FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

May 20, 2021

Via Electronic
Certified Mail #9171999991703579979332
Return Receipt Requested

New Mexico Environment Department
Air Quality Bureau
Permitting Section
525 Camino de los Marquez, Suite 1
Santa Fe, NM 87505-1816

Dear Permitting Section Manager:

Re: Freeport-McMoRan Tyrone Inc. - Tyrone Mine
NSR Significant Permit Revision Application for NSR Permit No. PSD2448-M6

Freeport-McMoRan Tyrone Inc. is submitting this enclosed NSR significant permit revision application for its existing Tyrone Mine facility, which is located 4.5 miles southwest of Tyrone, New Mexico in Grant County. This permit application is being submitted under 20.2.72.219.D NMAC to allow for mining and hauling activities in one (1) new Emma pit under three (3) new operating scenarios. These new operating scenarios encompass the following pits in various combinations: Emma, Mohawk, Burro Chief, and Little Rock 6. Each scenario, which is detailed in the enclosed permit application, contains two pits in operation at a time but with only one blast occurring in an hour.

The modeling that was performed in support of this permit application was based on Burro Mountain Road being relocated south of the Emma pit. The modeling results are also predicated on additional land being purchased near the new Emma pit to allow for operational and safety buffers, and land access restrictions being implemented in some areas that will redefine the air permit boundary. Specifically, fences are proposed to be installed on the northern side of the rerouted county road to restrict public access. Tyrone is in the process of acquiring the additional land outside of the Emma pit and obtaining approvals to reroute the county road and will keep NMED apprised of these activities.

Please note that the one (1) operating scenario in the Gettysburg and Mohawk pits, as approved in NSR Permit No. PSD2448-M5, and the six (6) operating scenarios approved in NSR Permit No. PSD2448-M6 will continue to be utilized, so the new scenarios in this permit application will be in addition to these scenarios.

The only other change requested in this permit application is the addition of one exempt emergency generator (Generac 5).

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MAY 24 2021

Air Quality Bureau

The format and content of this application are consistent with the Air Quality Bureau's current policy regarding NSR applications and uses the most current required forms. Enclosed is one hard copy and one working copy of the application, including an original certification page and an application check. Electronic copies will be submitted via the Secure Electronic Transfer option.

If you have any questions or need additional information, please don't hesitate to contact me at (575) 912-5117 or via e-mail at smedley@fmi.com.

Sincerely,

Shane Medley

Shane Medley
Environmental Scientist II
Environmental Services

SM
Enclosures: Significant Permit Revision Application
20210520-100

c: Array Environmental, LLC

Mail Application To:		For Department use only:
New Mexico Environment Department Air Quality Bureau Permits Section 525 Camino de los Marquez, Suite 1 Santa Fe, New Mexico, 87505 Phone: (505) 476-4300 Fax: (505) 476-4375 www.env.nm.gov/aqb		RECEIVED MAY 24 2021 Air Quality Bureau AIRS No.:

Universal Air Quality Permit Application

Use this application for NOI, NSR, or Title V sources.

Use this application for: the initial application, modifications, technical revisions, and renewals. For technical revisions, complete Sections, 1-A, 1-B, 2-E, 3, 9 and any other sections that are relevant to the requested action; coordination with the Air Quality Bureau permit staff prior to submittal is encouraged to clarify submittal requirements and to determine if more or less than these sections of the application are needed. Use this application for streamline permits as well. See Section 1-I for submittal instructions for other permits.

This application is submitted as (check all that apply): ☐ Request for a No Permit Required Determination (no fee)
☐ **Updating** an application currently under NMED review. Include this page and all pages that are being updated (no fee required).
Construction Status: ☐ Not Constructed ☑ Existing Permitted (or NOI) Facility ☐ Existing Non-permitted (or NOI) Facility
Minor Source: ☐ a NOI 20.2.73 NMAC ☑ 20.2.72 NMAC application or revision ☐ 20.2.72.300 NMAC Streamline application
Title V Source: ☐ Title V (new) ☐ Title V renewal ☐ TV minor mod. ☐ TV significant mod. TV Acid Rain: ☐ New ☐ Renewal
PSD Major Source: ☐ PSD major source (new) ☐ minor modification to a PSD source ☐ a PSD major modification

