Dust Control Plan (Version 3)

As Required By: Class II Air Quality Control Permit for the Copper World Project

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Prepared by:

Copper World, Inc.



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Revision Log

Revision Number	Revision Lead	Purpose of Revision	Revision Date
1	Hudbay	Supporting Document to the Copper World Project Class II Air Quality Control Permit.	May 2023
2	Hudbay	Providing supplemental information on Section 4.3 Dust Control Program C. Added Dust Control Program D. Added roadway inspection form. General edits.	November 2023
3	Hudbay	Update to monitoring and reporting components. Consistency edits with TDMP.	March 2024

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1.0 INTRODUCTION

As described herein, this Dust Control Plan (Plan) for the Copper World Project (Project) presents methodologies to prevent excessive fugitive emissions from regularly traveled unpaved roads and from open areas and storage piles used or created by the mining operations. Regularly traveled unpaved roadways include processing plant roads as well as the heavy haul truck roads.

The dominant methods of dust control, vehicle speed limits and road treatments, will be implemented on-site and along the unpaved road network to maintain opacity below 20%. Additionally, two control efficiencies are utilized herein for the unpaved road network: 90% and 95%. **Figures 1 through 4** provide the locations where these efficiencies are generally to be applied during operations. Representative operational years (Year 2, Year 8, and Year 14) are shown, including a view of the Plant Site area. This Plan also targets a 90% control efficiency for open areas and storage piles.

For select areas, a 95% control efficiency is applied to regularly traveled roadways using a specific dust control product (see **Appendix A**). Other vendor specific dust control products (dust suppressants) may be used dependent on achieving a 95% control efficiency.

With regard to achieving a 90% control efficiency on unpaved roadways, the Calculation Methodology presented in the Emission Inventory Information, Volume I, U.S. Environmental Protection Agency (EPA), was used.

There are three (4) dust control programs presented herein with regard to roads:

- 1. Dust Control Program A (generalized dust suppressant approach to achieve a 90% control efficiency)
- 2. Dust Control Program B (generalized watering approach to achieve a 90% control efficiency)
- 3. Dust Control Program C (product specific dust suppressant approach to achieve a 95% control efficiency on haul roads)
- 4. Dust Control Program D (product specific dust suppressant approach to achieve a 95% control efficiency on the section of Santa Rita Road located within Copper World's private Helvetia land boundary)

Dust control on open areas and storage piles is also discussed herein.

With regard to the dust control program using a vendor specific dust suppressant product to achieve 95% control, the planned haul road application areas for the following years are shown: Years 2, 8, and 14. Dust control requirements for the remainder of the operational years will consider these discreet years as well as take into account the actual mine plan.

2.0 FUGITIVE DUST EMISSIONS FROM UNPAVED ROADS

2.1 UNPAVED ROAD NETWORK

The Project has a network of unpaved haul roads for transporting sulfide ore, oxide ore, and waste rock from the open pit mining areas to the primary crushing and/or stockpiling area, heap leach area, and waste rock storage areas, respectively. Additionally, the Project has general roads throughout the facility used by support vehicles.

Site diagrams of the Project area are presented on **Figures 1 through 4**. In general, the road network at the Project includes: (a) haul roads located in the pits, (b) haul roads for transporting ore from the pits to the primary crusher/run of mine stockpile(s) and heap leach pad, (c) haul roads for transporting waste rock from the pits to the waste rock storage area, and (d) general facility roads around the Project for support vehicles, including the Plant Site.

This Dust Control Plan for the Project's unpaved road network includes the use of chemical dust suppressants or watering. The control efficiency achieved by chemical dust suppressants depends upon the strength of the ground inventory (base), whereas the control efficiency achieved by watering depends upon the amount of water that is used (gallons/yd²).

As determined by the generalized calculation methodology presented herein, the amount of watering depends on traffic volumes and evaporation rates. The examples used herein only include haul truck traffic. The amount of support vehicle traffic would also be considered when determining the water application intensity needed to control the roads to the stated 90% control efficiency.

The calculation methodology used to estimate traffic volume is presented in **Appendix B**. The road network locations and the average hourly haul truck traffic rates at the stated production, assuming operations of 24 hours per day, are presented below (as examples only):

- Roadways that will be used to transport ore and waste rock from the mining location inside the Elgin Pit to the exit point of its boundary. These roadways are expected to experience average heavy truck traffic of four (4) vehicles per hour (based on annual VMTs in Year 2 of operations); and
- b) Roadways that will be used to transport ore and waste rock from the mining location inside the Rosemont Pit to the exit point of its boundary. These roadways are expected to experience average heavy truck traffic of 15 vehicles per hour (based on annual VMTs in Year 8 of operations).

Note: These roadway segments, and the ensuing roadway watering intensities required to achieve a 90% control efficiency, are for illustration purposes only.

Unlike the generalized road watering calculations, the use of a chemical dust suppressant does not have a direct link to traffic volumes and weather conditions, such as evaporation. However, the reapplication frequency is influenced by these factors. Although the ground inventory value (base) and reapplication rate can be predetermined (estimated) for a selected control efficiency, the maintenance reapplication rate will be reevaluated during operations based on site specific conditions such as traffic volumes (which affects roadway wear/abrasion). This is applicable to Dust Control Programs A and C. Site specific conditions will also be used to adjust the calculated watering frequency for Dust Control Program B.

2.2 DESCRIPTION OF DUST CONTROL PROGRAMS

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 the flexibility to change dust control measures while still achieving the desired control efficiency, this document proposes four (4) dust control programs that either achieve a 90% control of PM₁₀ emissions (Dust Control Programs A

and B) or 95% control of PM₁₀ emissions (Dust Control Programs C and D). Dust Control Programs A and B allow the flexibility to alternate from one dust control program to another or use a separate dust control program for an individual roadway system. The use of Dust Control Programs C and D are location specific. Additional details on the programs are provided in **Section 4.0**.

Note: This Dust Control Plan ensures that at least a 90% control of PM_{10} emissions is achieved on the unpaved road network. The Project is also required to maintain no greater than a 20% opacity for all non-point sources. A 90% control efficiency is considered sufficient to ensure that 20% opacity limit will be met.

2.2.1 Dust Control Program A

Dust Control Program A is a generalized approach that consists of the application of sufficient chemical dust suppressant to achieve a ground inventory of 0.25 gallons/yard² with a reapplication frequency of 1-month (where reapplication frequency refers to the time interval between applications used to maintain a specific ground inventory). Note: The 0.25 gallons/yard² value was estimated from the chart in **Illustration 4.1** in **Section 4.1**. This estimated value may change due to site conditions.

