0.00009	lb/ton	None	0%	0.30	0.30	0.14	0.14	0.02	0.02
MN11	Unloading Waste Rock to Waste Rock Storage Area	TrStnUnp	3-03-024-08	F	11,000	tons	0.001	0.0006	0.00009	lb/ton	None	0%	13.07	13.07	6.18	6.18	0.94	0.94
MN12	Bulldozer Use	Bldzrs	3-05-010-99	F	6	hrs	2.82	0.43	0.30	lb/hr	None	0%	17.76	17.78	2.68	2.68	1.87	1.87
MN13	Water Truck Use	WtrTrksHD	3-05-010-99	F	20	VMT	17.06	4.38	0.44	lb/VMT	HaulRdWT	95%	334.27	16.71	85.89	4.29	8.59	0.43
MN14	Grader Use	Graders	3-05-010-99	F	10	VMT	1.99	0.70	0.06	lb/VMT	None	0%	19.79	19.79	6.93	6.93	0.61	0.61
MN15	Support Vehicle Use	SupVehH	3-05-010-99	F	59	VMT	9.10	2.34	0.23	lb/VMT	HaulRdU	90%	538.91	53.89	138.47	13.85	13.85	1.38
Primary Crushing, Conveying, Coarse Ore Storage, and Reclaim Conveying																		
PC01	Wind Erosion of the Run of Mine Stockpile	WindROM	3-03-888-01	F	26	acres	0.21	0.11	0.02	ton/acre-yr	None	0%	1.24	1.24	0.62	0.62	0.09	0.09
PC02	Unloading to Primary Crusher Dump Hopper (H-CDp) from Haul Trucks or Run of Mine Stockpile	TrStnUnp	3-03-024-08	F	6,950	tons	0.001	0.0006	0.00009	lb/ton	WSpry	82.5%	8.26	1.45	3.91	0.68	0.59	0.10
PC03	Primary Crusher (PCr)	CrushP	3-03-024-05	NF	6,950	tons	0.02	0.009	0.003	lb/ton	CAS	100%	139.00	0	62.55	0	20.85	0
PC04	Primary Crusher (PCr) to Crusher Discharge Hopper (H-CDs)	TrStnPrt	3-03-024-08	NF	6,950	tons	0.0002	0.00007	0.00001	lb/ton	Enclosed	100%	1.08	0	0.51	0	0.08	0
PC05	Crusher Discharge Hopper (H-CDs) to Crusher Discharge Feeder (F-CD)	TrStnPrt	3-03-024-08	NF	6,950	tons	0.0002	0.00007	0.00001	lb/ton	CAS	100%	1.08	0	0.51	0	0.08	0
PC06	Crusher Discharge Feeder (F-CD) to Stockpile Feed Conveyor (CV-SF)	TrStnPrt	3-03-024-08	NF	6,950	tons	0.0002	0.00007	0.00001	lb/ton	CAS	100%	1.08	0	0.51	0	0.08	0
PC07	Stockpile Feed Conveyor (CV-SF) to Stockpile Tripper Conveyor (CV-ST)	TrStnPrt	3-03-024-08	NF	6,950	tons	0.0002	0.00007	0.00001	lb/ton	SAS	100%	1.08	0	0.51	0	0.08	0
PC08	Stockpile Tripper Conveyor (CV-ST) to Covered Coarse Ore Stockpile	TrStnPrt	3-03-024-08	F	6,950	tons	0.0002	0.00007	0.00001	lb/ton	SAS	100%	1.08	0	0.51	0	0.08	0
PC09	Wind Erosion of the Coarse Ore Stockpile	WindCvd	3-03-888-01	F	5	acres	0	0	0	ton/acre-yr	Enclosed	100%	0	0	0	0	0	0
PC10	Coarse Ore Stockpile to Reclaim Feeders (F-R1/R4)	TrStnPrt	3-03-024-08	NF	6,950	tons	0.0002	0.00007	0.00001	lb/ton	UndrGrd	100%	1.08	0	0.51	0	0.08	0
PC11	Reclaim Feeders (F-R1/R4) to Reclaim Conveyor (CV-R)	TrStnPrt	3-03-024-08	NF	6,950	tons	0.0002	0.00007	0.00001	lb/ton	RTS	100%	1.08	0	0.51	0	0.08	0
PC12	Reclaim Conveyor (CV-R) to SAG Mill Feed Conveyor (CV-SMF)	TrStnPrt	3-03-024-08	NF	6,950	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	1.08	0	0.51	0	0.08	0
PC13	Pebble Conveyor No. 3 (CV-Pb3) to SAG Mill Feed Conveyor (CV-SMF)	TrStnPrt	3-03-024-08	NF	1,771	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.28	0	0.13	0	0.02	0

Table E.6 Maximum Hourly Particulate Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors PM	Emission Factors PM_{10}	Emission Factors $PM_{2.5}$	EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (lb/hr) Uncontrolled	PM Emissions (lb/hr) Controlled	PM_{10} Emissions (lb/hr) Uncontrolled	PM_{10} Emissions (lb/hr) Controlled	$PM_{2.5}$ Emissions (lb/hr) Uncontrolled	$PM_{2.5}$ Emissions (lb/hr) Controlled
PC14	SAG Mill Feed Conveyor (CV-SMF) to SAG Mill (M-SAG)	TrStnPrt	3-03-024-08	NF	8,726	tons	0.0002	0.00007	0.00001	lb/ton	Water	100%	1.36	0	0.64	0	0.10	0
Milling																		
M01	SAG Mill (M-SAG)	CrushS	3-03-024-06	NF	8,726	tons	0.05	0.02	0.015	lb/ton	Wet	100%	436.32	0	174.53	0	130.89	0
M02	SAG Mill (M-SAG) to Trommel Screen (Sn-T)	TrStnPrt	3-03-024-08	NF	8,726	tons	0.0002	0.00007	0.00001	lb/ton	Enclosed	100%	1.36	0	0.64	0	0.10	0
M03	Trommel Screen (Sn-T)	Screen	3-05-020-02	NF	8,726	tons	0.025	0.0087	0.0006	lb/ton	Wet	100%	218.16	0	75.92	0	5.13	0
M04	Trommel Screen (Sn-T) to Pebble Conveyor No. 1 (CV-Pb1)	TrStnPrt	3-03-024-08	NF	1,851.10	tons	0.0002	0.00007	0.00001	lb/ton	Clean	100%	0.29	0	0.14	0	0.02	0
M05	Pebble Conveyor No. 1 (CV-Pb1) to Pebble Wash Screen (Sn-PbW)	TrStnPrt	3-03-024-08	NF	1,851	tons	0.0002	0.00007	0.00001	lb/ton	Clean	100%	0.29	0	0.14	0	0.02	0
M06	Pebble Wash Screen (Sn-PbW)	Screen	3-05-020-02	NF	1,851	tons	0.025	0.0087	0.0006	lb/ton	Wet	100%	46.28	0	16.10	0	1.09	0
M07	Pebble Wash Screen (Sn-PbW) to Pebble Conveyor No. 2	TrStnPrt	3-03-024-08	NF	1,771	tons	0.0002	0.00007	0.00001	lb/ton	Clean	100%	0.26	0	0.13	0	0.02	0
M08	Pebble Conveyor No. 2 (CV-Pb2) to SAG Oversize Surge Bin (B-SAGOS)	TrStnPrt	3-03-024-08	NF	1,771	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.28	0	0.13	0	0.02	0
M09	SAG Oversize Surge Bin (B-SAGOS) to Pebble Crusher Feeder (F-PbC)	TrStnPrt	3-03-024-08	NF	1,771	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.28	0	0.13	0	0.02	0
M10	Pebble Crusher Feeder (F-PbC) to Pebble Crusher (PbC)	TrStnPrt	3-03-024-08	NF	1,771	tons	0.0002	0.00007	0.00001	lb/ton	Enclosed	100%	0.28	0	0.13	0	0.02	0
M11	Pebble Crusher (PbC)	CrushT	3-03-024-07	NF	1,771	tons	0.06	0.02	0.004	lb/ton	PCAS	100%	106.27	0	35.42	0	6.56	0
M12	Pebble Crusher (PbC) to Pebble Conveyor No. 3 (CV-Pb3)	TrStnPrt	3-03-024-08	NF	1,771	tons	0.0002	0.00007	0.00001	lb/ton	PCAS	100%	0.26	0	0.13	0	0.02	0
Copper Concentrate Dewatering and Stacking																		
CCD01	Copper Concentrate Filters (Ft-CC1/CC4) to Copper Concentrate Conveyor (CV-CC)	TrCuCncPrt	3-03-024-08	NF	138	tons	0.00004	0.00002	0.000003	lb/ton	Enclosed	100%	0.006	0	0.003	0	0.0004	0
CCD02	Copper Concentrate Conveyor (CV-CC) to Copper Concentrate Loadout Stockpile	TrCuCncPrt	3-03-024-08	F	138	tons	0.00004	0.00002	0.000003	lb/ton	CCS	100%	0.006	0	0.003	0	0.0004	0
CCD03	Wind Erosion of Copper Concentrate Loadout Stockpile	WindCvd	3-03-888-01	F	1.17	acres	0	0	0	ton/acre-yr	Enclosed	100%	0	0	0	0	0	0
CCD04	Copper Concentrate Loadout Stockpile to Shipment Truck via Front End Loaders	TrCuCncPrt	3-03-024-08	F	138	tons	0.00004	0.00002	0.000003	lb/ton	CCS	100%	0.006	0	0.003	0	0.0004	0
Molybdenum Dewatering and Packaging																		
MD01	Molybdenum Concentrate Filter (Ft-MC) to Molybdenum Concentrate Dryer (D-MC)	TrMlyCncPrt	3-03-024-08	NF	1.9	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.00005	0	0.00002	0	0.000003	0
MD02	Molybdenum Concentrate Dryer	MolyDry	3-03-024-11	NF	1.9	tons	19.70	12.00	5.91	lb/ton	MS/EP	100%	37.43	0	22.80	0	11.23	0
MD03	Molybdenum Concentrate Dryer (D-MC) to Molybdenum Concentrate Bin (B-MC)	DTrMlyCncPrt	3-03-024-08	NF	1.9	tons	0.00004	0.00002	0.000003	lb/ton	MDC	100%	0.00008	0	0.00004	0	0.000006	0
MD04	Molybdenum Concentrate Bin (B-MC) to Molybdenum Concentrate Hopper (H-MC)	DTrMlyCnc	3-03-024-08	NF	1.9	tons	0.0003	0.0002	0.00002	lb/ton	None	0%	0.0006	0.0006	0.0003	0.0003	0.00004	0.00004
MD05	Molybdenum Concentrate Hopper (H-MC) to Molybdenum Concentrate Conveyor (CV-MC)	DTrMlyCncPrt	3-03-024-08	NF	1.9	tons	0.00004	0.00002	0.000003	lb/ton	Enclosed	100%	0.00008	0	0.00004	0	0.000006	0
MD06	Molybdenum Concentrate Conveyor (CV-MC) to Molybdenum Packaging and Weigh System (MPS)	DTrMlyCnc	3-03-024-08	NF	1.9	tons	0.0003	0.0002	0.00002	lb/ton	MDC	100%	0.0006	0	0.0003	0	0.00004	0
Tailings Dewatering and Placement																		
TDS01	Tailings Filters (Ft-T1/T14) to Tailings Belt Feeders (F-T1/T14)	FiltTailPrt	3-03-024-08	NF	10,722	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.26	0	0.12	0	0.02	0
TDS02	Tailings Belt Feeders (F-T1/T14) to Fixed Tailings Conveyor No. 1 (CV-F1)	FiltTailPrt	3-03-024-08	NF	10,722	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.26	0	0.12	0	0.02	0
TDS03	Fixed Tailings Conveyor No. 1 (CV-F1) to Fixed Tailings Conveyor No. 2 (CV-F2)	FiltTailPrt	3-03-024-08	NF	10,722	tons	0.00002	0.00001	0.000002	lb/ton	Enclosed	100%	0.26	0	0.12	0	0.02	0

Table E.6 Maximum Hourly Particulate Emissions																		
Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors			EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (lb/hr)		PM_{10} Emissions (lb/hr)		$PM_{2.5}$ Emissions (lb/hr)	
							PM	PM_{10}	$PM_{2.5}$				Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
TDS04	Fixed Tailings Conveyor No. 2 (CV-F2) to Fixed Tailings Conveyor No. 3 (CV-F3)	FiltTailPrt	3-03-024-08	NF	10,722	tons	0.00002	0.00001	0.000002	lb/ton	None	0%	0.26	0.26	0.12	0.12	0.02	0.02
TDS05	Fixed Tailings Conveyor No. 3 (CV-F3) to Relocatable Conveyor (CV-R1)	FiltTailPrt	3-03-024-08	F	10,722	tons	0.00002	0.00001	0.000002	lb/ton	None	0%	0.26	0.26	0.12	0.12	0.02	0.02
TDS06	Relocatable Conveyor (CV-R1) to Shiftable Conveyor (CV-S1)	FiltTailPrt	3-03-024-08	F	10,722	tons	0.00002	0.00001	0.000002	lb/ton	None	0%	0.26	0.26	0.12	0.12	0.02	0.02
TDS07	Shiftable Conveyor (CV-S1) to Belt Wagon Conveyor (CV-BW1)	FiltTail	3-03-024-08	F	10,722	tons	0.0002	0.00009	0.00001	lb/ton	None	0%	2.00	2.00	0.95	0.95	0.14	0.14
TDS08	Belt Wagon Conveyor (CV-BW1) to Spreader Crawler Mounted Conveyor (CV-SP1)	FiltTail	3-03-024-08	F	10,722	tons	0.0002	0.00009	0.00001	lb/ton	None	0%	2.00	2.00	0.95	0.95	0.14	0.14
TDS09	Spreader Crawler Mounted Conveyor (CV-SP1) to Tailings Storage	FiltTail	3-03-024-08	F	10,722	tons	0.0002	0.00009	0.00001	lb/ton	None	0%	2.00	2.00	0.95	0.95	0.14	0.14
TDS10	Wind Erosion of Tailings Storage	TailStrg	3-03-888-01	F	1,500	acres	0.02	0.01	0.002	ton/acre-yr	None	0%	6.90	6.90	3.45	3.45	0.52	0.52
Fuel Burning Equipment																		
FB01	Diesel Electrowinning Hot Water Generator (HWG)	DFB	1-02-005-03	NF	1	hours	3.30	1.65	0.40	lb/1000 gal	None	0%	0.14	0.14	0.07	0.07	0.02	0.02
					6.0	MMBtu/hr												
FB02	Thickener Area Emergency Generator (TEG)	ICDE3	2-02-001-02	NF	1	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.44	0.44	0.44	0.44	0.44	0.44
					1,000	kW												
FB03	PLS Pond Area Emergency Generator (PEG)	ICDE3	2-02-001-02	NF	1	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.44	0.44	0.44	0.44	0.44	0.44
					1,000	kW												
FB04	Main Substation Emergency Generator (MEG)	ICDE3	2-02-001-02	NF	1	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.33	0.33	0.33	0.33	0.33	0.33
					750	kW												
FB05	Administration Building Emergency Generator (AEG)	ICDE3	2-02-001-02	NF	1	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.33	0.33	0.33	0.33	0.33	0.33
					750	kW												
FB06	Electrowinning Building Emergency Generator (EWEG)	ICDE1	2-02-001-02	NF	1	hours	0.40	0.40	0.40	g/kW-hr	None	0%	0.04	0.04	0.04	0.04	0.04	0.04
					50	kW												
FB07	Primary Crusher Fire Water Pump (PCFWP)	ICDE2	2-02-001-02	NF	1	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.13	0.13	0.13	0.13	0.13	0.13
					400	hp												
FB08	SX/EW Fire Water Pump (SXFWP)	ICDE2	2-02-001-02	NF	1	hours	0.20	0.20	0.20	g/kW-hr	None	0%	0.13	0.13	0.13	0.13	0.13	0.13
					400	hp												
Miscellaneous Sources																		
MS01	Transfer of Bulk Pebble Lime to the Bulk Pebble Lime Silo (S-BPL)	LimeLd	3-05-016-26	NF	5.18	tons	0.61	0.61	0.61	lb/ton	BPLSV	90%	3.16	0.32	3.16	0.32	3.16	0.32
MS02	Bulk Pebble Lime Silo (S-BPL) to Bulk Pebble Lime Silo Screw Conveyor (CV-BPLS)	ReagTr	3-03-024-04	NF	5.18	tons	0.008	0.004	0.0006	lb/ton	Enclosed	100%	0.04	0	0.02	0	0.003	0
MS03	Bulk Pebble Lime Silo Screw Conveyor (CV-BPLS) to SAG Mill Feed Conveyor (CV-SMF)	ReagTr	3-03-024-04	NF	5.18	tons	0.008	0.004	0.0006	lb/ton	None	0%	0.04	0.04	0.02	0.02	0.003	0.003
MS04	Transfer of Lime to the Lime Storage Bin (B-L)	LimeLd	3-05-016-26	NF	2.59	tons	0.61	0.61	0.61	lb/ton	LSV	90%	1.58	0.158	1.58	0.16	1.58	0.16
MS05	Transfer of Sodium Metasilicate to the Sodium Metasilicate Storage Bin (B-SM)	ReagTr	3-03-024-04	NF	0.41	tons	0.008	0.004	0.0006	lb/ton	SMSV	90%	0.003	0.0003	0.002	0.0002	0.0002	0.00002