Acknowledgements:

☑ I acknowledge that a pre-application meeting is available to me upon request. ☐ Title V Operating, Title IV Acid Rain, and NPR applications have no fees.
☑ $500 NSR application Filing Fee enclosed OR ☐ The full permit fee associated with 10 fee points (required w/ streamline applications).
☑ Check No.: **961742** in the amount of **$500**.
☑ I acknowledge the required submittal format for the hard copy application is printed double sided 'head-to-toe', 2-hole punched (except the Sect. 2 landscape tables is printed 'head-to-head'), numbered tab separators. Incl. a copy of the check on a separate page.
☑ I acknowledge there is an annual fee for permits in addition to the permit review fee: www.env.nm.gov/air-quality/permit-fees-2/.
☐ This facility qualifies for the small business fee reduction per 20.2.75.11.C. NMAC. The full $500.00 filing fee is included with this application and I understand the fee reduction will be calculated in the balance due invoice. The Small Business Certification Form has been previously submitted or is included with this application. (Small Business Environmental Assistance Program Information: www.env.nm.gov/air-quality/small-biz-eap-2/.)

Citation: Please provide the **low level citation** under which this application is being submitted: **20.2.72.219.D(1)(a) NMAC**
(e.g. application for a new minor source would be 20.2.72.200.A NMAC, one example for a Technical Permit Revision is 20.2.72.219.B.1.b NMAC, a Title V acid rain application would be: 20.2.70.200.C NMAC)

Section 1 – Facility Information

Section 1-A: Company Information		AI # if known (see 1st 3 to 5 #s of permit IDEA ID No.): **527**	Updating Permit/NOI #: **PSD2448-M6**
1	Facility Name: **Tyrone Mine**	Plant primary SIC Code (4 digits): **1021**	
		Plant NAIC code (6 digits): **212230**	
a	Facility Street Address (If no facility street address, provide directions from a prominent landmark): **Highway 90 South, Tyrone Mine Road, Tyrone, NM 88065**		
2	Plant Operator Company Name: **Freeport-McMoRan Tyrone Inc.**	Phone/Fax: **(575) 912-5101 / (575) 912-5031**	
a	Plant Operator Address: **P.O. Box 571, Tyrone, NM 88065**		

b	Plant Operator's New Mexico Corporate ID or Tax ID: **02-952187-004**	
3	Plant Owner(s) name(s): **Freeport-McMoRan Tyrone Inc.**	Phone/Fax: **(575) 912-5101 / (575) 912-5031**
a	Plant Owner(s) Mailing Address(s): **P.O. Box 571, Tyrone, NM 88065**	
4	Bill To (Company): **Freeport-McMoRan Tyrone Inc.**	Phone/Fax: **(575) 912-5101 / (575) 912-5031**
a	Mailing Address: **P.O. Box 571, Tyrone, NM 88065**	E-mail: **Ebower@fmi.com**
5	Ŀ Preparer: ☑ Consultant: **Claire Booth, Array Environmental, LLC**	Phone/Fax: **(720) 316-9935**
a	Mailing Address: **229 W First Street, Palisade, CO 81526**	E-mail: **claire@arrayenvironmental.com**
6	Plant Operator Contact: **Erich J. Bower**	Phone/Fax: **(575) 912-5101 / (575) 912-5021**
a	Address: **P.O. Box 571, Tyrone, NM 88065**	E-mail: **Ebower@fmi.com**
7	Air Permit Contact: **Shane Medley**	Title: **Environmental Scientist II**
a	E-mail: **smedley@fmi.com**	Phone/Fax: **(575) 912-5117 / (575) 912-5031**
b	Mailing Address: **P.O. Box 571, Tyrone, NM 88065**	
c	The designated Air permit Contact will receive all official correspondence (i.e. letters, permits) from the Air Quality Bureau.	