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). Page 3-20 of the EPA document is reproduced in **Appendix C**. Dust suppressants that could be used for this purpose include, among others, lignosulfonates, petroleum resins, asphalt emulsions, and acrylic cement. See **Section 4.1** for further discussion on Dust Control Program A.

2.2.2 Dust Control Program B

Dust Control Program B is a generalized approach that consists of periodic watering in sufficient amounts to achieve 90% control for PM_{10} . Program B would only be applied during days with precipitation of less than 0.01 inches. Example water application intensities necessary to achieve a 90% particulate control efficiency during daylight and nighttime hours are presented in **Tables 2-1 and 2-2**, respectively. The nighttime example assumes that the evaporation rate is half of the daytime rate. Additionally, the examples only use the average annual evaporation rate. Actual calculations would use a more refined set of monthly or seasonal evaporation values, etc.

The selected roadway examples were presented in Section 2.1.

See **Section 4.2** for further discussion on Dust Control Program B, including a description of how the application intensities are calculated.

Table 2-1 Average Hourly Watering Requirements During Daylight Hours for Dust Control Program B (Example Only)

Roadway System Category	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 Elgin Pit Boundary (Year 2)	04	0.143	0.031			
From Mining Location to Rosemont Pit Boundary (Year 8)	15	0.536	0.118			
^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 2-2 Average Hourly Watering Requirements During Nighttime Hours for Dust Control Program B (Example Only)

Roadway System Category	Traffic Volume (vehicles/hour)	Average Hourly ApplicationIntensity During Daylight HoursRequired to Achieve a 90% ControlEfficiency for Fugitive DustEmissions aliters/meter ² gallons/yard ²			
From Mining Location to Elgin Pit Boundary (Year 2)	04	0.071	0.016		
From Mining Location to Rosemont Pit Boundary (Year 8)	15	0.268	0.059		
^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.					

2.2.3 Dust Control Program C

Dust Control Program C consists of the application of a sufficient amount of a specific chemical suppressant to achieve 95% control on haul roads (see **Appendix A**). For haul road applications, the RoadPRO-NT (RPNT) product (or equivalent) is proposed. A target 'base' of material will be achieved through multiple applications (6-10) over an initial 30-45-day period. The targeted 'base' building over this period would be one (1) gallon per 70-90 square feet per application. Reapplication or maintenance applications are targeted at one (1) gallon per 400-750 square feet at an anticipated frequency of every month. **Figures 1 through 3** show where this product would be applied during operations during the respective years. See **Section 4.3** for further discussion on Dust Control Program C.

2.2.4 Dust Control Program D

Dust Control Program D consists of the application of a sufficient amount of a specific chemical suppressant to achieve 95% control on the Santa Rita Road section located within Copper World's private Helvetia land boundary (see Appendix A). For this section of Santa Rita Road, the SoilSement product (or equivalent) is proposed. A target 'base' of material will be achieved through multiple

applications (6-10) over an initial 30-45-day period. The targeted 'base' building over this period would be one (1) gallon per 70-90 square feet per application. Reapplication or maintenance applications are targeted at one (1) gallon per 400-750 square feet at an anticipated frequency of every month. **Figures 1 through 3** show where this product would be applied. See **Section 4.4** for further discussion on Dust Control Program D.

3.0 PLAN FOR THE CONTROL OF FUGITIVE DUST EMISSIONS FROM OPEN AREAS AND STORAGE PILES OR OTHER AREAS

Open areas and storage piles (stockpiles) which are in active use and subject to generating fugitive emissions will be controlled by the application of water as required by Title 18, Chapter 2, Article 6 of the A.A.C. and 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 A.A.C. R18-2-604 and R18-2-607 and 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.

Open areas and storage piles include mined areas, overburdened storage areas, as well as waste rock storage areas. However, open areas and storage areas which are subject to generating fugitive emissions generally 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 typically not necessary for such areas but would be applied as necessary.

At points where material accumulates around process equipment, Best Management Practices shall be implemented to minimize fugitive emissions of particulate matter. These practices may include removal of the material, covering with less erosive material, or watering.

4.0 DEMONSTRATION THAT THE DUST CONTROL PLAN WILL PROVIDE A 90% OR 95% CONTROL EFFICIENCY

4.1 DUST CONTROL PROGRAM A – 90% CONTROL EFFICIENCY

The control efficiency of a chemical dust suppressant is dependent upon the ground inventory of the dust suppressant and the frequency between applications. A generalized model was developed by the EPA and published in *Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures* (see **Appendix C** for an excerpt of the EPA document). The relationship is provided between these parameters and PM₁₀ control performance for general dust suppressants. A graph representing this model is presented in **Illustration 4.1**.

The sufficiency of Dust Control Program A to achieve a control efficiency of 90% for PM₁₀ is verified by considering **Illustration 4.1**. Using a chemical dust suppressant, a ground inventory of 0.25 gallons/yd² (estimate derived from chart) with a 1-month reapplication frequency will provide a control efficiency for PM₁₀ of 90%. It should be noted that the model for PM₁₀ control efficiency of petroleum-based dust suppressants published in the AP-42, Section 13.2.2 (dated November 2006), 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/yd² could result in control efficiencies higher than 90%. Again, this is a generalized approach and is not product specific.

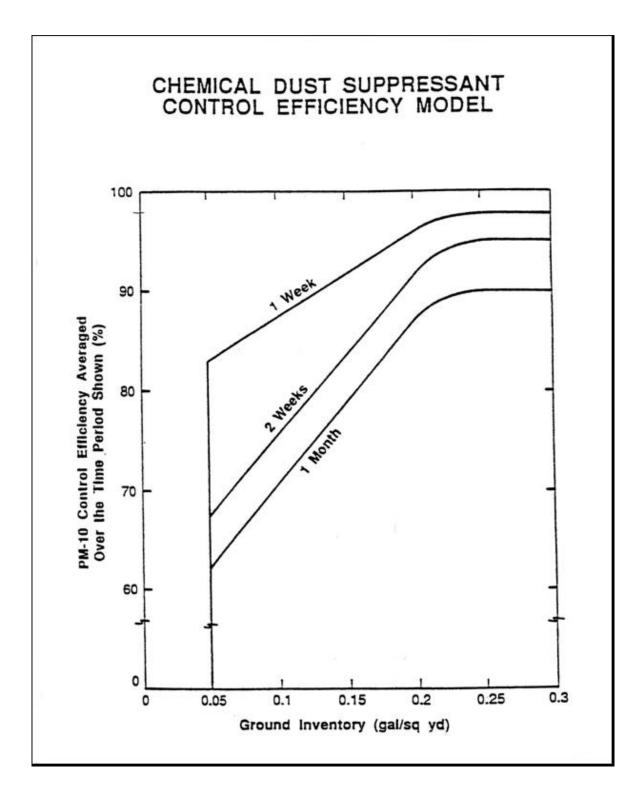


Illustration 4-1 EPA Model for Control Efficiency of PM₁₀ when Using Chemical Dust Suppressants.