Table E.6 Maximum Hourly Particulate Emissions																			
Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors			EF Units	Control Code	Pick-up or Control Eff. (%)	PM Emissions (lb/hr)		PM_{10} Emissions (lb/hr)		$PM_{2.5}$ Emissions (lb/hr)	
							PM	PM_{10}	$PM_{2.5}$				Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
MS06	Transfer of Flocculant from Supersacks to Flocculant Storage Bins (B-F1/F2)	ReagTr	3-03-024-04	NF	0.15	tons	0.008	0.004	0.0006	lb/ton	None	0%	0.001	0.001	0.0006	0.0006	0.00009	0.00009
MS07	Transfer of Guar from Bags to Guar Feeder (F-Gu)	ReagTr	3-03-024-04	NF	0.02	tons	0.008	0.004	0.0006	lb/ton	None	0%	0.0002	0.0002	0.00008	0.00008	0.00001	0.00001
MS08	Transfer of Granular Cobalt Sulfate from Bags to Cobalt Sulfate Feeder (F-CoS)	ReagTr	3-03-024-04	NF	0.0008	tons	0.008	0.004	0.0006	lb/ton	None	0%	0.000007	0.000007	0.000003	0.000003	0.0000005	0.0000005
Particulate Matter Pollution Control Equipment with Emission Limits																		
PCL01	Crushing Area Scrubber (PC-CAS)	CAS	none	NF	1	hours	1.57	1.28	0.81	lb/hr	None	0%	1.57	1.57	1.28	1.28	0.81	0.81
PCL02	Stockpile Area Scrubber (PC-SAS)	SAS	none	NF	1	hours	3.29	2.59	0.93	lb/hr	None	0%	3.29	3.29	2.59	2.59	0.93	0.93
PCL03	Reclaim Tunnel Scrubber (PC-RTS)	RTS	none	NF	1	hours	1.36	1.07	0.39	lb/hr	None	0%	1.36	1.36	1.07	1.07	0.39	0.39
PCL04	Pebble Crusher Area Scrubber (PC-PCAS)	PCAS	none	NF	1	hours	2.29	1.56	0.69	lb/hr	None	0%	2.29	2.29	1.56	1.56	0.69	0.69
PCL05	Copper Concentrate Scrubber 1 (PC-CCS1)	CCS	none	NF	1	hours	4.51	3.55	1.28	lb/hr	None	0%	4.51	4.51	3.55	3.55	1.28	1.28
PCL06	Copper Concentrate Scrubber 2 (PC-CCS2)	CCS	none	NF	1	hours	4.51	3.55	1.28	lb/hr	None	0%	4.51	4.51	3.55	3.55	1.28	1.28
PCL07	Molybdenum Scrubber (PC-MS) / Electrostatic Precipitator (PC-EP)	MS/EP	none	NF	1	hours	0.02	0.02	0.02	lb/hr	None	0%	0.02	0.02	0.02	0.02	0.02	0.02
PCL08	Molybdenum Dust Collector (PC-MDC)	MDC	none	NF	74,612	dscf	0.02	0.010	0.002	gr/dscf	None	0%	0.22	0.22	0.11	0.11	0.02	0.02
PCL09	Laboratory Dust Collector 1 (PC-L1)	LDC	none	NF	497,410	dscf	0.007	0.005	0.003	gr/dscf	None	0%	0.51	0.51	0.36	0.36	0.23	0.23
PCL10	Laboratory Dust Collector 2 (PC-L2)	LDC	none	NF	497,410	dscf	0.007	0.005	0.003	gr/dscf	None	0%	0.51	0.51	0.36	0.36	0.23	0.23
PCL11	Laboratory Dust Collector 3 (PC-L3)	LDC	none	NF	497,410	dscf	0.007	0.005	0.003	gr/dscf	None	0%	0.51	0.51	0.36	0.36	0.23	0.23
Total Emissions From Non-Fugitive Sources:													**1,023.16**	**22.06**	**415.24**	**17.33**	**189.44**	**8.47**
Total Emissions From Fugitive Sources:													**9,534.73**	**1,398.83**	**2,555.75**	**463.51**	**254.11**	**44.69**
Total Emissions:													**10,557.89**	**1,420.91**	**2,971.00**	**480.84**	**443.55**	**53.16**

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors							EF Units	Emissions (tpy)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
Mining																				
MN02	Blasting	Blast	3-05-020-09	F	16,096	tons ANFO	67.00	17.00	2.00	0	0	–	–	lb/tons ANFO	606.22	153.82	18.10	0	0	–
Solvent Extraction and Electrowinning																				
SXE01	Solvent Extraction	SX	4-90-001-99	F	8,760	hours	0	0	0	9.43E-05	0	Benzene	3.37E-07	lb/hr-ft²	0	0	0	3.77	0	1.35E-02
	4 Primary Mix Tanks (7.75' D x 9.75' H each)	4 @ 47.2 = 186.7	ft²		9,132.9	ft²	Total Surface Area of Solvent Extraction					Toluene	4.62E-06	lb/hr-ft²						1.93E-01
	4 Secondary Mix Tanks (9.5' D x 9.75' H each)	4 @ 70.9 = 283.5	ft²									Ethylbenzene	2.05E-05	lb/hr-ft²						8.21E-01
	3 Tertiary Mix Tanks (9.5' D x 9.75' H each)	3 @ 70.9 = 212.6	ft²									Xylenes	2.80E-05	lb/hr-ft²						1.12E+00
	4 Extraction Settlers (64' L x 33' W x 3.33' H each)	4 @ 2,112 = 8,448	ft²									Others (including Hexane)	2.94E-05	lb/hr-ft²						1.18E+00
SXE02	Electrowinning Commercial Cells (EWCC)	EW	none	NF	8,760	hours	0	0	0	0	1.57E-04	Cobalt Compounds	2.36E-08	lb/hr-ft²	0	0	0	0	0.02	2.72E-06
	Controlled by Cell Ventilation Scrubbers (PC-EWCVS1/EWCVS6)				2,640	ft²														
					99	Control Efficiency (%)														
Fuel Burning Equipment																				
FB01	Diesel Electrowinning Hot Water Generator (HWG)	DFB	1-02-005-03	NF	8,760	hours	5.00	20.00	0.21	0.20	0	POM	3.30E-03	lb/1000 gal	0.96	3.84	0.04	0.04	0	6.33E-04
					6.0	MMBtu/hr						Formaldehyde	6.10E-02	lb/1000 gal						1.17E-02
												Arsenic	4.00	lb/10^{12} Btu						1.05E-04
												Beryllium	3.00	lb/10^{12} Btu						7.88E-05
												Cadmium	3.00	lb/10^{12} Btu						7.88E-05
												Chromium	3.00	lb/10^{12} Btu						7.88E-05
												Lead	9.00	lb/10^{12} Btu						2.37E-04
												Mercury	3.00	lb/10^{12} Btu						7.88E-05
												Manganese	6.00	lb/10^{12} Btu						1.58E-04
												Nickel	3.00	lb/10^{12} Btu						7.88E-05
												Selenium	15.00	lb/10^{12} Btu						3.94E-04
FB02	Thickener Area Emergency Generator (TEG)	ICDE3	2-02-001-02	NF	500	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	1.93	3.31	0.004	0.22	0	–
					1,000	kW						Benzene	7.76E-04	lb/MMBtu						1.82E-03
												Toluene	2.81E-04	lb/MMBtu						6.59E-04
												Xylenes	1.93E-04	lb/MMBtu						4.53E-04
												Formaldehyde	7.89E-05	lb/MMBtu						1.85E-04
												Acetaldehyde	2.52E-05	lb/MMBtu						5.91E-05
												Acrolein	7.88E-06	lb/MMBtu						1.85E-05
												Naphthalene	1.30E-04	lb/MMBtu						3.05E-04
												Acenaphthylene	9.23E-06	lb/MMBtu						2.17E-05

Table E.7 Annual Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors CO	Emission Factors NO_x	Emission Factors SO_2	Emission Factors VOC	Emission Factors H_2SO_4	HAP Name	HAP EF	EF Units	Emissions (tpy) CO	Emissions (tpy) NO_x	Emissions (tpy) SO_2	Emissions (tpy) VOC	Emissions (tpy) H_2SO_4	HAP *
												Acenaphthene	4.68E-06	lb/MMBtu						1.10E-05
												Fluorene	1.28E-05	lb/MMBtu						3.00E-05
												Phenanthrene	4.08E-05	lb/MMBtu						9.57E-05
												Anthracene	1.23E-06	lb/MMBtu						2.89E-06
												Fluoranthene	4.03E-06	lb/MMBtu						9.46E-06
												Pyrene	3.71E-06	lb/MMBtu						8.71E-06
												Benz(a)anthracene	6.22E-07	lb/MMBtu						1.46E-06
												Chrysene	1.53E-06	lb/MMBtu						3.59E-06
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						2.60E-06
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						5.12E-07
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						6.03E-07
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						9.72E-07
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						8.12E-07
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						1.30E-06
FB03	PLS Pond Area Emergency Generator (PEG)	ICDE3	2-02-001-02	NF	500	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	1.93	3.31	0.004	0.22	0	–
					1,000	kW						Benzene	7.76E-04	lb/MMBtu						1.82E-03
												Toluene	2.81E-04	lb/MMBtu						6.59E-04
												Xylenes	1.93E-04	lb/MMBtu						4.53E-04
												Formaldehyde	7.89E-05	lb/MMBtu						1.85E-04
												Acetaldehyde	2.52E-05	lb/MMBtu						5.91E-05
												Acrolein	7.88E-06	lb/MMBtu						1.85E-05
												Naphthalene	1.30E-04	lb/MMBtu						3.05E-04
												Acenaphthylene	9.23E-06	lb/MMBtu						2.17E-05
												Acenaphthene	4.68E-06	lb/MMBtu						1.10E-05
												Fluorene	1.28E-05	lb/MMBtu						3.00E-05
												Phenanthrene	4.08E-05	lb/MMBtu						9.57E-05
												Anthracene	1.23E-06	lb/MMBtu						2.89E-06
												Fluoranthene	4.03E-06	lb/MMBtu						9.46E-06
												Pyrene	3.71E-06	lb/MMBtu						8.71E-06
												Benz(a)anthracene	6.22E-07	lb/MMBtu						1.46E-06
												Chrysene	1.53E-06	lb/MMBtu						3.59E-06
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						2.60E-06

Table E.7 Annual Gaseous Emissions																				
Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors							EF Units	Emissions (tpy)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						5.12E-07
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						6.03E-07
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						9.72E-07
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						8.12E-07
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						1.30E-06
FB04	Main Substation Emergency Generator (MEG)	ICDE3	2-02-001-02	NF	500	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	1.45	2.48	0.003	0.17	0	–
					750	kW						Benzene	7.76E-04	lb/MMBtu						1.37E-03
												Toluene	2.81E-04	lb/MMBtu						4.95E-04
												Xylenes	1.93E-04	lb/MMBtu						3.40E-04
												Formaldehyde	7.89E-05	lb/MMBtu						1.39E-04
												Acetaldehyde	2.52E-05	lb/MMBtu						4.44E-05
												Acrolein	7.88E-06	lb/MMBtu						1.39E-05
												Naphthalene	1.30E-04	lb/MMBtu						2.29E-04
												Acenaphthylene	9.23E-06	lb/MMBtu						1.62E-05
												Acenaphthene	4.68E-06	lb/MMBtu						8.24E-06
												Fluorene	1.28E-05	lb/MMBtu						2.25E-05
												Phenanthrene	4.08E-05	lb/MMBtu						7.18E-05
												Anthracene	1.23E-06	lb/MMBtu						2.16E-06
												Fluoranthene	4.03E-06	lb/MMBtu						7.09E-06
												Pyrene	3.71E-06	lb/MMBtu						6.53E-06
												Benz(a)anthracene	6.22E-07	lb/MMBtu						1.09E-06
												Chrysene	1.53E-06	lb/MMBtu						2.69E-06
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						1.95E-06
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						3.84E-07
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						4.52E-07
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						7.29E-07
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						6.09E-07
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						9.79E-07
FB05	Administration Building Emergency Generator (AEG)	ICDE3	2-02-001-02	NF	500	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	1.45	2.48	0.003	0.17	0	–
					750	kW						Benzene	7.76E-04	lb/MMBtu						1.37E-03
												Toluene	2.81E-04	lb/MMBtu						4.95E-04
												Xylenes	1.93E-04	lb/MMBtu						3.40E-04

Table E.7 Annual Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors							EF Units	Emissions (tpy)					
							CO	NO_X	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_X	SO_2	VOC	H_2SO_4	HAP *
												Formaldehyde	7.69E-05	lb/MMBtu						1.39E-04
												Acetaldehyde	2.52E-05	lb/MMBtu						4.44E-05
												Acrolein	7.88E-06	lb/MMBtu						1.39E-05
												Naphthalene	1.30E-04	lb/MMBtu						2.29E-04
												Acenaphthylene	9.23E-06	lb/MMBtu						1.62E-05
												Acenaphthene	4.68E-06	lb/MMBtu						8.24E-06
												Fluorene	1.28E-05	lb/MMBtu						2.25E-05
												Phenanthrene	4.08E-05	lb/MMBtu						7.18E-05
												Anthracene	1.23E-06	lb/MMBtu						2.16E-06
												Fluoranthene	4.03E-06	lb/MMBtu						7.09E-06
												Pyrene	3.71E-06	lb/MMBtu						6.53E-06
												Benz(a)anthracene	6.22E-07	lb/MMBtu						1.09E-06
												Chrysene	1.53E-06	lb/MMBtu						2.69E-06
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						1.95E-06
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						3.84E-07
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						4.52E-07
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						7.29E-07
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						6.09E-07
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						9.79E-07
FB06	Electrowinning Building Emergency Generator (EWEG)	ICDE1	2-02-001-02	NF	500	hours	5.00	4.43	0.0066	0.27	0	–	–	g/kW-hr	0.14	0.12	0.0002	0.007	0	–
					50	kW						Benzene	9.33E-04	lb/MMBtu						1.09E-04
												Toluene	4.09E-04	lb/MMBtu						4.60E-05
												Xylenes	2.85E-04	lb/MMBtu						3.34E-05
												1,3-Butadiene	3.91E-05	lb/MMBtu						4.58E-06
												Formaldehyde	1.18E-03	lb/MMBtu						1.38E-04
												Acetaldehyde	7.67E-04	lb/MMBtu						9.00E-05
												Acrolein	9.25E-05	lb/MMBtu						1.09E-05
												Naphthalene	8.48E-05	lb/MMBtu						9.95E-06
												Acenaphthylene	5.06E-06	lb/MMBtu						5.94E-07
												Acenaphthene	1.42E-06	lb/MMBtu						1.67E-07
												Fluorene	2.92E-05	lb/MMBtu						3.43E-06
												Phenanthrene	2.94E-05	lb/MMBtu						3.45E-06

Table E.7 Annual Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors								EF Units	Emissions (tpy)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Anthracene	1.87E-06	lb/MMBtu						2.19E-07
												Fluoranthene	7.61E-06	lb/MMBtu						8.93E-07
												Pyrene	4.78E-06	lb/MMBtu						5.61E-07
												Benzo(a)anthracene	1.68E-06	lb/MMBtu						1.97E-07
												Chrysene	3.53E-07	lb/MMBtu						4.14E-08
												Benzo(b)fluoranthene	9.91E-08	lb/MMBtu						1.16E-08
												Benzo(k)fluoranthene	1.55E-07	lb/MMBtu						1.82E-08
												Benzo(a)pyrene	1.88E-07	lb/MMBtu						2.21E-08
												Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu						4.40E-08
												Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu						6.84E-08
												Benzo(g,h,i)perylene	4.89E-07	lb/MMBtu						5.74E-08
FB07	Primary Crusher Fire Water Pump (PCFWP)	ICDE2	2-02-001-02	NF	500	hours	3.50	3.73	0.0066	0.27	0	–	–	g/kW-hr	0.58	0.61	0.001	0.04	0	–
					400	hp						Benzene	9.33E-04	lb/MMBtu						6.53E-04
												Toluene	4.09E-04	lb/MMBtu						2.86E-04
												Xylenes	2.85E-04	lb/MMBtu						2.00E-04
												1,3-Butadiene	3.91E-05	lb/MMBtu						2.74E-05
												Formaldehyde	1.18E-03	lb/MMBtu						8.26E-04
												Acetaldehyde	7.67E-04	lb/MMBtu						5.37E-04
												Acrolein	9.25E-05	lb/MMBtu						6.48E-05
												Naphthalene	8.48E-05	lb/MMBtu						5.94E-05
												Acenaphthylene	5.06E-06	lb/MMBtu						3.54E-06
												Acenaphthene	1.42E-06	lb/MMBtu						9.94E-07
												Fluorene	2.92E-05	lb/MMBtu						2.04E-05
												Phenanthrene	2.94E-05	lb/MMBtu						2.06E-05
												Anthracene	1.87E-06	lb/MMBtu						1.31E-06
												Fluoranthene	7.61E-06	lb/MMBtu						5.33E-06
												Pyrene	4.78E-06	lb/MMBtu						3.35E-06
												Benzo(a)anthracene	1.68E-06	lb/MMBtu						1.18E-06
												Chrysene	3.53E-07	lb/MMBtu						2.47E-07
												Benzo(b)fluoranthene	9.91E-08	lb/MMBtu						6.94E-08
												Benzo(k)fluoranthene	1.55E-07	lb/MMBtu						1.09E-07
												Benzo(a)pyrene	1.88E-07	lb/MMBtu						1.32E-07