Section 1-B: Current Facility Status

1.a	Has this facility already been constructed? ☑ Yes Ŀ No	1.b If yes to question 1.a, is it currently operating in New Mexico? ☑ Yes Ŀ No
2	If yes to question 1.a, was the existing facility subject to a Notice of Intent (NOI) (20.2.73 NMAC) before submittal of this application? Ŀ Yes ☑ No	If yes to question 1.a, was the existing facility subject to a construction permit (20.2.72 NMAC) before submittal of this application? ☑ Yes Ŀ No
3	Is the facility currently shut down? Ŀ Yes ☑ No	If yes, give month and year of shut down (MM/YY): **N/A**
4	Was this facility constructed before 8/31/1972 and continuously operated since 1972? ☑ Yes Ŀ No	
5	If Yes to question 4, has this facility been modified (see 20.2.72.7.P NMAC) or the capacity increased since 8/31/1972? ☑ Yes Ŀ No Ŀ N/A	
6	Does this facility have a Title V operating permit (20.2.70 NMAC)? ☑ Yes Ŀ No	If yes, the permit No. is: **P147-R2M1**
7	Has this facility been issued a No Permit Required (NPR)? Ŀ Yes ☑ No	If yes, the NPR No. is: **N/A**
8	Has this facility been issued a Notice of Intent (NOI)? Ŀ Yes ☑ No	If yes, the NOI No. is: **N/A**
9	Does this facility have a construction permit (20.2.72/20.2.74 NMAC)? ☑ Yes Ŀ No	If yes, the permit No. is: **PSD2448-M6**
10	Is this facility registered under a General permit (GCP-1, GCP-2, etc.)? Ŀ Yes ☑ No	If yes, the register No. is: **N/A**

Section 1-C: Facility Input Capacity & Production Rate

1	What is the facility's maximum input capacity, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: **N/A**	Daily: **400,000 tons rock**	Annually: **146,000,000 tons rock**
b	Proposed	Hourly: **N/A**	Daily: **400,000 tons rock**	Annually: **146,000,000 tons rock**
2	What is the facility's maximum production rate, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: **N/A**	Daily: **225 tons copper cathode**	Annually: **82,125 tons copper cathode**

b	Proposed	Hourly: **N/A**	Daily: **225 tons copper cathode**	Annually: **82,125 tons copper cathode**

Section 1-D: Facility Location Information

1	Section: **10, 11, 13-17, 21-28**	Range: **15W**	Township: **19S**	County: **Grant**	Elevation (ft): **5,801 ft**
2	UTM Zone: ☑ 12 or ☐ 13			Datum: ☐ NAD 27 ☐ NAD 83 ☐ WGS 84	
a	UTM E (in meters, to nearest 10 meters): **744,430 m E**			UTM N (in meters, to nearest 10 meters): **3,618,400 m N**	
b	**AND** Latitude (deg., min., sec.): **32° 40' 34.5" N**			Longitude (deg., min., sec.): **-108º 23' 35.8" W**	
3	Name and zip code of nearest New Mexico town: **Tyrone, NM 88065**				
4	Detailed Driving Instructions from nearest NM town (attach a road map if necessary): **From Tyrone, NM head south on Hwy 90. After approximately 5 miles, the facility will be on the right.**				
5	The facility is **5 miles southwest of Tyrone.**				
6	Status of land at facility (check one): ☑ Private ☐ Indian/Pueblo ☑ Federal BLM ☑ Federal Forest Service ☑ Other: **State**				
7	List all municipalities, Indian tribes, and counties within a ten (10) mile radius (20.2.72.203.B.2 NMAC) of the property on which the facility is proposed to be constructed or operated: **Municipalities: Silver City, NM. Indian Tribes: None. Counties: Grant, Luna**				
8	**20.2.72** NMAC applications **only**: Will the property on which the facility is proposed to be constructed or operated be closer than 50 km (31 miles) to other states, Bernalillo County, or a Class I area (see www.env.nm.gov/aqb/modeling/class1areas.html)? ☑ Yes ☐ No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers: **Gila Wilderness Area, 37 km**				
9	Name nearest Class I area: **Gila Wilderness Area**				
10	Shortest distance (in km) from facility boundary to the boundary of the nearest Class I area (to the nearest 10 meters): **37 km**				
11	Distance (meters) from the perimeter of the Area of Operations (AO is defined as the plant site inclusive of all disturbed lands, including mining overburden removal areas) to nearest residence, school or occupied structure: **110 m**				
12	Method(s) used to delineate the Restricted Area: **Fencing, signage, rugged physical terrain with steep grades.** "**Restricted Area**" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area.				
13	Does the owner/operator intend to operate this source as a portable stationary source as defined in 20.2.72.7.X NMAC? ☐ Yes ☑ No A portable stationary source is not a mobile source, such as an automobile, but a source that can be installed permanently at one location or that can be re-installed at various locations, such as a hot mix asphalt plant that is moved to different job sites.				
14	Will this facility operate in conjunction with other air regulated parties on the same property? ☒ No ☐ Yes If yes, what is the name and permit number (if known) of the other facility? **N/A**				