4.2 DUST CONTROL PROGRAM B – 90% CONTROL EFFICIENCY

The generalized 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 the EPA in the *Control of Open Fugitive Sources*, EPA-U50/3-88-008, September 1988. An excerpt from this *EPA* document, Page 3-12, is presented in **Appendix D** of this Dust Control Plan. The following equations were derived from this model:

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

$$p = 0.0049 \times PER$$
Equation 2
where:

- i = application intensity (liters/m²);
- p = potential average hourly daytime evaporation rate (mm/hr, 0.507 for Tucson, AZ);
- d = average hourly daytime traffic (vehicles/hr; see **Section 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, example uses 91.2 from the Nogales 6N monitoring station)

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. The example nighttime hour application intensities calculated herein assumed that the average hourly nighttime pan evaporation rate is equal to 50% of the average hourly daytime pan evaporation rates will be updated to site specific conditions when available.

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

The application intensities in **Tables 4.1 and 4.2** are based upon an hourly frequency of application. The Project 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 4.1 and 4.2** to be increased by a factor of 2.

Table 4-1 Summary of Data Used to Verify Dust Control Program B During Daylight Hours(Example Only)

Roadway System	Variables				Average Hourly Water Application Intensity (i) ^a	
Category	Wc (%)	p (mm/h)	d (vehicles/ hour)	t (hours)	liters/ meter ²	gallons/ yard²
From Mining Location to Elgin Pit Boundary (Year 2)	90	0.447	04	1.0	0.143	0.031
From Mining Location to Rosemont Pit Boundary (Year 8)	90	0.447	15	1.0	0.536	0.118
^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 4-2 Summary of Data Used to Verify Dust Control Program B During Daylight Hours (Example Only)

Roadway System	Variables				Average Hourly Water Application Intensity (i) ^a	
Category	Wc (%)	p (mm/h)	d (vehicles/ hour)	t (hours)	liters/ meter ²	gallons/ yard²
From Mining Location to Elgin Pit Boundary (Year 2)	90	0.223	04	1.0	0.071	0.016
From Mining Location to Rosemont Pit Boundary (Year 8)	90	0.223	15	1.0	0.268	0.059
^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 example application intensities in **Tables 4.1 and 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 pan evaporation rates representative of the different climatological periods of the year. Additionally, the calculated intensities are based on assumed mine production rates. Lower production rates, resulting in less traffic, would be characterized by lower application intensities. Also, if any type of water adhesion enhancing material, such as a surfactant, is used with Dust Control Plan B, application intensities would be re-evaluated. Additionally, adjustments to the parameters used in the equation, such as evaporation, will be adjusted to site-specific conditions as that information becomes available.

4.3 DUST CONTROL PROGRAM C – 95% CONTROL EFFICIENCY

The control efficiency of a chemical dust suppressant is dependent upon the ground inventory of the dust suppressant and the frequency between applications. The sufficiency of Dust Control Program C to achieve a control efficiency of 95% for PM_{10} is verified by considering the product specific guarantee presented in **Appendix A** of this Dust Control Plan.

Dust Control Program C consists of the application of a sufficient amount of a vendor specific chemical suppressant to achieve 95% control on haul roads. For haul road applications, the RoadPRO-NT (RPNT) product (or equivalent) is proposed (see **Appendix A**). A target 'base' of material will be achieved through multiple applications (6-10) over an initial 30-45-day period. The targeted 'base' building over this period would be one (1) gallon per 70-90 square feet per application. Reapplication or maintenance applications are targeted at one (1) gallon per 400-750 square feet at an anticipated frequency of every month. **Figures 1 through 3** show where this product would be applied during operations.

By building the targeted 'base', the fines are bonded to the large aggregate in the road preventing fugitive dust from forming. Maintenance applications will be required over time to deliver 95% control as the treated surface wears down or is covered up. This application will be evaluated on an ongoing basis to maintain 95% efficiency. Weather, traffic volume, and weak spots in the road that wear down faster are the key factors in determining maintenance application scheduling; wet weather conditions would delay the reapplication, whereas dry conditions or road damage would accelerate the reapplication.

Consistent with the targeted monthly reapplication rate (see **Appendix A**), daily site inspections of the applicable roadways will be made by the mine operation field supervisors. Biweekly inspections of the roadway conditions will also be made by the environmental department. Inspections will look for weak spots in the roadway (unraveling) and dust generation. These observations/inspections will be recorded and used by mine personnel to make any adjustments to the reapplication rate/timing as needed to maintain the vendor guarantee. See **Appendix E** for a roadway inspection form.

4.4 DUST CONTROL PROGRAM D – 95% CONTROL EFFICIENCY

The control efficiency of a chemical dust suppressant is dependent upon the ground inventory of the dust suppressant and the frequency between applications. The sufficiency of Dust Control Program D to achieve a control efficiency of 95% for PM_{10} is verified by considering the product specific guarantee presented in **Appendix A** of this Dust Control Plan.

Dust Control Program D consists of the application of a sufficient amount of a specific chemical suppressant to achieve 95% control on the Santa Rita Road section located within Copper World's private Helvetia land boundary. For haul road applications, the SoilSement product (or equivalent) is proposed (see **Appendix A**). A target 'base' of material will be achieved through multiple applications (6-10) over an initial 30-45-day period. The targeted 'base' building over this period would be one (1) gallon per 70-90 square feet per application. Reapplication or maintenance applications are targeted at one (1) gallon per 400-750 square feet at an anticipated frequency of every month. **Figures 1 through 3** show where this product would be applied.