Table E.7 Annual Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors							EF Units	Emissions (tpy)					
							CO	NO_X	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu						2.63E-07
												Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu						4.08E-07
												Benzo(g,h,i)perylene	4.89E-07	lb/MMBtu						3.42E-07
FB08	SX/EW Fire Water Pump (SXFWP)	ICDE2	2-02-001-02	NF	500	hours	3.50	3.73	0.0066	0.27	0	–	–	g/kW-hr	0.58	0.61	0.001	0.04	0	–
					400	hp						Benzene	9.33E-04	lb/MMBtu						6.53E-04
												Toluene	4.09E-04	lb/MMBtu						2.86E-04
												Xylenes	2.85E-04	lb/MMBtu						2.00E-04
												1,3-Butadiene	3.91E-05	lb/MMBtu						2.74E-05
												Formaldehyde	1.18E-03	lb/MMBtu						8.26E-04
												Acetaldehyde	7.67E-04	lb/MMBtu						5.37E-04
												Acrolein	9.25E-05	lb/MMBtu						6.48E-05
												Naphthalene	8.48E-05	lb/MMBtu						5.94E-05
												Acenaphthylene	5.06E-06	lb/MMBtu						3.54E-06
												Acenaphthene	1.42E-06	lb/MMBtu						9.94E-07
												Fluorene	2.92E-05	lb/MMBtu						2.04E-05
												Phenanthrene	2.94E-05	lb/MMBtu						2.06E-05
												Anthracene	1.87E-06	lb/MMBtu						1.31E-06
												Fluoranthene	7.61E-06	lb/MMBtu						5.33E-06
												Pyrene	4.78E-06	lb/MMBtu						3.35E-06
												Benzo(a)anthracene	1.68E-06	lb/MMBtu						1.18E-06
												Chrysene	3.53E-07	lb/MMBtu						2.47E-07
												Benzo(b)fluoranthene	9.91E-08	lb/MMBtu						6.94E-08
												Benzo(k)fluoranthene	1.55E-07	lb/MMBtu						1.09E-07
												Benzo(a)pyrene	1.88E-07	lb/MMBtu						1.32E-07
												Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu						2.63E-07
												Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu						4.08E-07
												Benzo(g,h,i)perylene	4.89E-07	lb/MMBtu						3.42E-07
Tanks																				
T01	C7 Distribution Tank (T-C7D)	C7DT	4-03-010-19	NF	8,760	hours	0	0	0	1.08E-01	0	–	–	lb/hr	0	0	0	0.47	0	–
T02	MIBC Storage Tank (T-MIBCS)	MST	4-90-999-98	NF	8,760	hours	0	0	0	3.53E-03	0	–	–	lb/hr	0	0	0	0.02	0	–
T03	Diesel Fuel Storage Tank - Heavy Vehicles 1 (T-DFS-HV1)	DFSTHV	4-03-010-19	NF	8,760	hours	0	0	0	1.39E-02	0	n-Hexane	5.71E-06	lb/hr	0	0	0	0.06	0	2.50E-05
												Benzene	2.74E-05	lb/hr						1.20E-04

Table E.7 Annual Gaseous Emissions																				
Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Annual Production Rate	Rate Units	Emission Factors							EF Units	Emissions (tpy)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Toluene	3.18E-04	lb/hr						1.40E-03
												Ethylbenzene	4.45E-05	lb/hr						1.95E-04
												m-Xylene	8.23E-04	lb/hr						3.61E-03
												1,2,4-Trimethylbenzene	6.76E-04	lb/hr						2.96E-03
T04	Diesel Fuel Storage Tank - Heavy Vehicles 2 (T-DFS-HV2)	DFSTHV	4-03-010-19	NF	8,760	hours	0	0	0	1.39E-02	0	n-Hexane	5.71E-06	lb/hr	0	0	0	0.06	0	2.50E-05
												Benzene	2.74E-05	lb/hr						1.20E-04
												Toluene	3.18E-04	lb/hr						1.40E-03
												Ethylbenzene	4.45E-05	lb/hr						1.95E-04
												m-Xylene	8.23E-04	lb/hr						3.61E-03
												1,2,4-Trimethylbenzene	6.76E-04	lb/hr						2.96E-03
Total Emissions From Non-Fugitive Sources:															9.00	16.76	0.05	1.51	0.02	3.37
Total Emissions From Fugitive Sources:															606.22	153.82	18.10	3.77	0.00	0.00
Total Emissions:															615.22	170.58	18.15	5.28	0.02	3.37

* All HAP emissions are included in the facility-wide potential to emit, regardless of if they are fugitive or non-fugitive emissions. For purposes of the emission inventory tables, all HAP emissions will be considered non-fugitive.

Table E.8 Maximum Daily Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	Emission Factors							EF Units	Emissions (tpd)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
Mining																				
MN02	Blasting	Blast	3-05-020-09	F	104	tons ANFO	67.00	17.00	2.00	0	0	–	–	lb/tons ANFO	3.48	0.88	0.10	0	0	–
Solvent Extraction and Electrowinning																				
SXE01	Solvent Extraction	SX	4-90-001-99	F	24	hours	0	0	0	9.43E-05	0	Benzene	3.37E-07	lb/hr-ft²	0	0	0	0.01	0	3.69E-05
	4 Primary Mix Tanks (7.75' D x 9.75' H each)	4 @ 47.2 = 188.7	ft²		9,132.9	ft²	Total Surface Area of Solvent Extraction					Toluene	4.82E-06	lb/hr-ft²						5.28E-04
	4 Secondary Mix Tanks (9.5' D x 9.75' H each)	4 @ 70.9 = 283.5	ft²									Ethylbenzene	2.05E-05	lb/hr-ft²						2.25E-03
	3 Tertiary Mix Tanks (9.5' D x 9.75' H each)	3 @ 70.9 = 212.6	ft²									Xylenes	2.80E-05	lb/hr-ft²						3.07E-03
	4 Extraction Settlers (64' L x 33' W x 3.33' H each)	4 @ 2,112 = 8,448	ft²									Others (including Hexane)	2.94E-05	lb/hr-ft²						3.22E-03
SXE02	Electrowinning Commercial Cells (EWCC)	EW	none	NF	24	hours	0	0	0	0	1.57E-04	Cobalt Compounds	2.36E-08	lb/hr-ft²	0	0	0	0	0.00005	7.46E-09
	Controlled by Cell Ventilation Scrubbers (PC-EWCVS1/EWCVS6)				2,640	ft²														
					99	Control Efficiency (%)														
Fuel Burning Equipment																				
FB01	Diesel Electrowinning Hot Water Generator (HWG)	DFB	1-02-005-03	NF	24	hours	5.00	20.00	0.21	0.20	0	POM	3.30E-03	lb/1000 gal	0.003	0.01	0.0001	0.0001	0	1.73E-06
					6.0	MMBtu/hr						Formaldehyde	6.10E-02	lb/1000 gal						3.21E-05
												Arsenic	4.00	lb/10^{12} Btu						2.88E-07
												Beryllium	3.00	lb/10^{12} Btu						2.16E-07
												Cadmium	3.00	lb/10^{12} Btu						2.16E-07
												Chromium	3.00	lb/10^{12} Btu						2.16E-07
												Lead	9.00	lb/10^{12} Btu						6.48E-07
												Mercury	3.00	lb/10^{12} Btu						2.16E-07
												Manganese	6.00	lb/10^{12} Btu						4.32E-07
												Nickel	3.00	lb/10^{12} Btu						2.16E-07
												Selenium	15.00	lb/10^{12} Btu						1.08E-06
FB02	Thickener Area Emergency Generator (TEG)	ICDE3	2-02-001-02	NF	24	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	0.09	0.16	0.0002	0.01	0	–
					1,000	kW						Benzene	7.76E-04	lb/MMBtu						6.74E-05
												Toluene	2.81E-04	lb/MMBtu						3.17E-05
												Xylenes	1.93E-04	lb/MMBtu						2.17E-05
												Formaldehyde	7.89E-05	lb/MMBtu						6.89E-06
												Acetaldehyde	2.52E-05	lb/MMBtu						2.84E-06
												Acrolein	7.88E-06	lb/MMBtu						8.88E-07
												Naphthalene	1.30E-04	lb/MMBtu						1.46E-05
												Acenaphthylene	9.23E-06	lb/MMBtu						1.04E-06

Table E.8 Maximum Daily Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	Emission Factors							EF Units	Emissions (tpd)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Acenaphthene	4.68E-06	lb/MMBtu						5.27E-07
												Fluorene	1.28E-05	lb/MMBtu						1.44E-06
												Phenanthrene	4.08E-05	lb/MMBtu						4.60E-06
												Anthracene	1.23E-06	lb/MMBtu						1.39E-07
												Fluoranthene	4.03E-06	lb/MMBtu						4.54E-07
												Pyrene	3.71E-06	lb/MMBtu						4.18E-07
												Benz(a)anthracene	6.22E-07	lb/MMBtu						7.01E-08
												Chrysene	1.53E-06	lb/MMBtu						1.72E-07
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						1.25E-07
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						2.46E-08
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						2.89E-08
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						4.66E-08
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						3.90E-08
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						6.26E-08
FB03	PLS Pond Area Emergency Generator (PEG)	ICDE3	2-02-001-02	NF	24	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	0.09	0.16	0.0002	0.01	0	–
					1,000	kW						Benzene	7.76E-04	lb/MMBtu						8.74E-05
												Toluene	2.81E-04	lb/MMBtu						3.17E-05
												Xylenes	1.93E-04	lb/MMBtu						2.17E-05
												Formaldehyde	7.89E-05	lb/MMBtu						8.89E-06
												Acetaldehyde	2.52E-05	lb/MMBtu						2.84E-06
												Acrolein	7.88E-06	lb/MMBtu						8.88E-07
												Naphthalene	1.30E-04	lb/MMBtu						1.46E-05
												Acenaphthylene	9.23E-06	lb/MMBtu						1.04E-06
												Acenaphthene	4.68E-06	lb/MMBtu						5.27E-07
												Fluorene	1.28E-05	lb/MMBtu						1.44E-06
												Phenanthrene	4.08E-05	lb/MMBtu						4.60E-06
												Anthracene	1.23E-06	lb/MMBtu						1.39E-07
												Fluoranthene	4.03E-06	lb/MMBtu						4.54E-07
												Pyrene	3.71E-06	lb/MMBtu						4.18E-07
												Benz(a)anthracene	6.22E-07	lb/MMBtu						7.01E-08
												Chrysene	1.53E-06	lb/MMBtu						1.72E-07
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						1.25E-07

Table E.8 Maximum Daily Gaseous Emissions																				
							Emission Factors							EF Units	Emissions (tpd)					
Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						2.46E-08
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						2.89E-08
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						4.66E-08
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						3.90E-08
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						6.26E-08
FB04	Main Substation Emergency Generator (MEG)	ICDE3	2-02-001-02	NF	24	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	0.07	0.12	0.0001	0.008	0	–
					750	kW						Benzene	7.76E-04	lb/MMBtu						6.56E-05
												Toluene	2.81E-04	lb/MMBtu						2.37E-05
												Xylenes	1.93E-04	lb/MMBtu						1.63E-05
												Formaldehyde	7.89E-05	lb/MMBtu						6.67E-06
												Acetaldehyde	2.52E-05	lb/MMBtu						2.13E-06
												Acrolein	7.88E-06	lb/MMBtu						6.66E-07
												Naphthalene	1.30E-04	lb/MMBtu						1.10E-05
												Acenaphthylene	9.23E-06	lb/MMBtu						7.80E-07
												Acenaphthene	4.68E-06	lb/MMBtu						3.95E-07
												Fluorene	1.28E-05	lb/MMBtu						1.08E-06
												Phenanthrene	4.08E-05	lb/MMBtu						3.45E-06
												Anthracene	1.23E-06	lb/MMBtu						1.04E-07
												Fluoranthene	4.03E-06	lb/MMBtu						3.40E-07
												Pyrene	3.71E-06	lb/MMBtu						3.13E-07
												Benz(a)anthracene	6.22E-07	lb/MMBtu						5.25E-08
												Chrysene	1.53E-06	lb/MMBtu						1.29E-07
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						9.38E-08
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						1.84E-08
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						2.17E-08
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						3.50E-08
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						2.92E-08
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						4.70E-08
FB05	Administration Building Emergency Generator (AEG)	ICDE3	2-02-001-02	NF	24	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	0.07	0.12	0.0001	0.008	0	–
					750	kW						Benzene	7.76E-04	lb/MMBtu						6.56E-05
												Toluene	2.81E-04	lb/MMBtu						2.37E-05
												Xylenes	1.93E-04	lb/MMBtu						1.63E-05

Table E.8 Maximum Daily Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	Emission Factors							EF Units	Emissions (tpd)					
							CO	NO_X	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_X	SO_2	VOC	H_2SO_4	HAP *
												Formaldehyde	7.89E-05	lb/MMBtu						6.67E-06
												Acetaldehyde	2.52E-05	lb/MMBtu						2.13E-06
												Acrolein	7.88E-06	lb/MMBtu						6.66E-07
												Naphthalene	1.30E-04	lb/MMBtu						1.10E-05
												Acenaphthylene	9.23E-06	lb/MMBtu						7.80E-07
												Acenaphthene	4.68E-06	lb/MMBtu						3.95E-07
												Fluorene	1.28E-05	lb/MMBtu						1.08E-06
												Phenanthrene	4.08E-05	lb/MMBtu						3.45E-06
												Anthracene	1.23E-06	lb/MMBtu						1.04E-07
												Fluoranthene	4.03E-06	lb/MMBtu						3.40E-07
												Pyrene	3.71E-06	lb/MMBtu						3.13E-07
												Benz(a)anthracene	6.22E-07	lb/MMBtu						5.25E-08
												Chrysene	1.53E-06	lb/MMBtu						1.29E-07
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						9.38E-08
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						1.84E-08
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						2.17E-08
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						3.50E-08
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						2.92E-08
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						4.70E-08
FB06	Electrowinning Building Emergency Generator (EWEG)	ICDE1	2-02-001-02	NF	24	hours	5.00	4.43	0.0066	0.27	0	–	–	g/kW-hr	0.007	0.006	0.000009	0.0004	0	–
					50	kW						Benzene	9.33E-04	lb/MMBtu						5.25E-06
												Toluene	4.09E-04	lb/MMBtu						2.30E-06
												Xylenes	2.85E-04	lb/MMBtu						1.61E-06
												1,3-Butadiene	3.91E-05	lb/MMBtu						2.20E-07
												Formaldehyde	1.18E-03	lb/MMBtu						6.65E-06
												Acetaldehyde	7.67E-04	lb/MMBtu						4.32E-06
												Acrolein	9.25E-05	lb/MMBtu						5.21E-07
												Naphthalene	8.48E-05	lb/MMBtu						4.78E-07
												Acenaphthylene	5.06E-06	lb/MMBtu						2.85E-08
												Acenaphthene	1.42E-06	lb/MMBtu						8.00E-09
												Fluorene	2.92E-05	lb/MMBtu						1.64E-07
												Phenanthrene	2.94E-05	lb/MMBtu						1.66E-07

Table E.8 Maximum Daily Gaseous Emissions																				
							Emission Factors							EF Units	Emissions (tpd)					
Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Anthracene	1.67E-06	lb/MMBtu						1.05E-08
												Fluoranthene	7.61E-06	lb/MMBtu						4.29E-08
												Pyrene	4.76E-06	lb/MMBtu						2.69E-08
												Benzo(a)anthracene	1.68E-06	lb/MMBtu						9.46E-09
												Chrysene	3.53E-07	lb/MMBtu						1.99E-09
												Benzo(b)fluoranthene	9.91E-08	lb/MMBtu						5.58E-10
												Benzo(k)fluoranthene	1.55E-07	lb/MMBtu						8.73E-10
												Benzo(a)pyrene	1.88E-07	lb/MMBtu						1.06E-09
												Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu						2.11E-09
												Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu						3.28E-09
												Benzo(g,h,i)perylene	4.89E-07	lb/MMBtu						2.75E-09
FB07	Primary Crusher Fire Water Pump (PCFWP)	ICDE2	2-02-001-02	NF	24	hours	3.50	3.73	0.0066	0.27	0	--	--	g/kW-hr	0.03	0.03	0.00005	0.002	0	--
					400	hp						Benzene	9.33E-04	lb/MMBtu						3.13E-05
												Toluene	4.09E-04	lb/MMBtu						1.37E-05
												Xylenes	2.85E-04	lb/MMBtu						9.58E-06
												1,3-Butadiene	3.91E-05	lb/MMBtu						1.31E-06
												Formaldehyde	1.18E-03	lb/MMBtu						3.96E-05
												Acetaldehyde	7.67E-04	lb/MMBtu						2.58E-05
												Acrolein	9.25E-05	lb/MMBtu						3.11E-06
												Naphthalene	8.48E-05	lb/MMBtu						2.85E-06
												Acenaphthylene	5.06E-06	lb/MMBtu						1.70E-07
												Acenaphthene	1.42E-06	lb/MMBtu						4.77E-08
												Fluorene	2.92E-05	lb/MMBtu						9.81E-07
												Phenanthrene	2.94E-05	lb/MMBtu						9.88E-07
												Anthracene	1.87E-06	lb/MMBtu						6.28E-08
												Fluoranthene	7.61E-06	lb/MMBtu						2.56E-07
												Pyrene	4.78E-06	lb/MMBtu						1.61E-07
												Benzo(a)anthracene	1.68E-06	lb/MMBtu						5.64E-08
												Chrysene	3.53E-07	lb/MMBtu						1.19E-08
												Benzo(b)fluoranthene	9.91E-08	lb/MMBtu						3.33E-09
												Benzo(k)fluoranthene	1.55E-07	lb/MMBtu						5.21E-09
												Benzo(a)pyrene	1.88E-07	lb/MMBtu						6.32E-09