Section 1-E: Proposed Operating Schedule (The 1-E.1 & 1-E.2 operating schedules may become conditions in the permit.)

1	Facility **maximum** operating ($\frac{hours}{day}$): **24**	($\frac{days}{week}$): **7**	($\frac{weeks}{year}$): **52**	($\frac{hours}{year}$): **8,760**		
2	Facility's maximum daily operating schedule (if less than 24 $\frac{hours}{day}$)?	Start: **N/A**	☐AM ☐PM	End: **N/A**	☐AM ☐PM	
3	Month and year of anticipated start of construction: **Upon receipt of permit and payment of application fees.**					
4	Month and year of anticipated construction completion: **TBD**					
5	Month and year of anticipated startup of new or modified facility: **TBD**					
6	Will this facility operate at this site for more than one year? ☑ Yes ☐ No					

Section 1-F: Other Facility Information

1	Are there any current Notice of Violations (NOV), compliance orders, or any other compliance or enforcement issues related to this facility? Ľ Yes ☑ No If yes, specify:		
a	If yes, NOV date or description of issue: **N/A**		NOV Tracking No: **N/A**
b	Is this application in response to any issue listed in 1-F, 1 or 1a above? Ľ Yes ☑ No If Yes, provide the 1c & 1d info below:		
c	Document Title: **N/A**	Date: **N/A**	Requirement # (or page # and paragraph #): **N/A**
d	Provide the required text to be inserted in this permit: **N/A**		
2	Is air quality dispersion modeling or modeling waiver being submitted with this application? ☑ Yes Ľ No		
3	Does this facility require an "Air Toxics" permit under 20.2.72.400 NMAC & 20.2.72.502, Tables A and/or B? Ľ Yes ☑ No		
4	Will this facility be a source of federal Hazardous Air Pollutants (HAP)? ☑ Yes Ľ No		
a	If Yes, what type of source? Ľ **Major** (Ľ ≥10 tpy of any single HAP **OR** Ľ ≥25 tpy of any combination of HAPS) **OR** ☑ **Minor** (Ľ <10 tpy of any single HAP **AND** ☑ <25 tpy of any combination of HAPS)		
5	Is any unit exempt under 20.2.72.202.B.3 NMAC? ☑ Yes Ľ No		
a	If yes, include the name of company providing commercial electric power to the facility: **PNM** Commercial power is purchased from a commercial utility company, which specifically does not include power generated on site for the sole purpose of the user.		

Section 1-G: Streamline Application

(This section applies to 20.2.72.300 NMAC Streamline applications only)

1	Ľ I have filled out Section 18, "Addendum for Streamline Applications."	☑ N/A (This is not a Streamline application.)

Section 1-H: Current Title V Information - Required for all applications from TV Sources

(Title V-source required information for all applications submitted pursuant to 20.2.72 NMAC (Minor Construction Permits), or 20.2.74/20.2.79 NMAC (Major PSD/NNSR applications), and/or 20.2.70 NMAC (Title V))