By building the targeted 'base', the fines are bonded to the large aggregate in the road, preventing fugitive dust from forming. Maintenance applications will be required over time to deliver 95% control as the treated surface wears down or is covered up. This application will be evaluated on an ongoing basis to maintain 95% emission control. Weather, traffic volume, and weak spots in the road that wear down faster are the key factors in determining maintenance application scheduling; wet weather conditions would delay the reapplication, whereas dry conditions or road damage would accelerate the reapplication.

Consistent with the targeted monthly reapplication rate (see **Appendix A**), daily site inspections of the applicable roadways will be made by the mine operation field supervisors. Biweekly inspections of the roadway conditions will also be made by the environmental department. Inspections will look for weak

spots in the roadway (unraveling) and dust generation. These observations/inspections will be recorded and used by mine personnel to make any adjustments to the reapplication rate/timing as needed to maintain the vendor guarantee. See **Appendix E** for a roadway inspection form.

5.0 DEMONSTRATION OF COMPLIANCE WITH THE REQUIREMENTS OF ARTICLE 6 OF THE A.A.C. AND CHAPTER 17.16, ARTICLE III OF THE P.C.C.

Section R18-2-604 of the A.A.C. and Section 17.16.080 of the P.C.C. require, 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 3.0 of this Plan described the control measures for wind-blown fugitive dust from open areas and storage piles at the Project. By developing and maintaining a visible crust on the soil in open areas and applicable storage piles, implementing best management practices (e.g., watering as required), and minimizing access to these areas, this Dust Control Plan complies with the requirements of Article 6 of the A.A.C and Chapter 17.16, Article III of the P.C.C. for the control of fugitive dust emissions from open areas and storage piles.

6.0 PERIODIC REAPPLICATION

6.1 CHEMICAL DUST SUPPRESSANTS

Dust control programs that utilize chemical dust suppressants require periodic application of the chemical dust suppressant to replenish the dust suppressant materials that are removed from the road due to the abrasion of the vehicles on the treated road surface.

6.2 ROAD WATERING

The frequency of reapplication of water used in Dust Control Program B will depend upon the operational plans of the Project. 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 **Section 4.2** 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 daily or when roads are moist due to recent rain, as the control efficiency during such days is assumed to be 100% by AP-42. Additionally, watering will not be required on roads that are moist from the application of previous control water.

7.0 RECORD KEEPING REQUIREMENTS

7.1 RECORDS OF THE APPLICATION OF CHEMICAL DUST SUPPRESSANTS

Records will be maintained demonstrating the Project's compliance with the initial chemical dust suppressant ground inventory required by Dust Control Programs A, C, and D by recording the information necessary to demonstrate a 90% or 95% control efficiency, respectively.

7.2 RECORDS OF REAPPLICATION OF CHEMICAL DUST SUPPRESSANTS

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

7.3 RECORDS OF APPLICATION OF WATER

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

7.4 RECORDS OF ROADWAY INSPECTIONS

Records will be maintained demonstrating the Project's compliance with the requirements of Dust Control Programs A, B, C, and D by recording observations on the roadway inspection form provided in **Appendix E**.

8.0 MONITORING AND REPORTING

8.1 MONITORING

Monitoring components associated with this Dust Control Plan will be per the approved Class II Air Control Permit issued for the Project. Monitoring components pertinent to this Plan will be updated based on the approved Permit and no later than 90 days prior to the start of construction of the Copper World Project. The updated Plan shall be assumed approved upon submission unless the Director objects within 30 days.

8.2 REPORTING

Reporting components associated with this Dust Control Plan will be per the approved Class II Air Control Permit issued for the Project. Reporting components pertinent to this Plan will be updated based on the approved Permit and no later than 90 days prior to the start of construction of the Copper World Project. The updated Plan shall be assumed approved upon submission unless the Director objects within 30 days.

9.0 ADAPTIVE MANAGEMENT

The adaptive management process will be incorporated into the implementation of operational dust control measures. This process will ensure that the most practicable dust control measures are utilized, and that the intent of the Plan is being met. Regarding this Plan, this process includes the following:

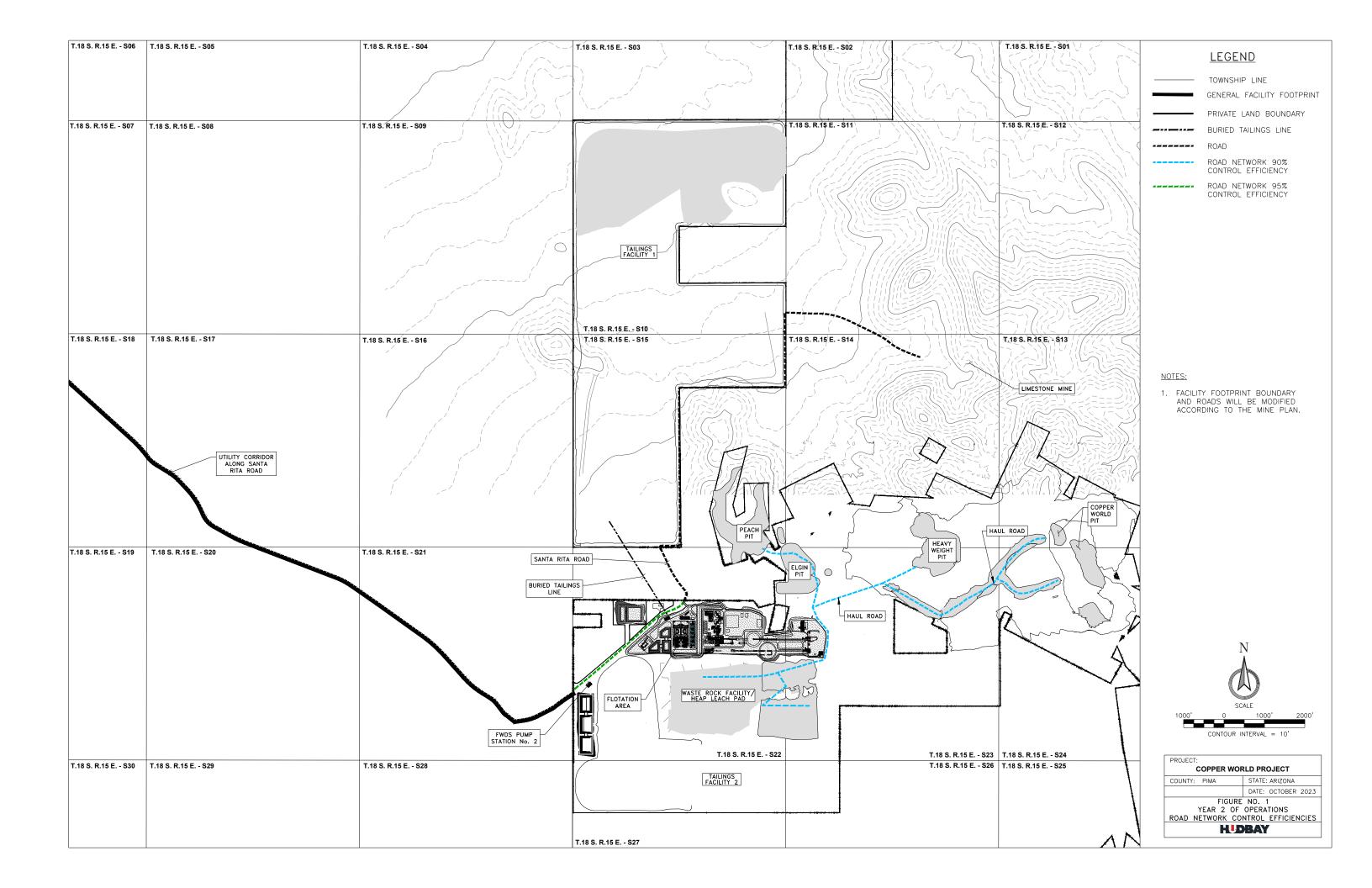
• Starting from the time active operations begins, annual review of this Dust Control Plan for its effectiveness in controlling fugitive emissions.