Table E.8 Maximum Daily Gaseous Emissions																				
Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	Emission Factors							EF Units	Emissions (tpd)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu						1.26E-08
												Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu						1.96E-08
												Benzo(g,h,i)perylene	4.89E-07	lb/MMBtu						1.64E-08
FB08	SX/EW Fire Water Pump (SXFWP)	ICDE2	2-02-001-02	NF	24	hours	3.50	3.73	0.0066	0.27	0	–	–	g/kW-hr	0.03	0.03	0.00005	0.002	0	–
					400	hp						Benzene	9.33E-04	lb/MMBtu						3.13E-05
												Toluene	4.09E-04	lb/MMBtu						1.37E-05
												Xylenes	2.85E-04	lb/MMBtu						9.58E-06
												1,3-Butadiene	3.91E-05	lb/MMBtu						1.31E-06
												Formaldehyde	1.18E-03	lb/MMBtu						3.96E-05
												Acetaldehyde	7.67E-04	lb/MMBtu						2.58E-05
												Acrolein	9.25E-05	lb/MMBtu						3.11E-06
												Naphthalene	8.48E-05	lb/MMBtu						2.85E-06
												Acenaphthylene	5.06E-06	lb/MMBtu						1.70E-07
												Acenaphthene	1.42E-06	lb/MMBtu						4.77E-08
												Fluorene	2.92E-05	lb/MMBtu						9.81E-07
												Phenanthrene	2.94E-05	lb/MMBtu						9.88E-07
												Anthracene	1.87E-06	lb/MMBtu						6.28E-08
												Fluoranthene	7.61E-06	lb/MMBtu						2.56E-07
												Pyrene	4.78E-06	lb/MMBtu						1.61E-07
												Benzo(a)anthracene	1.68E-06	lb/MMBtu						5.64E-08
												Chrysene	3.53E-07	lb/MMBtu						1.19E-08
												Benzo(b)fluoranthene	9.91E-08	lb/MMBtu						3.33E-09
												Benzo(k)fluoranthene	1.55E-07	lb/MMBtu						5.21E-09
												Benzo(a)pyrene	1.88E-07	lb/MMBtu						6.32E-09
												Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu						1.26E-08
												Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu						1.96E-08
												Benzo(g,h,i)perylene	4.89E-07	lb/MMBtu						1.64E-08
Tanks																				
T01	C7 Distribution Tank (T-C7D)	C7DT	4-03-010-19	NF	24	hours	0	0	0	1.08E-01	0	–	–	lb/hr	0	0	0	0.001	0	–
T02	MIBC Storage Tank (T-MIBCS)	MST	4-90-999-98	NF	24	hours	0	0	0	3.53E-03	0	–	–	lb/hr	0	0	0	0.00004	0	–
T03	Diesel Fuel Storage Tank - Heavy Vehicles 1 (T-DFS-HV1)	DFSTHV	4-03-010-19	NF	24	hours	0	0	0	1.39E-02	0	n-Hexane	5.71E-06	lb/hr	0	0	0	0.0002	0	6.85E-08
												Benzene	2.74E-05	lb/hr						3.29E-07

Table E.8 Maximum Daily Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Daily Production Rate	Rate Units	Emission Factors							EF Units	Emissions (tpd)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Toluene	3.18E-04	lb/hr						3.82E-06
												Ethylbenzene	4.45E-05	lb/hr						5.34E-07
												m-Xylene	8.23E-04	lb/hr						9.88E-06
												1,2,4-Trimethylbenzene	6.76E-04	lb/hr						8.11E-06
T04	Diesel Fuel Storage Tank - Heavy Vehicles 2 (T-DFS-HV2)	DFSTHV	4-03-010-19	NF	24	hours	0	0	0	1.38E-02	0	n-Hexane	5.71E-06	lb/hr	0	0	0	0.0002	0	6.85E-08
												Benzene	2.74E-05	lb/hr						3.29E-07
												Toluene	3.18E-04	lb/hr						3.82E-06
												Ethylbenzene	4.45E-05	lb/hr						5.34E-07
												m-Xylene	8.23E-04	lb/hr						9.88E-06
												1,2,4-Trimethylbenzene	6.76E-04	lb/hr						8.11E-06
Total Emissions From Non-Fugitive Sources:															**0.39**	**0.63**	**0.0008**	**0.04**	**0.00005**	**0.01**
Total Emissions From Fugitive Sources:															**3.48**	**0.88**	**0.10**	**0.01**	**0.00**	**0.00**
Total Emissions:															**3.87**	**1.51**	**0.10**	**0.05**	**0.00005**	**0.01**

* All HAP emissions are included in the facility-wide potential to emit, regardless of if they are fugitive or non-fugitive emissions. For purposes of the emission inventory tables, all HAP emissions will be considered non-fugitive.

Table E.9 Hourly Gaseous Emissions																				
Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors							EF Units	Emissions (lb/hr)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
Mining																				
MN02	Blasting	Blast	3-05-020-09	F	52	tons ANFO	67	17	2	0	0	–	–	lb/tons ANFO	3,484.00	884.00	104.00	0	0	–
Solvent Extraction and Electrowinning																				
SXE01	Solvent Extraction	SX	4-90-001-99	F	1	hours	0	0	0	9.43E-05	0	Benzene	3.37E-07	lb/hr-ft^2	0	0	0	0.86	0	3.08E-03
	4 Primary Mix Tanks (7.75' D x 9.75' H each)	4 @ 47.2 = 188.7	ft^2		9,132.9	ft^2	Total Surface Area of Solvent Extraction					Toluene	4.82E-06	lb/hr-ft^2						4.40E-02
	4 Secondary Mix Tanks (9.5' D x 9.75' H each)	4 @ 70.9 = 283.5	ft^2									Ethylbenzene	2.05E-05	lb/hr-ft^2						1.87E-01
	3 Tertiary Mix Tanks (9.5' D x 9.75' H each)	3 @ 70.9 = 212.6	ft^2									Xylenes	2.80E-05	lb/hr-ft^2						2.56E-01
	4 Extraction Settlers (64' L x 33' W x 3.33' H each)	4 @ 2,112 = 8,448	ft^2									Others (including Hexane)	2.94E-05	lb/hr-ft^2						2.69E-01
SXE02	Electrowinning Commercial Cells (EWCC)	EW	none	NF	1	hours	0	0	0	0	1.57E-04	Cobalt Compounds	2.36E-08	lb/hr-ft^2	0	0	0	0	0.004	6.22E-07
	Controlled by Cell Ventilation Scrubbers (PC-EWCVS1/EWCVS6)				2,640	ft^2														
					99	Control Efficiency (%)														
Fuel Burning Equipment																				
FB01	Diesel Electrowinning Hot Water Generator (HWG)	DFB	1-02-005-03	NF	1	hours	5.00	20.00	0.21	0.20	0	POM	3.30E-03	lb/1000 gal	0.22	0.88	0.009	0.009	0	1.45E-04
					6.0	MMBtu/hr						Formaldehyde	6.10E-02	lb/1000 gal						2.67E-03
												Arsenic	4.00	lb/10^{12} Btu						2.40E-05
												Beryllium	3.00	lb/10^{12} Btu						1.80E-05
												Cadmium	3.00	lb/10^{12} Btu						1.80E-05
												Chromium	3.00	lb/10^{12} Btu						1.80E-05
												Lead	9.00	lb/10^{12} Btu						5.40E-05
												Mercury	3.00	lb/10^{12} Btu						1.80E-05
												Manganese	6.00	lb/10^{12} Btu						3.60E-05
												Nickel	3.00	lb/10^{12} Btu						1.80E-05
												Selenium	15.00	lb/10^{12} Btu						9.00E-05
FB02	Thickener Area Emergency Generator (TEG)	ICDE3	2-02-001-02	NF	1	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	7.72	13.23	0.01	0.88	0	–
					1,000	kW						Benzene	7.76E-04	lb/MMBtu						7.28E-03
												Toluene	2.81E-04	lb/MMBtu						2.64E-03
												Xylenes	1.93E-04	lb/MMBtu						1.81E-03
												Formaldehyde	7.89E-05	lb/MMBtu						7.41E-04
												Acetaldehyde	2.52E-05	lb/MMBtu						2.37E-04
												Acrolein	7.88E-06	lb/MMBtu						7.40E-05
												Naphthalene	1.30E-04	lb/MMBtu						1.22E-03
												Acenaphthylene	9.23E-06	lb/MMBtu						8.66E-05

Table E.9 Hourly Gaseous Emissions																				
Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors							EF Units	Emissions (lb/hr)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Acenaphthene	4.68E-06	lb/MMBtu						4.39E-05
												Fluorene	1.28E-05	lb/MMBtu						1.20E-04
												Phenanthrene	4.08E-05	lb/MMBtu						3.83E-04
												Anthracene	1.23E-06	lb/MMBtu						1.15E-05
												Fluoranthene	4.03E-06	lb/MMBtu						3.78E-05
												Pyrene	3.71E-06	lb/MMBtu						3.48E-05
												Benz(a)anthracene	6.22E-07	lb/MMBtu						5.84E-06
												Chrysene	1.53E-06	lb/MMBtu						1.44E-05
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						1.04E-05
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						2.05E-06
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						2.41E-06
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						3.89E-06
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						3.25E-06
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						5.22E-06
FB03	PLS Pond Area Emergency Generator (PEG)	ICDE3	2-02-001-02	NF	1	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	7.72	13.23	0.01	0.88	0	–
					1,000	kW						Benzene	7.76E-04	lb/MMBtu						7.28E-03
												Toluene	2.81E-04	lb/MMBtu						2.64E-03
												Xylenes	1.93E-04	lb/MMBtu						1.81E-03
												Formaldehyde	7.89E-05	lb/MMBtu						7.41E-04
												Acetaldehyde	2.52E-05	lb/MMBtu						2.37E-04
												Acrolein	7.88E-06	lb/MMBtu						7.40E-05
												Naphthalene	1.30E-04	lb/MMBtu						1.22E-03
												Acenaphthylene	9.23E-06	lb/MMBtu						8.66E-05
												Acenaphthene	4.68E-06	lb/MMBtu						4.39E-05
												Fluorene	1.28E-05	lb/MMBtu						1.20E-04
												Phenanthrene	4.08E-05	lb/MMBtu						3.83E-04
												Anthracene	1.23E-06	lb/MMBtu						1.15E-05
												Fluoranthene	4.03E-06	lb/MMBtu						3.78E-05
												Pyrene	3.71E-06	lb/MMBtu						3.48E-05
												Benz(a)anthracene	6.22E-07	lb/MMBtu						5.84E-06
												Chrysene	1.53E-06	lb/MMBtu						1.44E-05
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						1.04E-05

Table E.9 Hourly Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors							EF Units	Emissions (lb/hr)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						2.05E-06
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						2.41E-06
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						3.89E-06
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						3.25E-06
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						5.22E-06
FB04	Main Substation Emergency Generator (MEG)	ICDE3	2-02-001-02	NF	1	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	5.78	9.92	0.01	0.66	0	–
					750	kW						Benzene	7.76E-04	lb/MMBtu						5.46E-03
												Toluene	2.81E-04	lb/MMBtu						1.98E-03
												Xylenes	1.93E-04	lb/MMBtu						1.36E-03
												Formaldehyde	7.89E-05	lb/MMBtu						5.55E-04
												Acetaldehyde	2.52E-05	lb/MMBtu						1.77E-04
												Acrolein	7.88E-06	lb/MMBtu						5.55E-05
												Naphthalene	1.30E-04	lb/MMBtu						9.15E-04
												Acenaphthylene	9.23E-06	lb/MMBtu						6.50E-05
												Acenaphthene	4.68E-06	lb/MMBtu						3.28E-05
												Fluorene	1.28E-05	lb/MMBtu						9.01E-05
												Phenanthrene	4.08E-05	lb/MMBtu						2.87E-04
												Anthracene	1.23E-06	lb/MMBtu						8.66E-06
												Fluoranthene	4.03E-06	lb/MMBtu						2.84E-05
												Pyrene	3.71E-06	lb/MMBtu						2.61E-05
												Benz(a)anthracene	6.22E-07	lb/MMBtu						4.38E-06
												Chrysene	1.53E-06	lb/MMBtu						1.08E-05
												Benzo(b)fluoranthene	1.11E-06	lb/MMBtu						7.81E-06
												Benzo(k)fluoranthene	2.18E-07	lb/MMBtu						1.53E-06
												Benzo(a)pyrene	2.57E-07	lb/MMBtu						1.81E-06
												Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu						2.91E-06
												Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu						2.44E-06
												Benzo(g,h,i)perylene	5.56E-07	lb/MMBtu						3.91E-06
FB05	Administration Building Emergency Generator (AEG)	ICDE3	2-02-001-02	NF	1	hours	3.50	6.00	0.0066	0.40	0	–	–	g/kW-hr	5.78	9.92	0.01	0.66	0	–
					750	kW						Benzene	7.76E-04	lb/MMBtu						5.46E-03
												Toluene	2.81E-04	lb/MMBtu						1.98E-03
												Xylenes	1.93E-04	lb/MMBtu						1.36E-03

Table E.9 Hourly Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors								EF Units	Emissions (lb/hr)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF			CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Formaldehyde	7.89E-05		lb/MMBtu						5.55E-04
												Acetaldehyde	2.52E-05		lb/MMBtu						1.77E-04
												Acrolein	7.88E-06		lb/MMBtu						5.55E-05
												Naphthalene	1.30E-04		lb/MMBtu						9.15E-04
												Acenaphthylene	9.23E-06		lb/MMBtu						6.50E-05
												Acenaphthene	4.68E-06		lb/MMBtu						3.29E-05
												Fluorene	1.28E-05		lb/MMBtu						9.01E-05
												Phenanthrene	4.08E-05		lb/MMBtu						2.87E-04
												Anthracene	1.23E-06		lb/MMBtu						8.65E-06
												Fluoranthene	4.03E-06		lb/MMBtu						2.84E-05
												Pyrene	3.71E-06		lb/MMBtu						2.61E-05
												Benz(a)anthracene	6.22E-07		lb/MMBtu						4.38E-06
												Chrysene	1.53E-06		lb/MMBtu						1.08E-05
												Benzo(b)fluoranthene	1.11E-06		lb/MMBtu						7.81E-06
												Benzo(k)fluoranthene	2.18E-07		lb/MMBtu						1.53E-06
												Benzo(a)pyrene	2.57E-07		lb/MMBtu						1.81E-06
												Indeno(1,2,3-cd)pyrene	4.14E-07		lb/MMBtu						2.91E-06
												Dibenz(a,h)anthracene	3.46E-07		lb/MMBtu						2.44E-06
												Benzo(g,h,i)perylene	5.56E-07		lb/MMBtu						3.91E-06
FB06	Electrowinning Building Emergency Generator (EWEG)	ICDE1	2-02-001-02	NF	1	hours	5.00	4.43	0.0066	0.27	0	–	–		g/kW-hr	0.55	0.49	0.0007	0.03	0	–
					50	kW						Benzene	9.33E-04		lb/MMBtu						4.38E-04
												Toluene	4.09E-04		lb/MMBtu						1.92E-04
												Xylenes	2.85E-04		lb/MMBtu						1.34E-04
												1,3-Butadiene	3.91E-05		lb/MMBtu						1.84E-05
												Formaldehyde	1.18E-03		lb/MMBtu						5.54E-04
												Acetaldehyde	7.67E-04		lb/MMBtu						3.60E-04
												Acrolein	9.25E-05		lb/MMBtu						4.34E-05
												Naphthalene	8.48E-05		lb/MMBtu						3.98E-05
												Acenaphthylene	5.06E-06		lb/MMBtu						2.37E-06
												Acenaphthene	1.42E-06		lb/MMBtu						6.66E-07
												Fluorene	2.92E-05		lb/MMBtu						1.37E-05
												Phenanthrene	2.94E-05		lb/MMBtu						1.38E-05

Table E.9 Hourly Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors							EF Units	Emissions (lb/hr)					
							CO	NO_X	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_X	SO_2	VOC	H_2SO_4	HAP *
												Anthracene	1.87E-06	lb/MMBtu						8.78E-07
												Fluoranthene	7.61E-06	lb/MMBtu						3.57E-06
												Pyrene	4.78E-06	lb/MMBtu						2.24E-06
												Benzo(a)anthracene	1.68E-06	lb/MMBtu						7.89E-07
												Chrysene	3.53E-07	lb/MMBtu						1.66E-07
												Benzo(b)fluoranthene	9.91E-08	lb/MMBtu						4.65E-08
												Benzo(k)fluoranthene	1.55E-07	lb/MMBtu						7.28E-08
												Benzo(a)pyrene	1.88E-07	lb/MMBtu						8.82E-08
												Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu						1.76E-07
												Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu						2.74E-07
												Benzo(g,h,i)perylene	4.89E-07	lb/MMBtu						2.30E-07
FB07	Primary Crusher Fire Water Pump (PCFWP)	ICDE2	2-02-001-02	NF	1	hours	3.50	3.73	0.0066	0.27	0	–	–	g/kW-hr	2.30	2.46	0.004	0.18	0	–
					400	hp						Benzene	9.33E-04	lb/MMBtu						2.61E-03
												Toluene	4.09E-04	lb/MMBtu						1.15E-03
												Xylenes	2.85E-04	lb/MMBtu						7.98E-04
												1,3-Butadiene	3.91E-05	lb/MMBtu						1.09E-04
												Formaldehyde	1.18E-03	lb/MMBtu						3.30E-03
												Acetaldehyde	7.67E-04	lb/MMBtu						2.15E-03
												Acrolein	9.25E-05	lb/MMBtu						2.59E-04
												Naphthalene	8.48E-05	lb/MMBtu						2.37E-04
												Acenaphthylene	5.06E-06	lb/MMBtu						1.42E-05
												Acenaphthene	1.42E-06	lb/MMBtu						3.98E-06
												Fluorene	2.92E-05	lb/MMBtu						8.18E-05
												Phenanthrene	2.94E-05	lb/MMBtu						8.23E-05
												Anthracene	1.87E-06	lb/MMBtu						5.24E-06
												Fluoranthene	7.61E-06	lb/MMBtu						2.13E-05
												Pyrene	4.78E-06	lb/MMBtu						1.34E-05
												Benzo(a)anthracene	1.68E-06	lb/MMBtu						4.70E-06
												Chrysene	3.53E-07	lb/MMBtu						9.88E-07
												Benzo(b)fluoranthene	9.91E-08	lb/MMBtu						2.77E-07
												Benzo(k)fluoranthene	1.55E-07	lb/MMBtu						4.34E-07
												Benzo(a)pyrene	1.88E-07	lb/MMBtu						5.26E-07