1	Responsible Official (R.O.) (20.2.70.300.D.2 NMAC): **Erich J. Bower**	Phone: **(575) 912-5101**
a	R.O. Title: **President, General Manager**	R.O. e-mail: ebower@fmi.com
b	R. O. Address: **Hwy 90 South, Tyrone Mine Road, Tyrone, NM 88065**	
2	Alternate Responsible Official (20.2.70.300.D.2 NMAC): **Ronald Gerdes**	Phone:
a	A. R.O. Title: **Manager, Operations**	A. R.O. e-mail: rgerdes@fmi.com
b	A. R. O. Address: **Hwy 90 South, Tyrone Mine Road, Tyrone, NM 88065**	
3	Company's Corporate or Partnership Relationship to any other Air Quality Permittee (List the names of any companies that have operating (20.2.70 NMAC) permits and with whom the applicant for this permit has a corporate or partnership relationship): **Chino Mines Company**	
4	Name of Parent Company ("Parent Company" means the primary name of the organization that owns the company to be permitted wholly or in part.): **Freeport-McMoRan Inc.**	
a	Address of Parent Company: **333 N. Central Ave, Phoenix, AZ 85004**	
5	Names of Subsidiary Companies ("Subsidiary Companies" means organizations, branches, divisions or subsidiaries, which are owned, wholly or in part, by the company to be permitted.): **N/A**	
6	Telephone numbers & names of the owners' agents and site contacts familiar with plant operations: **N/A**	

7	Affected Programs to include Other States, local air pollution control programs (i.e. Bernalillo) and Indian tribes: Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B)? If yes, state which ones and provide the distances in kilometers: **States: Arizona (57 km). Local Air Pollution Control Programs: None. Indian Tribes: None.**

Section 1-I – Submittal Requirements

Each 20.2.73 NMAC (**NOI**), a 20.2.70 NMAC (**Title V**), a 20.2.72 NMAC (**NSR** minor source), or 20.2.74 NMAC (**PSD**) application package shall consist of the following:

Hard Copy Submittal Requirements:

1) One hard copy **original signed and notarized application package printed double sided 'head-to-toe' 2-hole punched** as we bind the document on top, not on the side; except Section 2 (landscape tables), which should be head-to-head. Please use **numbered tab separators** in the hard copy submittal(s) as this facilitates the review process. For NOI submittals only, hard copies of UA1, Tables 2A, 2D & 2F, Section 3 and the signed Certification Page are required. Please include a copy of the check on a separate page.

2) If the application is for a minor NSR, PSD, NNSR, or Title V application, include one working hard **copy** for Department use. This copy should be printed in book form, 3-hole punched, and **must be double sided**. Note that this is in addition to the head-to-to 2-hole punched copy required in 1) above. Minor NSR Technical Permit revisions (20.2.72.219.B NMAC) only need to fill out Sections 1-A, 1-B, 3, and should fill out those portions of other Section(s) relevant to the technical permit revision. TV Minor Modifications need only fill out Sections 1-A, 1-B, 1-H, 3, and those portions of other Section(s) relevant to the minor modification. NMED may require additional portions of the application to be submitted, as needed.

3) The entire NOI or Permit application package, including the full modeling study, should be submitted electronically. Electronic files for applications for NOIs, any type of General Construction Permit (GCP), or technical revisions to NSRs must be submitted with compact disk (CD) or digital versatile disc (DVD). For these permit application submittals, **two** CD copies are required (in sleeves, not crystal cases, please), with additional CD copies as specified below. NOI applications require only a single CD submittal. Electronic files for other New Source Review (construction) permits/permit modifications or Title V permits/permit modifications can be submitted on CD/DVD or sent through AQB's secure file transfer service.

Electronic files sent by (check one):

Ľ CD/DVD attached to paper application

☑ secure electronic transfer. Air Permit Contact Name: **Shane Medley**

Email: **smedley@fmi.com**

Phone number: **(575) 912-5117**

a. If the file transfer service is chosen by the applicant, after receipt of the application, the Bureau will email the applicant with instructions for submitting the electronic files through a secure file transfer service. Submission of the electronic files through the file transfer service needs to be completed within 3 business days after the invitation is received, so the applicant should ensure that the files are ready when sending the hard copy of the application. The applicant will not need a password to complete the transfer. **Do not use the file transfer service for NOIs, any type of GCP, or technical revisions to NSR permits.**

4) Optionally, the applicant may submit the files with the application on compact disk (CD) or digital versatile disc (DVD) following the instructions above and the instructions in 5 for applications subject to PSD review.

5) If **air dispersion modeling** is required by the application type, include the **NMED Modeling Waiver** and/or electronic air dispersion modeling report, input, and output files. The dispersion modeling ***summary report only*** should be submitted as hard copy(ies) unless otherwise indicated by the Bureau.