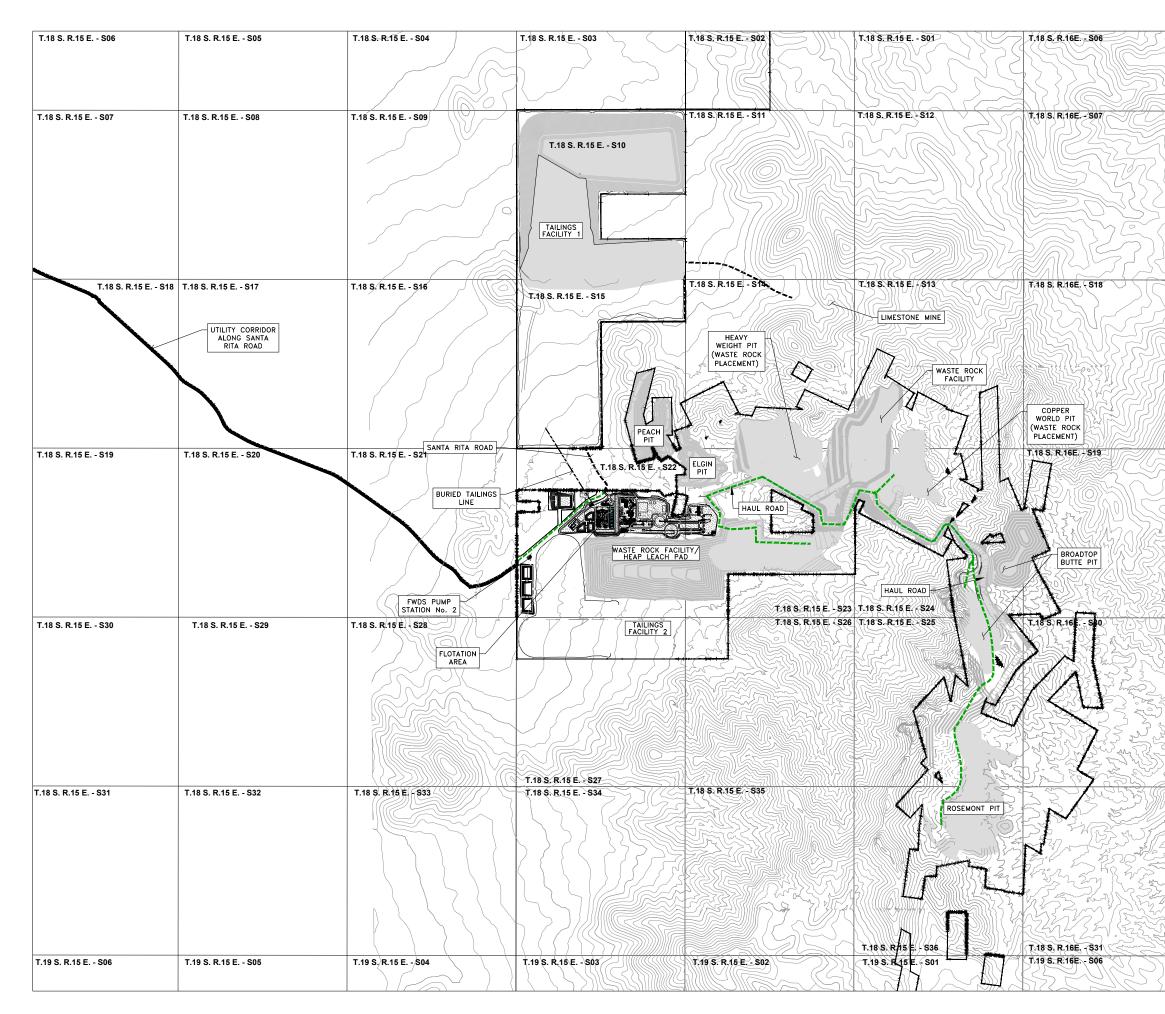
If the review of the Plan shows ineffectiveness in controlling fugitive emissions, a revised Plan shall be submitted to ADEQ for approval. The revised Plan shall show improved methods/techniques for reducing fugitive emissions.