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors							EF Units	Emissions (lb/hr)					
							CO	NO_x	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_x	SO_2	VOC	H_2SO_4	HAP *
												Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu						1.05E-06
												Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu						1.63E-06
												Benzo(g,h,i)perylene	4.89E-07	lb/MMBtu						1.37E-06
FB08	SX/EW Fire Water Pump (SXFWP)	ICDE2	2-02-001-02	NF	1	hours	3.50	3.73	0.0066	0.27	0	–	–	g/kW-hr	2.30	2.46	0.004	0.18	0	–
					400	hp						Benzene	9.33E-04	lb/MMBtu						2.61E-03
												Toluene	4.09E-04	lb/MMBtu						1.15E-03
												Xylenes	2.85E-04	lb/MMBtu						7.98E-04
												1,3-Butadiene	3.91E-05	lb/MMBtu						1.09E-04
												Formaldehyde	1.18E-03	lb/MMBtu						3.30E-03
												Acetaldehyde	7.67E-04	lb/MMBtu						2.15E-03
												Acrolein	9.25E-05	lb/MMBtu						2.59E-04
												Naphthalene	8.48E-05	lb/MMBtu						2.37E-04
												Acenaphthylene	5.06E-06	lb/MMBtu						1.42E-05
												Acenaphthene	1.42E-06	lb/MMBtu						3.98E-06
												Fluorene	2.92E-05	lb/MMBtu						8.18E-05
												Phenanthrene	2.94E-05	lb/MMBtu						8.23E-05
												Anthracene	1.87E-06	lb/MMBtu						5.24E-06
												Fluoranthene	7.61E-06	lb/MMBtu						2.13E-05
												Pyrene	4.78E-06	lb/MMBtu						1.34E-05
												Benzo(a)anthracene	1.68E-06	lb/MMBtu						4.70E-06
												Chrysene	3.53E-07	lb/MMBtu						9.88E-07
												Benzo(b)fluoranthene	9.91E-08	lb/MMBtu						2.77E-07
												Benzo(k)fluoranthene	1.55E-07	lb/MMBtu						4.34E-07
												Benzo(a)pyrene	1.88E-07	lb/MMBtu						5.26E-07
												Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu						1.05E-06
												Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu						1.63E-06
												Benzo(g,h,i)perylene	4.89E-07	lb/MMBtu						1.37E-06
Tanks																				
T01	C7 Distribution Tank (T-C7D)	C7DT	4-03-010-19	NF	1	hours	0	0	0	1.06E-01	0	–	–	lb/hr	0	0	0	0.11	0	–
T02	MIBC Storage Tank (T-MIBCS)	MST	4-90-999-98	NF	1	hours	0	0	0	3.53E-03	0	–	–	lb/hr	0	0	0	0.004	0	–
T03	Diesel Fuel Storage Tank - Heavy Vehicles 1 (T-DFS-HV1)	DFSTHV	4-03-010-19	NF	1	hours	0	0	0	1.39E-02	0	n-Hexane	5.71E-06	lb/hr	0	0	0	0.01	0	5.71E-06
												Benzene	2.74E-05	lb/hr						2.74E-05

Table E.9 Hourly Gaseous Emissions

Unit ID	Unit Description	Process Code	SCC	Non-Fug. (NF) / Fug. (F)	Hourly Production Rate	Rate Units	Emission Factors							EF Units	Emissions (lb/hr)					
							CO	NO_X	SO_2	VOC	H_2SO_4	HAP Name	HAP EF		CO	NO_X	SO_2	VOC	H_2SO_4	HAP *
												Toluene	3.16E-04	lb/hr						3.16E-04
												Ethylbenzene	4.45E-05	lb/hr						4.45E-05
												m-Xylene	6.23E-04	lb/hr						6.23E-04
												1,2,4-Trimethylbenzene	6.76E-04	lb/hr						6.76E-04
T04	Diesel Fuel Storage Tank - Heavy Vehicles 2 (T-DFS-HV2)	DFSTHV	4-03-010-19	NF	1	hours	0	0	0	1.39E-02	0	n-Hexane	5.71E-06	lb/hr	0	0	0	0.01	0	5.71E-06
												Benzene	2.74E-05	lb/hr						2.74E-05
												Toluene	3.16E-04	lb/hr						3.16E-04
												Ethylbenzene	4.45E-05	lb/hr						4.45E-05
												m-Xylene	6.23E-04	lb/hr						6.23E-04
												1,2,4-Trimethylbenzene	6.76E-04	lb/hr						6.76E-04
Total Emissions From Non-Fugitive Sources:															**32.38**	**52.57**	**0.87**	**3.61**	**0.004**	**0.84**
Total Emissions From Fugitive Sources:															**3,484.00**	**884.00**	**104.00**	**0.86**	**0.00**	**0.00**
Total Emissions:															**3,516.38**	**936.57**	**104.87**	**4.48**	**0.004**	**0.84**

* All HAP emissions are included in the facility-wide potential to emit, regardless of if they are fugitive or non-fugitive emissions. For purposes of the emission inventory tables, all HAP emissions will be considered non-fugitive.

APPENDIX F

SITE MAPS

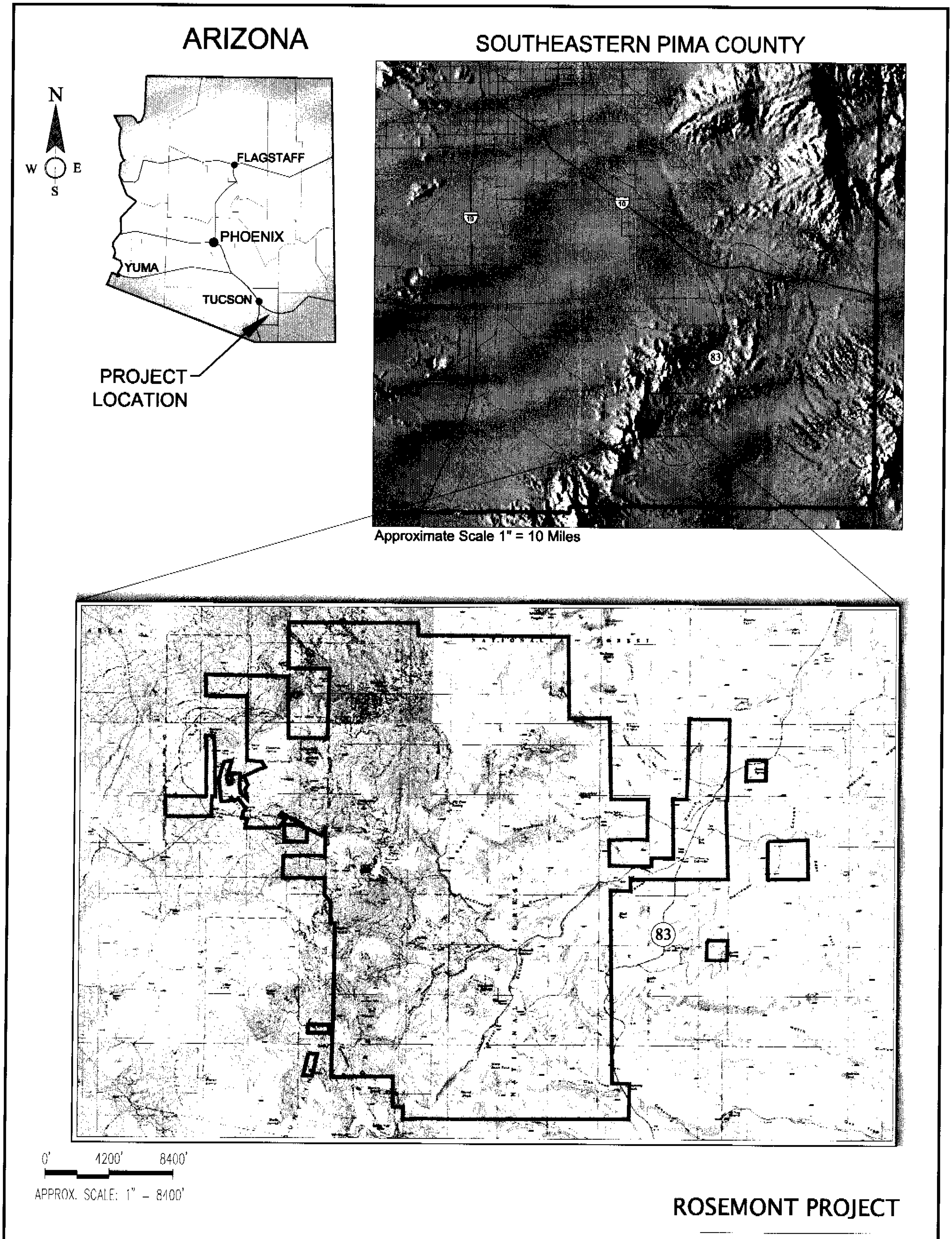

Figure F.1 Vicinity Map of the RCP

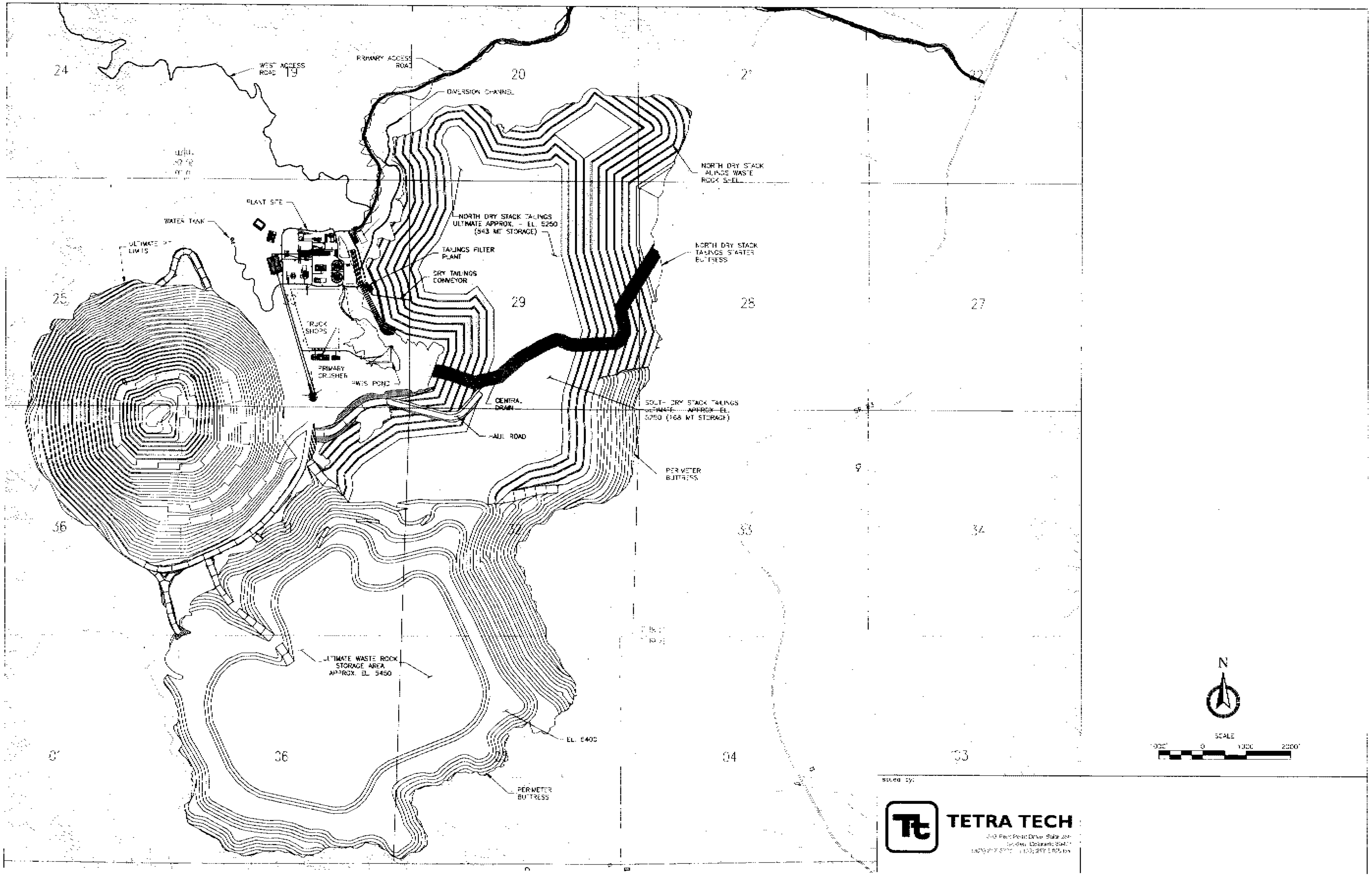

Figure F.2 The Ultimate Configuration of the RCP

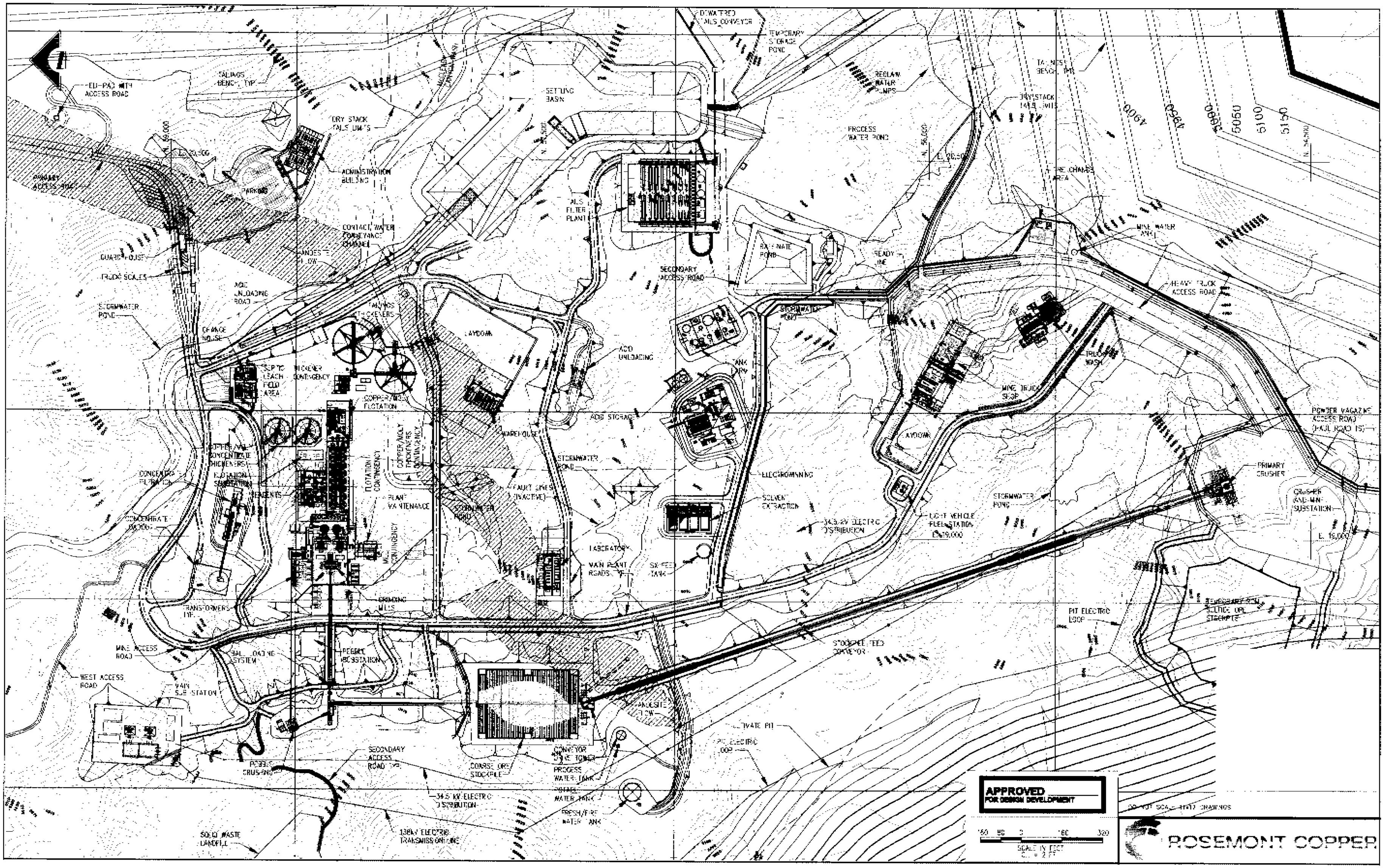

Figure F.3 Site Map Showing Major Processes at the RCP

APPENDIX G

DUST CONTROL PLAN

TABLE OF CONTENTS

LIST OF FIGURES

Page

LIST OF TABLES

Page

G.1. INTRODUCTION

As described in the Calculation Methodology presented in Appendix D, a 90% control efficiency is utilized during the calculation of fugitive dust emissions from regularly traveled unpaved haul roads servicing the open pit as well as from the general facility roads around the RCP. Additionally, the RCP plans to implement reasonable dust control measures to prevent excessive fugitive emissions from open areas and storage piles created by the mining operations. This document constitutes the RCP's dust control plan for achieving a 90% control of fugitive dust emissions from unpaved roads and preventing excessive fugitive emissions from open areas.