6) If the applicant submits the electronic files on CD and the application is subject to PSD review under 20.2.74 NMAC (PSD) or NNSR under 20.2.79 NMC include,
   a. one additional CD copy for US EPA,
   b. one additional CD copy for each federal land manager affected (NPS, USFS, FWS, USDI) and,
   c. one additional CD copy for each affected regulatory agency other than the Air Quality Bureau.

   If the application is submitted electronically through the secure file transfer service, these extra CDs do not need to be submitted.

Electronic Submittal Requirements [in addition to the required hard copy(ies)]:

1) All required electronic documents shall be submitted as 2 separate CDs or submitted through the AQB secure file transfer service. Submit a single PDF document of the entire application as submitted and the individual documents comprising the application.

2) The documents should also be submitted in Microsoft Office compatible file format (Word, Excel, etc.) allowing us to access the text and formulas in the documents (copy & paste). Any documents that cannot be submitted in a Microsoft Office compatible

format shall be saved as a PDF file from within the electronic document that created the file. If you are unable to provide Microsoft office compatible electronic files or internally generated PDF files of files (items that were not created electronically: i.e. brochures, maps, graphics, etc,), submit these items in hard copy format. We must be able to review the formulas and inputs that calculated the emissions.

3) It is preferred that this application form be submitted as 4 electronic files (3 MSWord docs: Universal Application section 1 [UA1], Universal Application section 3-19 [UA3], and Universal Application 4, the modeling report [UA4]) and 1 Excel file of the tables (Universal Application section 2 [UA2]). Please include as many of the 3-19 Sections as practical in a single MS Word electronic document. Create separate electronic file(s) if a single file becomes too large or if portions must be saved in a file format other than MS Word.

4) The electronic file names shall be a maximum of 25 characters long (including spaces, if any). The format of the electronic Universal Application shall be in the format: "A-3423-FacilityName". The "A" distinguishes the file as an application submittal, as opposed to other documents the Department itself puts into the database. Thus, all electronic application submittals should begin with "A-". Modifications to existing facilities should use the core permit number (i.e. '3423') the Department assigned to the facility as the next 4 digits. Use 'XXXX' for new facility applications. The format of any separate electronic submittals (additional submittals such as non-Word attachments, re-submittals, application updates) and Section document shall be in the format: "A-3423-9-description", where "9" stands for the section # (in this case Section 9-Public Notice). Please refrain, as much as possible, from submitting any scanned documents as this file format is extremely large, which uses up too much storage capacity in our database. Please take the time to fill out the header information throughout all submittals as this will identify any loose pages, including the Application Date (date submitted) & Revision number (0 for original, 1, 2, etc.; which will help keep track of subsequent partial update(s) to the original submittal. Do not use special symbols (#, @, etc.) in file names. The footer information should not be modified by the applicant.

Table of Contents

Table 2-A: Regulated Emission Sources

Unit and stack numbering must correspond throughout the application package. If applying for a NOI under 20.2.73 NMAC, equipment exemptions under 2.72.202 NMAC do not apply.