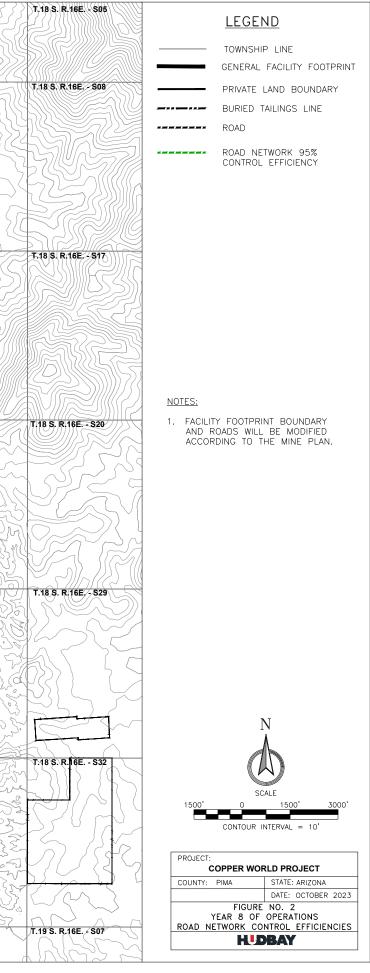
10.0 DATA MANAGEMENT

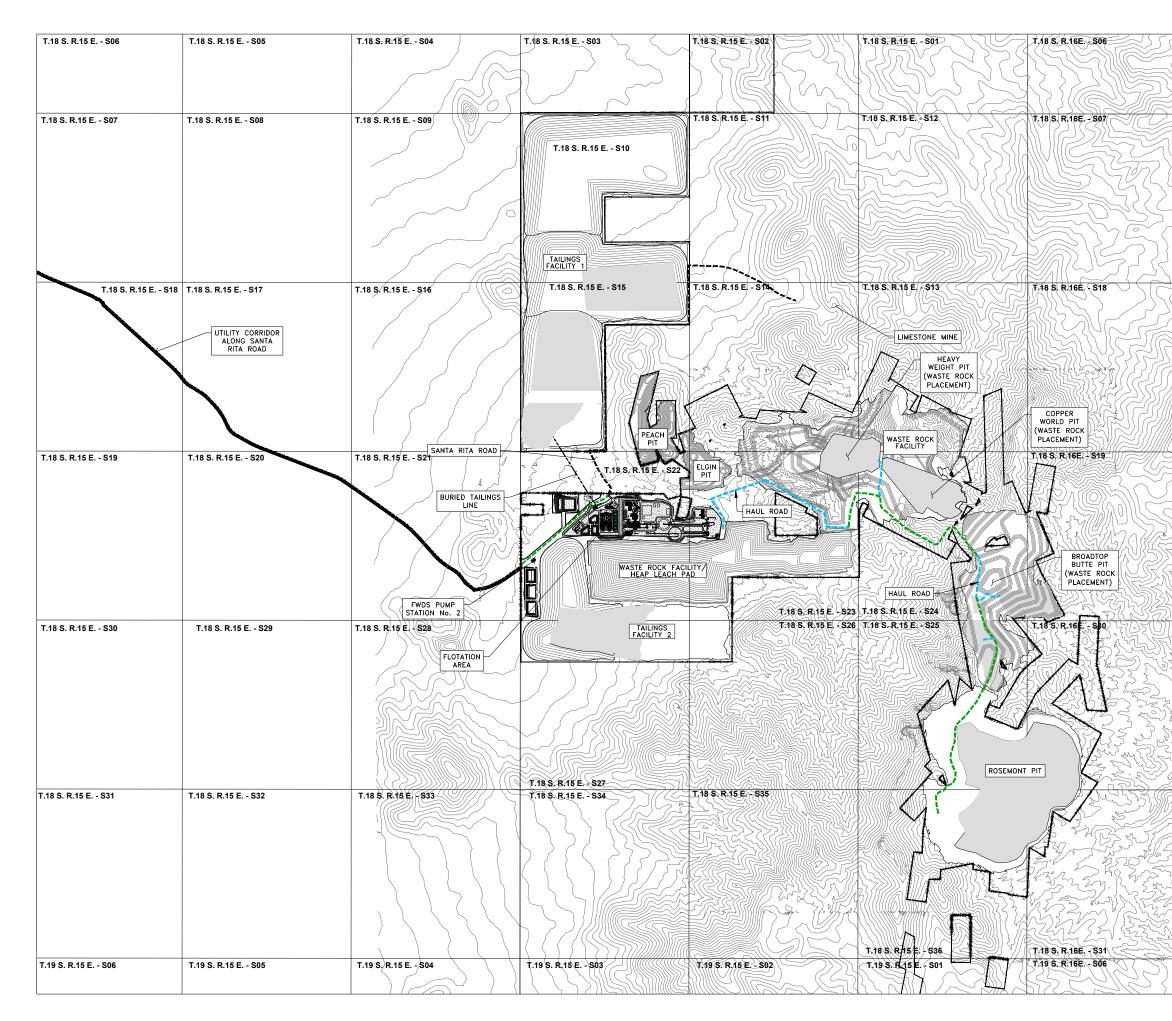
Records will either be kept in hardcopy format or electronically. These records will be used as a basis of reporting and compliance verification. All records, analyses, and reports required by ADEQ will be retained for a minimum of five years from the date of generation. All records shall be made available for inspection by authorized ADEQ department personnel during normal working hours.