G.2. FUGITIVE DUST EMISSIONS FROM UNPAVED ROADS

G.2.1 Unpaved Road Network

The RCP has a network of unpaved haul roads for transporting concentrating ore, leaching ore, and waste rock from the open pit mine to the primary crushing area, leaching area, and waste rock areas, respectively. Additionally, the RCP has general roads around the facility used by support vehicles. Site diagrams of the RCP are presented in Appendix F. Primary roads include: (a) haul roads located in the pit, (b) haul roads for transporting concentrating ore from the pit to the primary crusher/run of mine stockpile, (c) haul roads for transporting leaching ore from the pit to the leach pad, (d) haul roads for transporting waste rock from the pit to the waste rock storage area, and (e) general facility roads around the RCP for support vehicles.

The RCP dust control plan for unpaved roads includes the use of chemical dust suppressants and/or road watering. The control efficiency achieved by chemical dust suppressants depends upon the strength of the ground inventory, whereas the control efficiency achieved by watering depends upon the amount of water that is used (gallons/yd^2) and the traffic volume. Since the chemical dust suppressant usage does not depend on traffic volumes, the ground inventory value determined for a 90% control efficiency can be applied on a periodic basis to any unpaved road at the facility, regardless of the rate of vehicles traveling on the road. However, because the control efficiency achieved by unpaved road watering depends upon traffic volume, in this dust control plan, the haul trucks traveling on haul roads during Year 5 operations at the RCP (the year when haul road travel rates are greatest) is used as an example in determining the application intensity of water used to control fugitive emissions. Additionally, the road network at the RCP is divided into four categories to account for each road network category having a different maximum traffic volume.

During actual operation, the RCP will evaluate the haul truck traffic rates at different time periods throughout the life of the mine to correctly identify the application intensity needed for road watering to achieve a 90% control efficiency on haul roads. Also, the RCP will evaluate the traffic rate of support vehicles to determine the water application intensity needed to control the general unpaved facility roads to a 90% control efficiency.

The calculation methodology used to estimate traffic volume is presented in Appendix G1. The road network categories and the average hourly haul truck traffic rates at the maximum production, assuming operations of 24 hours per day, are presented below:

a) Roadways that will be used to transport concentrating ore, leaching ore, and waste rock from the mining location inside the pit to the exit point of the pit. These roadways are expected to experience an average traffic rate of 120.0 vehicles per hour;

b) Roadways that will be used to transport concentrating ore from the exit of the pit to the primary crusher dump hopper / run of mine stockpile. These roadways are estimated to experience an average traffic rate of 30.0 vehicles per hour;

c) Roadways that will be used to transport leaching ore from the exit of the pit to the leaching area. These roadways are estimated to experience an average traffic rate of 2.0 vehicles per hour; and

d) Roadways that will be used to transport waste rock from the exit of the pit to the waste rock storage area. These roadways are estimated to experience an average traffic rate of 88.0 vehicles per hour.

G.2.2 Description of Dust Control Plans

Optimal dust control measures depend upon the characteristics of the road network and its use, and upon meteorological considerations. Additionally, dust control measures are continuously evolving with new products becoming available on a regular basis. In order to provide flexibility to change dust control measures while achieving the desired control efficiency, this document proposes three programs, each designed to achieve a 90% control of PM_{10} emissions. The RCP dust control plan includes the flexibility to alternate from one dust control program to another or to use a separate dust control program for an individual roadway system.

The RCP dust control plan ensures that at least a 90% control of PM_{10} emissions is achieved on the unpaved road network. The RCP is also required to maintain no greater than a 20% opacity for all non-point sources (see Table 4.1). A 90% control efficiency is considered sufficient to ensure that the 20% opacity limit will be met.

G.2.2.1 Dust Control Program A

Dust Control Program A consists of the application of sufficient chemical dust suppressant to achieve a ground inventory of 0.25 gallons/yard^2 with a reapplication frequency of 1-month (where reapplication frequency refers to the time interval between applications used to maintain a specific ground inventory). The term "ground inventory" represents the residual accumulation of a dust suppressant from previous applications. (For a detailed definition of "ground inventory" see page 3-20 of *Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures*, EPA-450/2-92-004, in Appendix G2). Dust suppressants which could be used for this purpose include, among others, lignosulfonates, petroleum resins, asphalt emulsions, and acrylic cement.

G.2.2.2 Dust Control Program B

Dust Control Program B consists of periodic watering in sufficient amounts to achieve 90% control for PM_{10}. The program will be applied only during days with precipitation of less than 0.01 inches. The water application intensities necessary to achieve a 90% particulate control efficiency during daylight and nighttime hours are presented in Tables G.2.1 and G.2.2, respectively. The roadway network categories are presented in Section G.2.1 and a description on how the application intensities are calculated is presented in Section G.4.2.

Table G.2.1 Average Hourly Watering Requirements During Daylight Hours for Dust Control Program B

Roadway System Category	Average Traffic Volume (vehicles/hour)	Average Hourly Application Intensity During Daylight Hours Required to Achieve a 90% Control Efficiency for Fugitive Dust Emissions [a]	
		liters/meter^2	gallons/yard^2
From Mining Location to Pit Boundary	120.0	4.87	1.08
From Pit Boundary to Primary Crusher Dump Hopper / Run of Mine Stockpile	30.0	1.22	0.27
From Pit Boundary to Leach Pad	2.0	0.08	0.02
From Pit Boundary to Waste Rock Storage Area	88.0	3.57	0.79

[a] The model predicts a 90% control efficiency regardless whether the water application intensity is met with a single hourly application, multiple applications during the 1-hour period, or greater application intensities for less frequent applications.

Table G.2.2 Average Hourly Watering Requirements During Nighttime Hours for Dust Control Program B

Roadway System Category	Average Traffic Volume (vehicles/hour)	Average Hourly Application Intensity During Daylight Hours Required to Achieve a 90% Control Efficiency for Fugitive Dust Emissions [a]	
		liters/meter^2	gallons/yard^2
From Mining Location to Pit Boundary	120.0	2.43	0.54
From Pit Boundary to Primary Crusher Dump Hopper / Run of Mine Stockpile	30.0	0.61	0.13
From Pit Boundary to Leach Pad	2.0	0.04	0.009
From Pit Boundary to Waste Rock Storage Area	88.0	1.79	0.39

[a] The model predicts a 90% control efficiency regardless whether the water application intensity is met with a single hourly application, multiple applications during the 1-hour period, or greater application intensities for less frequent applications.

G.2.2.3 Dust Control Program C

Dust Control Program C consists of the application of sufficient chemical dust suppressant to achieve a ground inventory of 0.05 gallons/yard^2 with a 1-month reapplication frequency (the ground inventory of 0.05 gallons/yard^2 provides a base control efficiency of 62%.) plus periodic watering to increase the base control efficiency achieved by chemical dust suppressants alone to 90%. A summary of the roadway traffic volume and corresponding annual average watering requirements of Dust Control Program C is presented in Table G.2.3 (Daylight Hours) and Table G.2.4 (Nighttime Hours). If any type of water adhesion enhancing material, such as a surfactant, is used with Dust Control Program C, application intensities will be re-evaluated.

Table G.2.3 Average Hourly Watering Requirements During Daylight Hours for Dust Control Program C

Roadway System Category	Average Traffic Volume (vehicles/hour)	Average Hourly Application Intensity During Daylight Hours Required to Achieve a 90% Control Efficiency for Fugitive Dust Emissions [a]	
		liters/meter^2	gallons/yard^2
From Mining Location to Pit Boundary	120.0	1.85	0.41
From Pit Boundary to Primary Crusher Dump Hopper / Run of Mine Stockpile	30.0	0.46	0.10
From Pit Boundary to Leach Pad	2.0	0.03	0.007
From Pit Boundary to Waste Rock Storage Area	88.0	1.36	0.30

[a] The model predicts a 90% control efficiency regardless whether the water application intensity is met with a single hourly application, multiple applications during the 1-hour period, or greater application intensities for less frequent applications.

Table G.2.4 Average Hourly Watering Requirements During Nighttime Hours for Dust Control Program C

Roadway System Category	Average Traffic Volume (vehicles/hour)	Average Hourly Application Intensity During Daylight Hours Required to Achieve a 90% Control Efficiency for Fugitive Dust Emissions [a]	
		liters/meter^2	gallons/yard^2
From Mining Location to Pit Boundary	120.0	0.93	0.20
From Pit Boundary to Primary Crusher Dump Hopper / Run of Mine Stockpile	30.0	0.23	0.05
From Pit Boundary to Leach Pad	2.0	0.02	0.003
From Pit Boundary to Waste Rock Storage Area	88.0	0.68	0.15

[a] The model predicts a 90% control efficiency regardless whether the water application intensity is met with a single hourly application, multiple applications during the 1-hour period, or greater application intensities for less frequent applications.

G.3. PLAN FOR THE CONTROL OF FUGITIVE DUST EMISSIONS FROM OPEN AREAS AND STORAGE PILES

G.3.1 Open Areas and Storage Piles

Open areas and storage piles include mined areas, overburden storage areas, as well as waste rock storage areas. Open areas and storage areas which are subject to generating fugitive emissions exclude ore, waste rock, and other similar areas because these areas are characterized by a low silt content and therefore, are not dust producing areas. Consequently, dust control measures are not necessary for such areas.

G.3.2 Description of Dust Control Plan

Open areas and storage piles which are in active use and subject to generating fugitive emissions will be controlled by the application of water as required by Chapter 17.16, Article III of the P.C.C.. Open areas and storage piles which are not actively used will be controlled by applying the methods required by P.C.C. Sections 17.16.080 and 17.16.110, respectively. This includes the application of sufficient chemical dust suppressant and/or water to develop and maintain a visible crust. Periodic inspections of the open areas will be performed to evaluate the condition of the visible crust and, if necessary, additional chemical dust suppressant and/or water will be applied. Other means which may be applied include use of an adhesive soil stabilizer, paving covering, landscaping, detouring, or other acceptable means. Access to such areas will also be minimized by the construction of berms or other barriers to prevent re-disturbance of the areas.

G.4. DEMONSTRATION THAT THE DUST CONTROL PLAN WILL PROVIDE A 90% CONTROL EFFICIENCY

G.4.1 Dust Control Program A

The control efficiency of a chemical dust suppressant is dependent upon the ground inventory of the dust suppressant and the frequency between applications. A model developed by EPA, and published in *Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures* (see Appendix G2), provides the relationship between these parameters and PM_{10} control performance for dust suppressants in general. A graph representing this model is presented in Figure G.4.1.

The sufficiency of Dust Control Program A to achieve a control efficiency of 90% for PM_{10} is verified by considering this figure. Using a chemical dust suppressant, a ground inventory of 0.25 gallons/yd^2 with a 1-month reapplication frequency will provide a control efficiency for PM_{10} of 90%. It should be noted that the model for PM_{10} control efficiency of petroleum-based dust suppressants published in the AP-42, Section 13.2.2 (11/06), agrees with the EPA model used to determine the sufficiency of Dust Control Program A.

The control efficiencies in the above mentioned models are averages and not maximums. Therefore, it can be assumed that using a chemical dust suppressant with a ground inventory of 0.25 gallons/yd^2 could result in control efficiencies higher than 90%.

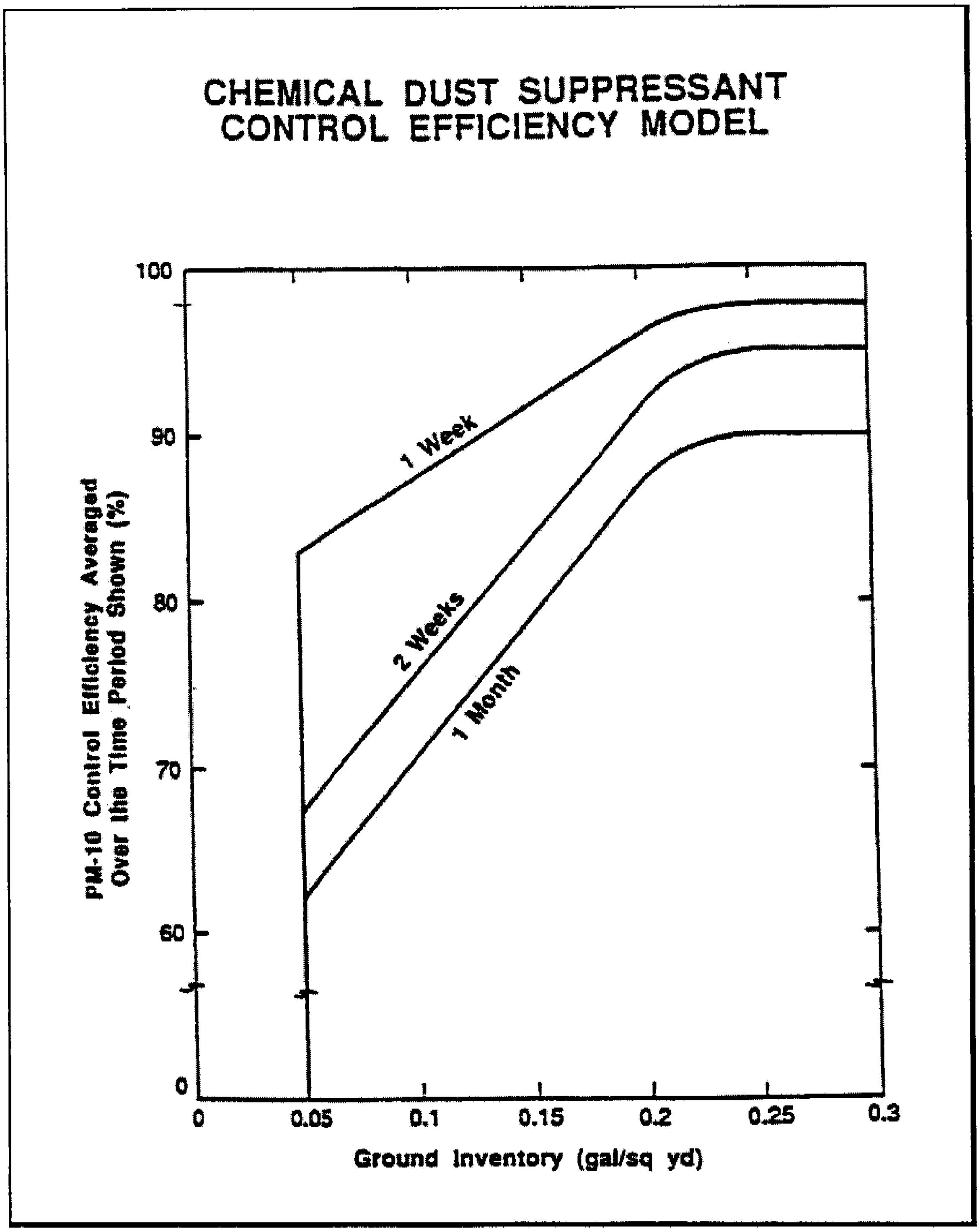

Figure G.4.1 Model for Control Efficiency of PM_{10} when Using Chemical Dust Suppressants.

G.4.2 Dust Control Program B

The application intensity of water during daylight and nighttime hours required to achieve a 90% control efficiency for each road category is calculated using an empirical model developed by EPA (*Control of Open Fugitive Sources*, EPA-U50/3-88-008, September, 1988, presented in Appendix G3). The following equations were derived from this model:

$$i = \frac{0.8 \times p \times d \times t}{(100 - W_c)} \qquad \text{Equation 1}$$

$$p = 0.0049 \times PER \qquad \text{Equation 2}$$

where:

- i = application intensity (liters/m^2);
- p = potential average hourly daytime evaporation rate (mm/hr, 0.507 for Tucson, AZ);
- d = average hourly daytime traffic (vehicles/hr; see Section G.2.1);
- t = time between applications (hours, 1 for hourly applications)
- W_c = average particulate control efficiency (%, 90 in this case); and
- PER = mean annual pan evaporation rate (inches/year, 103.51 for Tucson, AZ from Western Region Climate Center data from 1894-2005).

As shown by Equation 1, the application intensity is dependent upon the pan evaporation rate. Because the pan evaporation rate differs between daytime and nighttime conditions, as well as meteorological conditions, application intensities will also vary with daylight hours and nighttime hours and with meteorological conditions. Nighttime hour application intensities are calculated assuming the average hourly nighttime pan evaporation rate is equal to 50% of the average hourly daytime pan evaporation rate.

The application intensity required to achieve a 90% control efficiency is calculated using Equation 1. However, the application intensities are for illustration purposes due to the varying conditions of evaporation rates and traffic volumes. A summary of the input variables and resulting application intensities during daylight hours and nighttime hours derived from the above equation are presented in Tables G.4.1 and G.4.2, respectively.