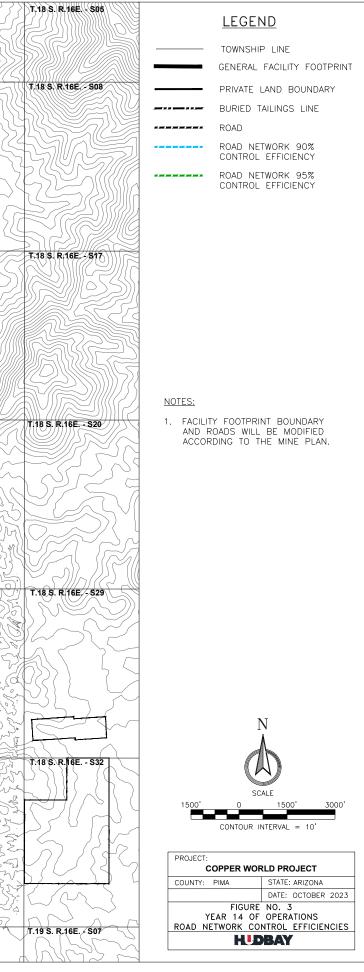
FIGURES

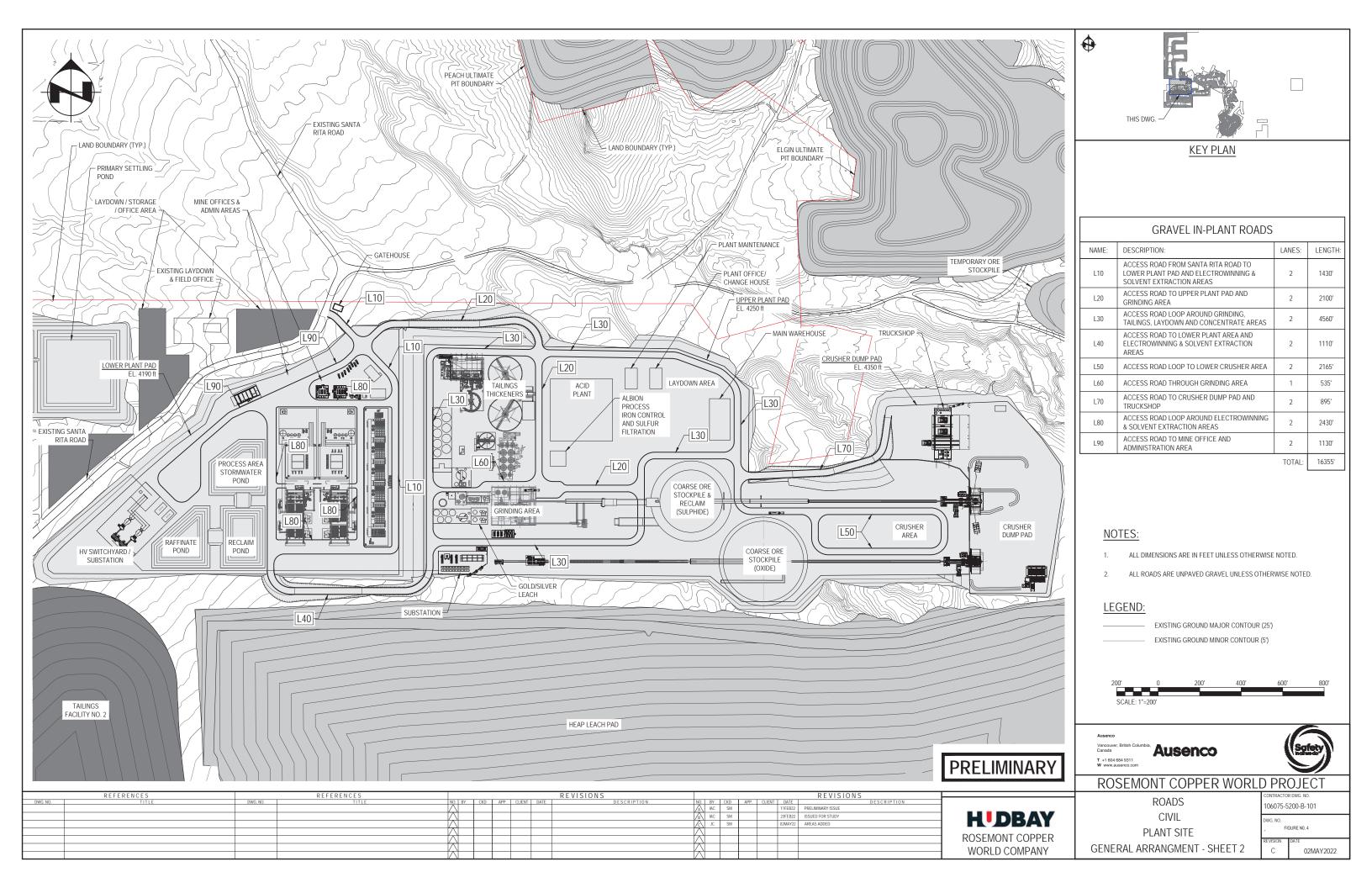












APPENDIX A

VENDOR GUARANTEE FOR 95% ROADWAY CONTROL EFFICIENCY



2/22/2023

Samantha Valentine Mine Planning ENG Hudbay Minerals Rosemont Copper Company Tucson AZ

Per Rosemont's request, Midwest has put together the following information on roadway dust control programs to achieve 95+% dust control of the treated areas while eliminating the use of water for roadway dust control of these areas. The dramatic emissions "cycling" associated with water-only dust control programs is eliminated, and consistent results are achieved.

Products:

RoadPro-NT (RPNT) is a patented polymeric-infused asphalt emulsion chemistry blended 10:1 with water delivering with proven durability to handle heavier equipment and traffic volumes and would be applied to haul roads. When cured, this product is non-water soluble and will not follow storm drainage. Material cures in 1-3 hours in a typical AZ climate.

SoilSement is a polymer-based program blended 10:1 with water that delivers excellent dust control on lightduty access roads. This product is also non-water soluble when cured and will not follow storm drainage. Material cures in 1-3 hours in typical AZ climate.

Plan:

For both products, establishing a "base" of material through multiple applications (6-10) over the initial 30-45 days is critical. Targeted "base" building over this period would be 1 Gal:70-90 sq ft per application. By building a significant base, the fines are bonded to the larger aggregate in the road preventing fugitive dust from forming. Maintenance applications are required over time to deliver 95+% control as the treated surface wears down or is covered up. Reapplication or maintenance applications are targeted at 1Gal:400-750 sq ft at an anticipated frequency of every month.

These applications will be evaluated on an ongoing basis and employ the Midwest "selective" strategy to maintain 95+% emission control. Weather, traffic volumes, and weak spots in the road that wear down faster are the key factors in determining maintenance application scheduling. For example, wet weather conditions would delay the reapplication. Unusually, dry conditions or road damage would accelerate the reapplication.

Please let me know if you have any questions or comments.

Thanks

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www.midwestind.com

Tel 330.456.3121 Fax 330.456.3247 Toll free 1.800.321.0699

Tim Solberg Midwest Mining Dust Control Solutions

APPENDIX B

ROADWAY NETWORK TRAFFIC VOLUME CALCULATION METHODOLOGY

ROADWAY SYSTEM TRAFFIC VOLUME CALCULATION METHODOLOGY

The calculation of the road watering application intensity for unpaved roadways is dependent upon traffic volume. For illustration purposes, the roadway system at the Project was divided into two roadway segments based on average hourly traffic rates. Traffic volume estimates for the example roadways were calculated by dividing the anticipated hourly amount of material transferred by the haul trucks on each roadway by the average haul truck load (260 tons) and multiplying this number by 2 to account for the haul trucks returning empty to the mining location. This methodology is shown in the following equation:

Traffic Volume
$$\left(\frac{\text{vehicles}}{\text{hour}}\right) = \left(\text{Material Transferred by Haul Trucks}\left(\frac{\text{tons}}{\text{hour}}\right) \times \frac{1 \text{ trip}}{260 \text{ tons}} \times \frac{2 \text{ passes}}{\text{trip}}\right)$$

The process rates and resulting traffic volume estimates for example roadway systems are listed in the table below. The example traffic volumes in this table are presented for operations associated with Year 2 and Year 8. However, since process rates vary (hourly, daily, and annually), the traffic volumes will be monitored on an on-going basis so that accurate water application intensities can be determined and a 90% control efficiency met.

Roadway System Category	Maximum Daily Process Rate (tons/hour)	Traffic Volume (vehicles/hour)
From Mining Location to Elgin Pit Boundary (Year 2)	520	4
From Mining Location to Rosemont Pit Boundary (Year 8)	1,430	15

Summary of Data Used to Calculate Roadway System Traffic Volume

APPENDIX C

EXCERPT FROM FUGITIVE DUST BACKGROUND DOCUMENT AND TECHNICAL INFORMATION DOCUMENT FOR BEST AVAILABLE CONTROL MEASURES, EPA-450/2-92-004, SEPTEMBER 1992, PAGES 3-14 to 3-24

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 abovefreezing 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
			Traffi	c reduction

Source improvement: Paving

Gravel surface

Surface treatment:

Watering

Chemical stabilization

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

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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 <u>Surface Improvements</u>

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 <u>Surface Treatments</u>

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



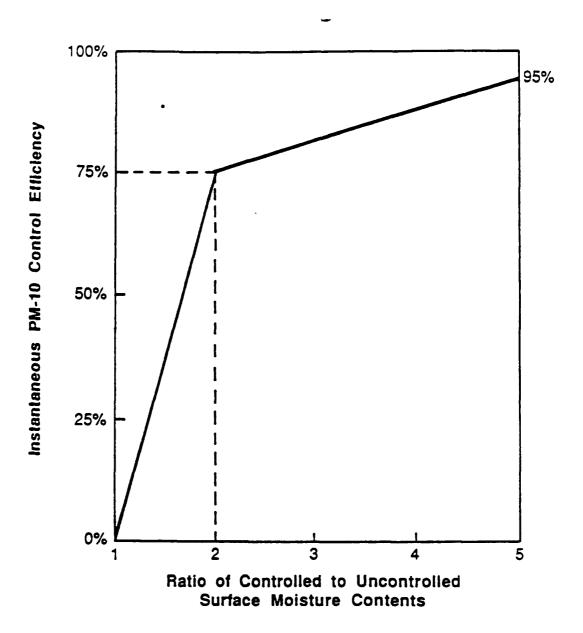


Figure 3-1. Watering Control Effectiveness for Unpaved Travel Surfaces.

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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/yd².
- 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.

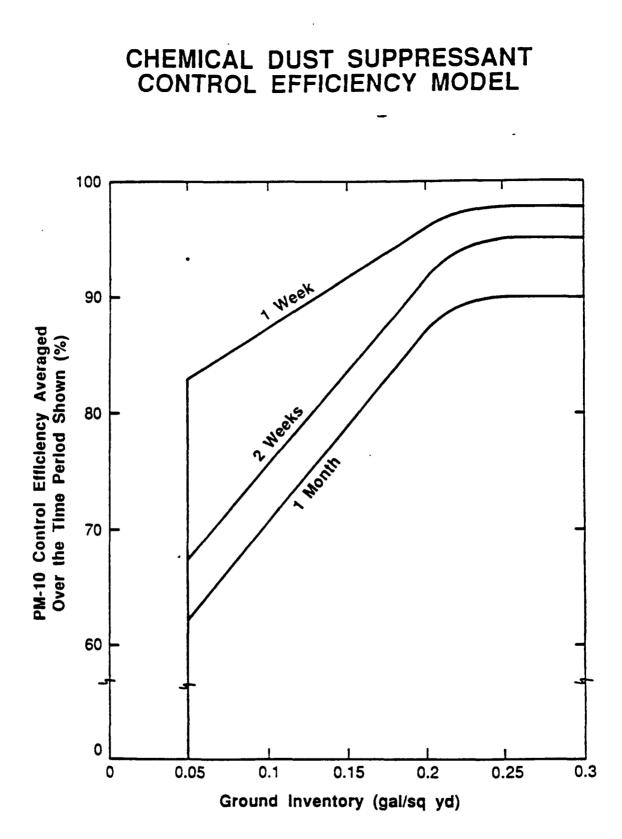


Figure 3-2. Average PM10 control efficiency for chemical suppressants.

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Figure 3-2 represents an <u>average</u> 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/yd² 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 inventor y, gal/yd ²	Average control efficienc y, 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/yd².

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

3.2.3.2.1 <u>Use of Paved Road Controls on Chemically Treated</u> <u>Unpaved Roads</u>--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

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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

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APPENDIX D

EXCERPT FROM CONTROL OF OPEN FUGITIVE DUST SOURCES, EPA-U50/3-88-008, SEPTEMBER 1988 (PAGE 3-12)

3.3.3 <u>Surface Treatments</u>

3.3.3.1 <u>Watering</u>. 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:

$$C = 100 - \frac{0.8 \text{ p d t}}{1} \tag{3-2}$$

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

 $p = 0.0049 \times (value in Figure 3-2)$ for annual conditions 0.0065 x (value in Figure 3-2) for summer conditions

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

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APPENDIX E

ROADWAY INSPECTION FORM

ROADWAY INSPEC	TION FORM CO (Daily/Biweek	PPER WORLD PROJECT			
General Area:		Observer(s):			
Roadway Name:		Date/Time:			
Road Section Inspected From: To:		Weather Conditions (If applicable) Wind Direction: Wind Speed: Temperature:			
Applicable Dust Control Program (DCP) (Note: DCP C and D are product and location specific)	Program (DCP) (Note: DCP CDCP B (Watering-geneand D are product andDCP C (Dust Suppress				
General Conditions	Daily Precipitation ove Estimated One-Way H	er 0.1 inches: Yes No No August Ves No			
Application - Water					
Is there any evidence of visible	fugitive dust generatio	n? Yes No			
If yes, section(s) with excessiv	e dust generation				
Road Moisture Condition		Moist 📄 Dry 📄 Mixed 📄			
Overall effectiveness of roadwa	ay control	Good Needs Attention			
Current Application Frequency	(passes/hr)				
Current Application Rate (gallo	ns/yd²)				
Application - Suppressant					
Is there any evidence of visible		n? Yes No			
If yes, section(s) with excessiv	e dust generation				
Are there weak spots that are v	wearing down/unravelin	g? Yes No No			
If yes, list areas that need atte	If yes, list areas that need attention.				
Overall effectiveness of roadway control Good 🗌 Needs Attention					
Date of Last Application of Dust Suppressant					
Comments:					