The application intensities in Tables G.4.1 and G.4.2 are based upon an hourly frequency of application. The RCP may reduce the frequency of application by increasing the application intensity. A frequency of once every two hours, for example, would require that the application intensities in Tables G.4.1 and G.4.2 to be increased by a factor of 2.

Table G.4.1 Summary of Data Used to Verify Dust Control Program B During Daylight Hours

Roadway System Category	Variables				Average Hourly Water Application Intensity (i) [a]	
	Wc (%)	p (mm/h)	d (vehicles/ hour)	t (hours)	liters/ meter^2	gallons/ yard^2
From Mining Location to Pit Boundary	90	0.507	120.0	1.0	4.87	1.08
From Pit Boundary to Primary Crusher Dump Hopper / Run of Mine Stockpile	90	0.507	30.0	1.0	1.22	0.27
From Pit Boundary to Leach Pad	90	0.507	2.0	1.0	0.08	0.02
From Pit Boundary to Waste Rock Storage Area	90	0.507	88.0	1.0	3.57	0.79

[a] The model predicts a 90% control efficiency regardless whether the water application intensity is met with a single hourly application, multiple applications during the 1-hour period, or greater application intensities for less frequent applications.

Table G.4.2 Summary of Data Used to Verify Dust Control Program B During Nighttime Hours

Roadway System Category	Variables				Average Hourly Water Application Intensity (i) [a]	
	Wc (%)	p (mm/h)	d (vehicles/ hour)	t (hours)	liters/ meter^2	gallons/ yard^2
From Mining Location to Pit Boundary	90	0.254	120.0	1.0	2.43	0.54
From Pit Boundary to Primary Crusher Dump Hopper / Run of Mine Stockpile	90	0.254	30.0	1.0	0.61	0.13
From Pit Boundary to Leach Pad	90	0.254	2.0	1.0	0.04	0.009
From Pit Boundary to Waste Rock Storage Area	90	0.254	88.0	1.0	1.79	0.39

[a] The model predicts a 90% control efficiency regardless whether the water application intensity is met with a single hourly application, multiple applications during the 1-hour period, or greater application intensities for less frequent applications.

It should be noted that the pan evaporation rates used to calculate the application intensities in Tables G.4.1 and G.4.2 represent annual averages which, when used with Equation 1, will result in an application intensity that is too high for winter months and too low for summer months. Actual application intensities will be determined based on actual pan evaporation rates as determined for the different climatological periods of the year. Additionally, the calculated intensities are based on the maximum mine production rates. Lower production rates characterized by lower traffic rates will be characterized by lower application intensities. If any type of water adhesion enhancing material, such as a surfactant, is used with Dust Control Plan B, application intensities will be reevaluated.

G.4.3 Dust Control Program C

The sufficiency of Dust Control Program C to achieve a control efficiency of 90% for fugitive dust emissions is verified by considering Figure G.4.1. Using a chemical dust suppressant, a ground inventory of 0.05 gallons/yard^2 with a 1-month reapplication frequency provides a control efficiency of 62% for PM_{10}. The additional 28% control necessary to increase the control efficiency to 90% will be attained through periodic watering. The control efficiency of the watering program, W_c, necessary to increase the chemical dust suppressant control efficiency, CDS_c, of 62% to a combined dust suppressant/watering control efficiency of 90% is derived from the following equation:

$$W_c = \left(\frac{\text{Additional Control Necessary (\%)}}{(100\% - CDS_c)} \right) \times 100\% \qquad \text{Equation 3}$$

$$W_c = \left(\frac{28\%}{(100\% - 62\%)} \right) \times 100\%$$

$$W_c = 73.7\%$$

This value, 73.7%, is used in conjunction with the model described in Section G.4.2 to determine the average application intensity of watering that is necessary to achieve a 73.7% control efficiency. A summary of the input variables and resulting hourly application intensities during daylight and nighttime hours derived from the model is given in Tables G.4.3 and G.4.4, respectively.

Table G.4.3 Summary of Data Used to Verify Dust Control Program C During Daylight Hours

Roadway System Category	Variables				Average Hourly Water Application Intensity (i) [a]	
	Wc (%)	p (mm/h)	d (vehicles/ hour)	t (hours)	liters/ $meter^2$	gallons/ $yard^2$
From Mining Location to Pit Boundary	73.7	0.507	120.0	1.0	1.85	0.41
From Pit Boundary to Primary Crusher Dump Hopper / Run of Mine Stockpile	73.7	0.507	30.0	1.0	0.46	0.10
From Pit Boundary to Leach Pad	73.7	0.507	2.0	1.0	0.03	0.007
From Pit Boundary to Waste Rock Storage Area	73.7	0.507	88.0	1.0	1.36	0.30

[a] The model predicts a 90% control efficiency regardless whether the water application intensity is met with a single hourly application, multiple applications during the 1-hour period, or greater application intensities for less frequent applications.

Table G.4.4 Summary of Data Used to Verify Dust Control Program C During Nighttime Hours

Roadway System Category	Variables				Average Hourly Water Application Intensity (i) [a]	
	Wc (%)	p (mm/h)	d (vehicles/ hour)	t (hours)	liters/ $meter^2$	gallons/ $yard^2$
From Mining Location to Pit Boundary	73.7	0.254	120.0	1.0	0.93	0.20
From Pit Boundary to Primary Crusher Dump Hopper / Run of Mine Stockpile	73.7	0.254	30.0	1.0	0.23	0.05
From Pit Boundary to Leach Pad	73.7	0.254	2.0	1.0	0.02	0.003
From Pit Boundary to Waste Rock Storage Area	73.7	0.254	88.0	1.0	0.68	0.15

[a] The model predicts a 90% control efficiency regardless whether the water application intensity is met with a single hourly application, multiple applications during the 1-hour period, or greater application intensities for less frequent applications.

G.5. DEMONSTRATION OF COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 17.16, ARTICLE III OF THE P.C.C.

Section 17.16.080 of the P.C.C. requires, in part, that fugitive dust from open areas be kept to a minimum by good modern practices such as using an approved dust suppressant.

Section G.3 of this document describes the control measures for wind-blown fugitive dust from open areas and storage piles at the RCP. By developing and maintaining a visible crust on the soil in all open areas and applicable storage piles, implementing best management practices (e.g., watering), and minimizing access to these areas, the RCP Dust Control Plan complies with the requirements of Chapter 17.16, Article III for the control of fugitive dust emissions from open areas and storage piles.

G.6. PERIODIC REAPPLICATION

G.6.1 Chemical Dust Suppressants

Dust control programs that utilize chemical dust suppressants require periodic applications of the chemical dust suppressant in order to replenish dust suppressants that are removed from the road due to the abrasion of the vehicles on the treated road surface. Each successive application will correspond to:

a) The manufacturer's recommendation if available; or

b) If manufacturer's recommendations are not available, the amount necessary to completely replenish the initial ground inventory every six months.

G.6.2 Road Watering

The frequency of reapplication of water used in Dust Control Programs B and C will depend upon the operational plans of the RCP. The frequency can be hourly, less frequent or more frequent, depending upon the traffic density, meteorological conditions, and operational considerations. The application intensities for water should be treated as annual averages as some days will require a greater water application whereas others will require a lesser water application due to seasonal climatic condition changes. The models introduced in Sections G.4.2 and G.4.3 predict the same control efficiency independent of whether the water is applied during one pass per hour of the water truck or during multiple passes during the 1-hour period. Additionally, watering will not be required for days when natural precipitation equals or exceeds 0.01 inches or when roads are moist due to recent rain, as the control efficiency during such days is assumed to be 100% by AP-42.

G.7. RECORD KEEPING REQUIREMENTS

G.7.1 Records of the Application of Chemical Dust Suppressants

Records will be maintained demonstrating the RCP's compliance with the initial chemical dust suppressant ground inventory required by Dust Control Programs A and C by recording the information necessary to demonstrate a 90% control efficiency.

G.7.2 Records of Reapplication of Chemical Dust Suppressants

Records will be maintained demonstrating the RCP's compliance with the periodic reapplication of dust suppressants to replace losses as identified in Section G.6.1. Records will be maintained concurrently with the records described in Section G.7.1.

G.7.3 Records of Application of Water

Records will be maintained demonstrating the RCP's compliance with the watering requirements of Dust Control Programs B and C by recording the information necessary to demonstrate a 90% control efficiency.

APPENDIX G1

ROADWAY NETWORK TRAFFIC VOLUME CALCULATION METHODOLOGY

G1. ROADWAY SYSTEM TRAFFIC VOLUME CALCULATION METHODOLOGY

Because the control efficiency of unpaved road watering is dependent upon traffic volume, the roadway system at the RCP was divided into four road network categories based on average hourly traffic rates. Traffic volume estimates for the road network categories are calculating by dividing the anticipated hourly amount of material transferred by the haul trucks on each road network category by the average haul truck load (250 tons) and multiplying this number by two to account for the haul trucks returning empty to the mining location. This methodology is shown in the following equation:

$$\text{Traffic Volume}\left(\frac{\text{vehicles}}{\text{hour}}\right)=\left(\text{Material Transferred by Haul Trucks}\left(\frac{\text{tons}}{\text{hour}}\right)\times\frac{1\,\text{trip}}{250\,\text{tons}}\times\frac{2\,\text{passes}}{\text{trip}}\right)$$

The process rates and resulting traffic volume estimates for each roadway system are listed in Table G1.1. The traffic volumes in this table are presented for Year 5 operations at the RCP. However, since process rates vary hourly, daily, and annually, traffic volumes will be monitored on an on-going basis so that accurate water application intensities are determined and a 90% control efficiency will be met.

Table G1.1 Summary of Data Used to Calculate Roadway System Traffic Volume (Year 5)

Roadway System Category	Maximum Process Rate (tons/hour)	Traffic Volume (vehicles/hour)
From Mining Location to Pit Boundary	15,000	120.0
From Pit Boundary to Primary Crusher Dump Hopper / Run of Mine Stockpile	3,750	30.0
From Pit Boundary to Leach Pad	250	2.0
From Pit Boundary to Waste Rock Storage Area	11,000	88.0

APPENDIX G2

EXCERPT FROM

***FUGITIVE DUST BACKGROUND DOCUMENT AND TECHNICAL INFORMATION DOCUMENT FOR BEST AVAILABLE CONTROL MEASURES*, EPA - 450/2-92-004, SEPTEMBER 1992**

PB93-1222

United States
Environmental Protection
Agency

Air

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

EPA-450/2-92-004
September 1992

EPA

FUGITIVE DUST BACKGROUND DOCUMENT AND TECHNICAL INFORMATION DOCUMENT FOR BEST AVAILABLE CONTROL MEASURES

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3.1.2.2 Water Flushing of Roads--

Street flushers remove surface materials from roads and parking lots using high pressure water sprays. Some systems supplement the cleaning with broom sweeping after flushing. Unlike the two sweeping methods, flushing faces some obvious drawbacks in terms of water usage, potential water pollution, and the frequent need to return to the water source. However, flushing generally tends to be more effective in controlling particulate emissions.

Equations to estimate instantaneous control efficiency values are given in Table 3-1. Note that water flushing and flushing followed by broom sweeping represent the two most effective control methods (on the basis of field emission measurements) given in that table.

In the case of winter sanding, dust generation potential can be reduced if the fine materials left on roadways after pavement drying are cleaned up promptly and without further spreading and resuspension. Prompt cleaning also keeps abrasives from being ground into small particles by road traffic or freeze/thawing. Quick cleanup may not be mandated, however, if a new snowstorm is likely. Cleanup using combination water flushing/broom sweeping is recommended as soon as possible after a storm when above-freezing temperatures keep the flushing water from freezing on the roadway. If the road is already wet, flushing may not be required.

3.2 UNPAVED ROADS

There are numerous control options for unpaved travel surfaces, as shown in Table 3-5. Note that the controls fall into the three general categories of source extent reductions, surface improvements, and surface treatment. Each of these is discussed in greater detail in the following sections.

TABLE 3-5. CONTROL TECHNIQUES FOR UNPAVED TRAVEL SURFACES[a]

Source extent reduction:	Speed reduction
	Traffic reduction
Source improvement:	Paving
	Gravel surface
Surface treatment:	Watering
	Chemical stabilization

[a] Table entries reflect EPA draft guidance on urban fugitive dust control.

3.2.1 Source Extent Reductions

These controls either limit the amount of traffic on a road to reduce the PM-10 emission rate or lower speeds to reduce the emission factor value given by Equation (2-6). Examples could include ride share programs, restriction of roads to certain vehicle types, or strict enforcement of speed limits. In any instance, the control afforded by these measures is readily obtained by the application of the equation.

3.2.2 Surface Improvements

These controls alter the road surface. Unlike surface treatments (discussed below), these improvements are largely "one-shot" control methods; that is, periodic retreatments are not normally required.

The most obvious surface improvement is, of course, paving an unpaved road. This option is expensive and is probably most applicable to high volume (more than a few hundred passes per day) public roads and industrial plant roads that are not subject to very heavy vehicles (e.g., slag pot carriers, haul trucks, etc.) or spillage of material in transport. Control efficiency estimates can be obtained by applying the information of Section 3-1.

Other improvement methods cover the road surface material with another material of lower silt content (e.g., covering a dirt road with gravel or slag, or using a "road carpet" under ballast). Because Equation (2-6) shows a linear relationship between the emission factor and the silt content of the road surface, any reduction in the silt value is accompanied by an equivalent reduction in emissions. This type of improvement is initially much less expensive than paving; however, maintenance (such as grading and spot reapplication of the cover material) may be required.

Finally, vegetative cover has been proposed as a surface improvement for very low traffic volume roads (i.e., access roads to agricultural fields). Even though vehicle related emissions from such a road would be quite low, this method will also reduce wind erosion of the road surface.

3.2.3 Surface Treatments

Surface treatment refers to those control techniques which require periodic reapplications. Treatments fall into the two main categories of (1) wet suppression (i.e., watering, possibly with surfactants or other additives), which keeps the surface wet to control emissions, and (2) chemical stabilization, which attempts to change the physical (and, hence, the emissions) characteristics of the roadway. Necessary reapplication frequencies may range from several minutes for plain water under hot, summertime conditions to several weeks (or months) for chemicals.

Water is usually applied to unpaved roads using a truck with a gravity or pressure feed. This is only a temporary measure, and periodic reapplications are necessary to achieve any substantial level of control efficiency. Some increase in overall control efficiency is afforded by wetting agents which reduce surface tension.

Chemical dust suppressants, on the other hand, have much less frequent reapplication requirements. These suppressants are designed to alter the roadway, such as cementing loose material into a fairly impervious surface (thus simulating a paved surface) or forming a surface which attracts and retains moisture (thus simulating wet suppression).

Chemical dust suppressants are generally applied to the road surface as a water solution of the agent. The degree of control achieved is a direct function of the application intensity (volume of solution per area), dilution ratio, and frequency (number of applications per unit time) of the chemical applied to the surface and also depends on the type and number of vehicles using the road.

3.2.3.1 Watering--

The control efficiency of unpaved road watering depends upon: (a) the amount of water applied per unit area of road surface, (b) the time between reapplications, (c) traffic volume during that period, and (d) prevailing meteorological conditions during the period. All of these factors affect the road surface moisture content. The control efficiency relationship shown in Figure 3-1 is buried in field tests conducted at a coal-fired power plant. Surface moisture grab samples over the daily watering cycle along with the daily traffic flow cycle are needed to determine an average control efficiency using this figure. The low control efficiency for watering of unpaved roads and the need for frequent (almost daily) reapplication preclude the use of watering as possible BACM.

3.2.3.2 Chemical Treatments--

As noted, some chemicals (most notably salts) simulate wet suppression by attracting and retaining moisture on the road surface. These methods are often supplemented by some watering. It is recommended that control efficiency estimates be obtained using Figure 3-1 and enforcement be based on grab sample moisture contents.

The more common chemical dust suppressants form a hard cemented surface. It is this type of suppressant that is considered below.

Besides water, petroleum resins (such as Coherex®) have historically been the products most widely used in industry. However, considerable interest has been shown at both the plant and corporate level in alternative chemical dust suppressants. As a result of this continued interest, several new dust

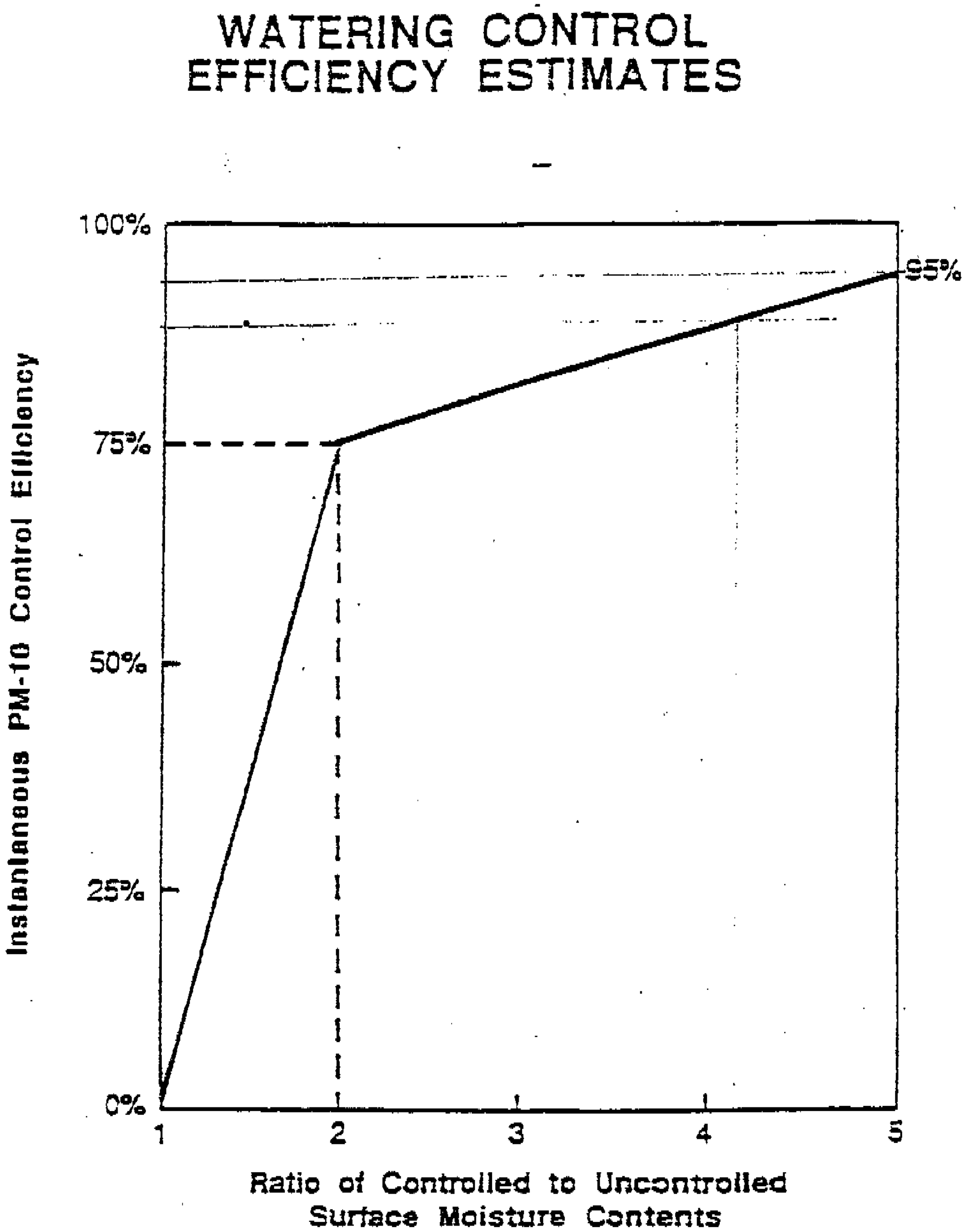

Figure 3-1. Watering Control Effectiveness for Unpaved Travel Surfaces.

suppressants have been introduced. These have included asphalt emulsions, acrylics, and adhesives. In addition, the generic petroleum resin formulations developed at the Mellon Institute with funding from the American Iron and Steel Institute (AISI) have gained considerable attention. These generic suppressants were designed to be produced on-site at iron and steel plants. On-site production of this type of suppressant in quantities commonly used in iron and steel plants has been estimated to reduce chemical costs by approximately 50 percent (Russell and Caruso, 1984).

In an earlier test report, average performance curves were generated for four chemical dust suppressants: (a) a commercially available petroleum resin, (b) a generic petroleum resin for on-site production at an industrial facility, (c) an acrylic cement, and (d) an asphalt emulsion (Muleski and Cowherd, 1987). (Note that at the time of the testing program, these suppressant types accounted for the majority of the market share in the iron and steel industry.) The results of this program were combined with other test results to develop a model to estimate <u>time-averaged</u> PM-10 control performance. This model is illustrated in Figure 3-2. Several items are to be noted:

- The term "ground inventory" is a measure of residual effects from previous applications. Ground inventory is found by adding together the total volume (per unit area) of concentrate (<u>not solution</u>) since the start of the dust control season. An example is provided below.
- Note that no credit for control is assigned until the ground inventory exceeds 0.05 gal/yd^2.
- Because suppressants must be periodically reapplied to unpaved roads, use of the time-average values given in the figure are appropriate. Recommended minimum reapplication frequencies (as well as alternatives) are discussed later in this section.

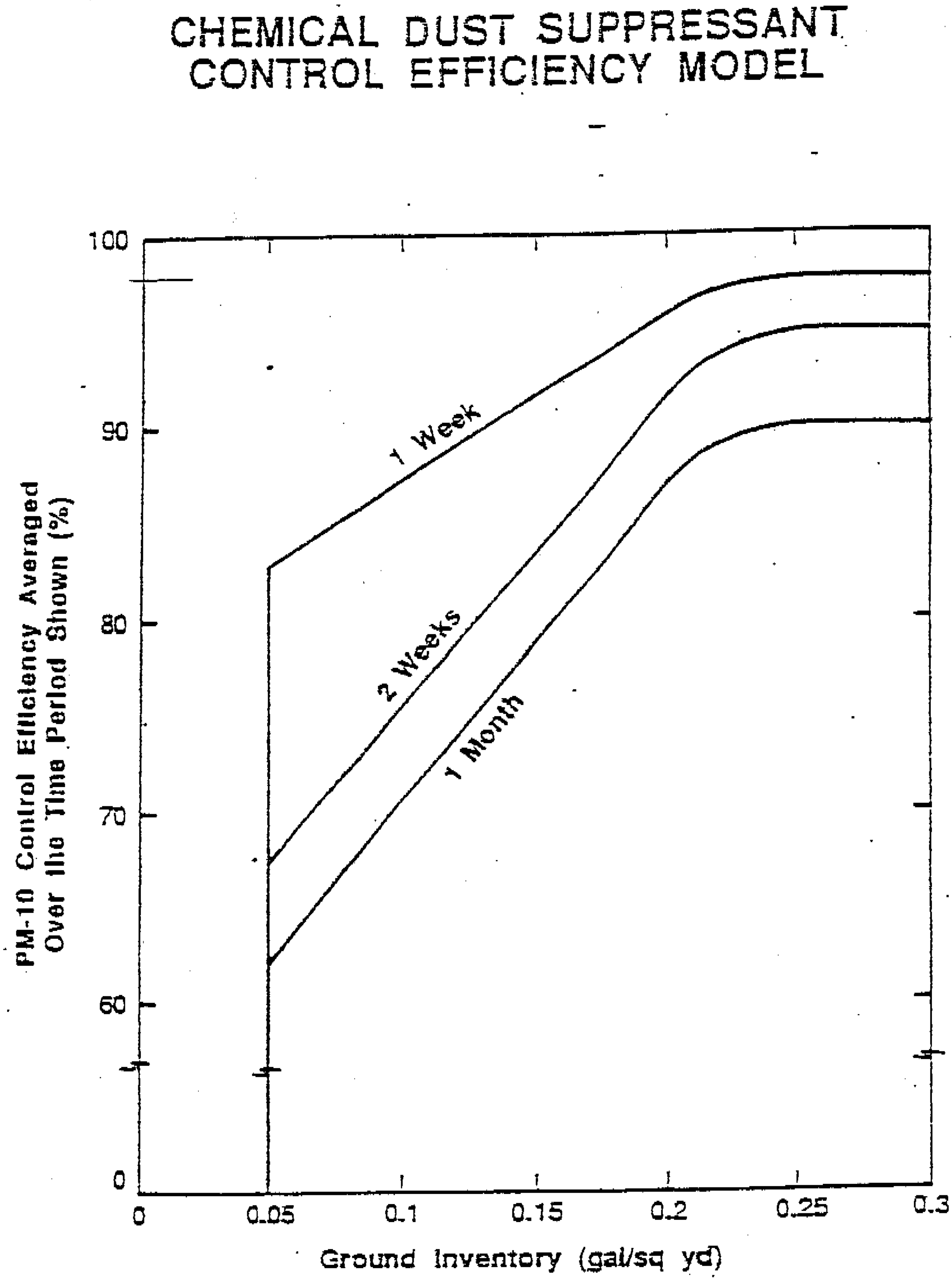

Figure 3-2. Average PM10 control efficiency for chemical suppressants.

- Figure 3-2 represents an average of the four suppressants given above. The basis of the methodology lies in a similar model for petroleum resins only (Muleski and Cowherd, 1987). However, agreement between the control efficiency estimates given by Figure 3-2 and available field measurements is reasonably good.

As an example of the use of Figure 3-2, suppose the Equation (2-6) has been used to estimate a PM-10 emission factor of 2.0 kg/VKT. Further, suppose that starting on May 1, the road is treated with 0.25 gal/yd^2 of a (1 part chemical to 5 parts water) solution on the first of each month until October. In this instance, the following average controlled emission factors are found:

Period	Ground inventory, gal/yd^2	Average control efficiency, percent[a]	Average controlled emission factor, kg/VKT
May	0.042	0	2.0
June	0.083	68	0.64
July	0.12	75	0.50
August	0.17	82	0.36
September	0.21	88	0.24

a From Figure 3-1; zero efficiency assigned if ground inventory is less than 0.05 gal/yd^2.

In formulating dust control plans for chemical dust suppressants, additional topics must be considered. These are briefly discussed below.

3.2.3.2.1 Use of Paved Road Controls on Chemically Treated Unpaved Roads—Repeated use of chemical dust suppressants tend, over time, to form fairly impervious surfaces on unpaved roads. The resulting surface may permit the use of paved road cleaning techniques to reduce aggregate loading due to spillage and track-on. A field program conducted tests on surfaces that had been flushed and vacuumed 3 days earlier (Muleski and Cowherd, 1987). (The surfaces themselves had last been chemically treated 70 days before.) Control efficiency values of 90 percent or more (based on the uncontrolled emission factor of the unpaved roads) were found for each particulate size fraction considered.

The use of paved road techniques for "housekeeping" purposes would appear to have the benefits of both high control (referenced to an uncontrolled unpaved road) and potentially relatively low cost (compared to follow-up chemical applications). Generally, it is recommended that these methods not be employed until the ground inventory exceeds approximately 0.2 gal/yd^2 (0.9 L/m^2). Plant personnel should, of course, first examine the use of paved road techniques on chemically-treated surfaces in limited areas prior to implementing a full-scale program.

3.2.3.2.2 <u>Minimum Reapplication Frequency</u>--Because unpaved roads in industry are often used for the movement of materials and are often surrounded by additional unpaved travel areas, spillage and carryout onto the chemically treated road required periodic "housekeeping" activities. In addition, gradual abrasion of the treated surface by traffic will result in loose material on the surface which should be controlled.

It is recommended that at least dilute reapplications be employed every month to control loose surface material unless paved road control techniques are used (as described above). More frequent reapplications would be required if spillage and track-on pose particular problems for a road.

3.2.3.2.3 <u>Weather Considerations</u>--Roads generally have higher moisture contents during cooler periods due to decreased evaporation. Small increases in surface moisture may result in large increases in control efficiency (as referenced to the dry summertime conditions inherent in the AP-42 unpaved road predictive equation). In addition, application of chemical dust suppressants during cooler periods of the year may be inadvisable for traffic safety reasons.

Weather-related application schedules should be considered prior to implementing any control program. Responsible parties and regulatory agency personnel should work closely in making this joint determination.

Compared to the other open dust sources discussed in this manual, there is a wealth of cost information available for chemical dust suppressants on unpaved roads. Note that many salt products are delivered and applied by the same truck. For those products, costs are easily obtained by contacting a local distributor.

3.3 STORAGE PILES

The control techniques applicable to storage piles fall into distinct categories as related to materials handling operations (including traffic around piles) and wind erosion. In both cases, the control can be achieved by: (a) source extent reduction, (b) source improvement related to work practices and transfer equipment (load-in and load-out operations), and (c) surface treatment. These control options are summarized in Table 3-6. The efficiency of these controls ties back to the emission factor relationships presented earlier in this section.

In most cases, good work practices which confine freshly exposed material provide substantial opportunities for emission reduction without the need for investment in a control application program. For example, pile activity, loading and unloading, can be confined to leeward (downwind) side of the pile. This statement also applies to areas around the pile as well as the pile itself. In particular, spillage of material caused by pile load-out and maintenance equipment can add a large

APPENDIX G3

EXCERPT FROM
CONTROL OF OPEN FUGITIVE DUST SOURCES,
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CONTROL OF OPEN FUGITIVE DUST SOURCES

Midwest Research Institute
Kansas City, MO

Sep 88

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
NTIS

3.3.3 Surface Treatments

3.3.3.1 Watering. The control efficiency of unpaved road watering depends upon (a) the amount of water applied per unit area of road surface, (b) the time between reapplications, (c) traffic volume during that period, and (d) prevailing meteorological conditions during the period. While several investigations have estimated or studied watering efficiencies, few have specified all the factors listed above.

An empirical model for the performance of watering as a control technique has been developed.[8] The supporting data base consists of 14 tests performed in four states during five different summer and fall months. The model is:

$$C = 100 - \frac{0.8\ p\ d\ t}{i} \qquad (3\text{-}2)$$

where: C = average control efficiency, percent

p = potential average hourly daytime evaporation rate, mm/h

d = average hourly daytime traffic rate, (h^{-1})

i = application intensity, L/m^2

t = time between applications, h

Estimates of the potential average hourly daytime evaporation rate may be obtained from

$$p = \begin{cases} 0.0049 \times (\text{value in Figure 3-2}) \text{ for annual conditions} \\ 0.0065 \times (\text{value in Figure 3-2}) \text{ for summer conditions} \end{cases}$$

An alternative approach (which is potentially suitable for a regulatory format) is shown as Figure 3-3. This figure is adapted from 11 field tests conducted at a coal-fired power plant. Measured control efficiencies did not correlate well with either time or vehicle passes after application. However, this is believed due to reduced evening evaporation (logistics delayed the start of testing until 3 p.m. and testing continued through the early evening). Surface moisture grab samples were taken throughout the testing period, and not surprisingly, these show a strong correlation with control efficiency.

Figure 3-3 shows that between the average uncontrolled moisture content and a value of twice that, a small increase in moisture content results in a large increase in control efficiency. Beyond this point, control efficiency grows slowly with increased moisture content. Although

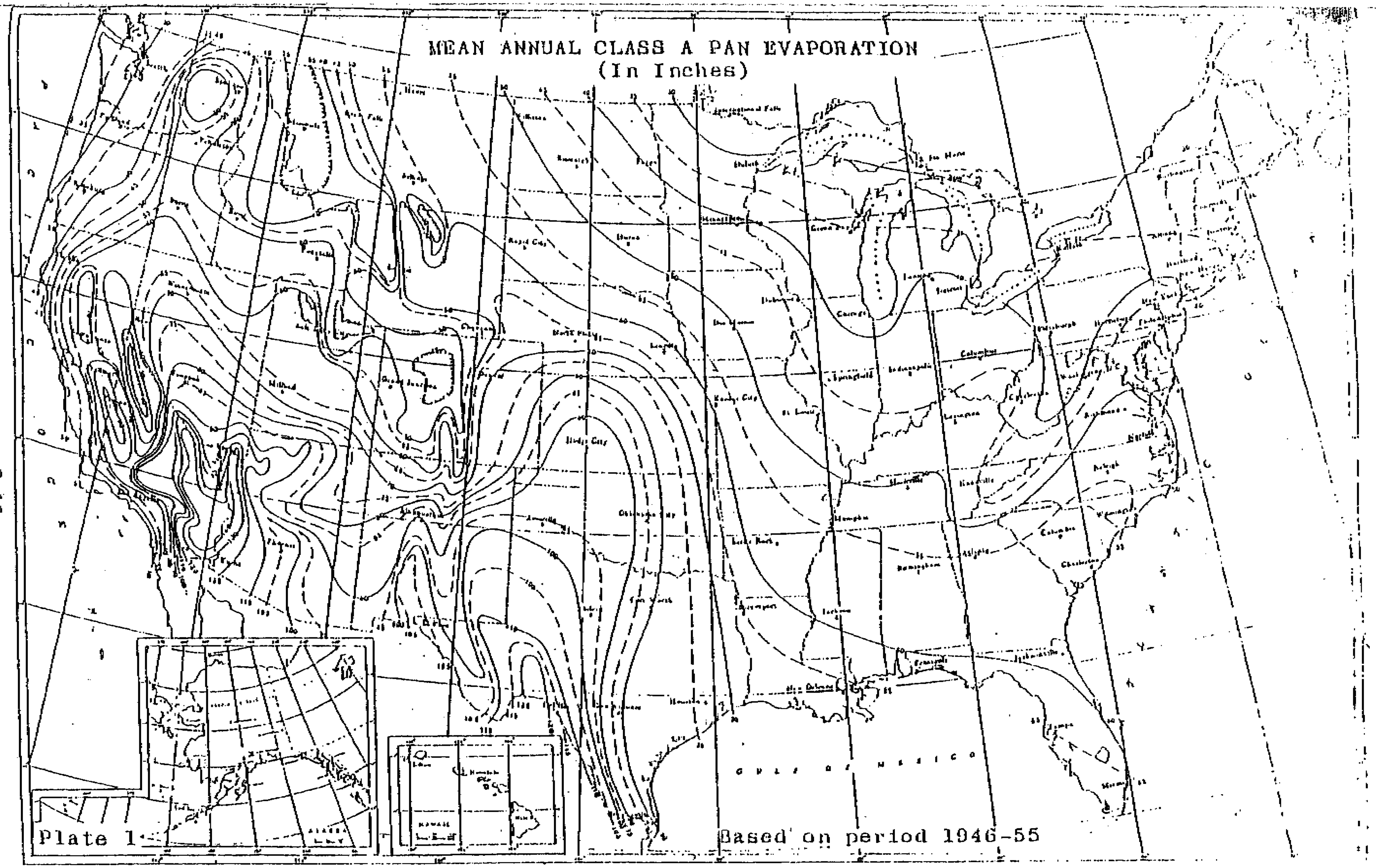

Figure 3-2. Annual evaporation data.

APPENDIX H

DRAFT PERMIT
(TO BE SUBMITTED AT A LATER DATE)