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufacturer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] Date of Construction/ Reconstruction[2]	Controlled by Unit # Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
SX/EW-1 (Fugitive)	Mixer/Settlers (6 Extraction & 4 Stripping)	N/A	N/A	N/A	61,366 SF	61,366 SF	1/2/2001 1/2/2001	N/A N/A	30388801	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
SX/EW-2 (Fugitive)	SX/EW (3) Acid Tank House	N/A	N/A	N/A	24,000 gal/min	24,000 gal/min	1/2/1984 1/2/1984	N/A N/A	30388801	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
SX/EW-3 (Fugitive)	Raffinate Tank 1 - Open	N/A	N/A	N/A	2 million gallons	2 million gallons	1/2/2001 1/2/2001	N/A N/A	30388801	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
SX/EW-4 (Fugitive)	Raffinate Tank 2 - Open	N/A	N/A	N/A	0.4 million gallons	0.4 million gallons	1/2/2001 1/2/2001	N/A N/A	30388801	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
B-748	Hot Water Boiler (Cathode Washing)	Lochinvar Corporation	Unknown	C11H00231748	1.256 MMBtu/hr	1.256 MMBtu/hr	6/26/2012 	N/A SXWBOIL	10201002	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
B-951	Hot Water Boiler (Cathode Washing)	Lochinvar Corporation	Unknown	DI2H00239951	1.256 MMBtu/hr	1.256 MMBtu/hr	2/28/2012 	N/A SXWBOIL	10201002	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
B-3891	Hot Water Boiler (Heat Exchanger)	Parker Boiler Co.	T3600	963891	3.6 MMBtu/hr	3.6 MMBtu/hr	2000 2020-2021	N/A B-3891	10201002	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
B-1454	Hot Water Boiler (Heat Exchanger)	Parker Boiler Co.	T3600	961454	3.6 MMBtu/hr	3.6 MMBtu/hr	2000 2020-2021	N/A B-1454	10201002	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
SD-1	Diesel Engine for Water Pump	Caterpillar	C9	JSC16214	300 hp	300 hp	9/2/2010 12/16/2010	N/A SD-1	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
SD-2	Diesel Engine for Water Pump	Caterpillar	C9	JSC25024	300 hp	300 hp	5/24/2012 2/1/2013	N/A SD-2	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
ENV-101	Diesel Engine for Water Pump	John Deere	4045TF250	T04045T780502	125 hp	125 hp	7/23/1998 1/25/2000	N/A ENV-101	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
ENV-111	Diesel Engine for Water Pump	John Deere	4045TF250	T04045T884613	125 hp	125 hp	5/16/2001 12/8/2004	N/A ENV-111	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
ENV-117	Diesel Engine for Water Pump	John Deere	4045TF275	PE4045T491314	115 hp	115 hp	10/22/2002 TBD	N/A ENV-117	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
ENV-122	Diesel Engine for Water Pump	Caterpillar	3054C	33408431	125 hp	125 hp	5/1/2005 6/3/2005	N/A ENV-122	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
ENV-123	Diesel Engine for Water Pump	Caterpillar	3126B	BEJ10905	225 hp	225 hp	6/29/2005 12/14/2005	N/A ENV-123	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
Mine Blasting (Fugitive)	Blasting	N/A	N/A	N/A	N/A	N/A	1/2/2001 	N/A N/A	30388801	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ **To Be Modified** ☐ To be Replaced	N/A	N/A
Mine Handling (Fugitive)	Handling	N/A	N/A	N/A	N/A	N/A	1/2/2001 	N/A N/A	30388801	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ **To Be Modified** ☐ To be Replaced	N/A	N/A
Mine Hauling (Fugitive)	Hauling	N/A	N/A	N/A	N/A	N/A	1/2/2001 	N/A N/A	30388801	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ **To Be Modified** ☐ To be Replaced	N/A	N/A

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufacturer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] Date of Construction/ Reconstruction[2]	Controlled by Unit # Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
Reclamation Handling (Fugitive)	Handling	N/A	N/A	N/A	N/A	N/A	1/2/2001 	N/A N/A	30388801	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
Reclamation Hauling (Fugitive)	Hauling	N/A	N/A	N/A	N/A	N/A	1/2/2001 	N/A N/A	30388801	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
C&S Plant (formerly SP-7A) Handling (Fugitive)	Crushing and Screening Plant Handling	N/A	N/A	N/A	N/A	N/A	7/16/2010 	N/A N/A	30388801	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
C&S Plant (formerly SP-7A) Hauling (Fugitive)	Crushing and Screening Plant Hauling	N/A	N/A	N/A	N/A	N/A	7/16/2010 	N/A N/A	30388801	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
SPCC-TYR-061 (GDF1)	Gasoline Dispensing Facility	N/A	N/A	N/A	20,000 gal	20,000 gal	N/A 1984	N/A N/A	30388801	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
SPCC-TYR-119 (GDF2)	Gasoline Dispensing Facility	N/A	N/A	N/A	2,000 gal	2,000 gal	N/A 2008	N/A N/A	30388801	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
OP-2	Diesel Engine for Water Pump	Perkins	403C-15	401164N	32.5 hp	32.5 hp	2/27/2006 3/19/2008	N/A OP-2	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
OP-4	Diesel Engine for Water Pump	Caterpillar	C6.6	66609304	225 hp	225 hp	7/27/2008 2/4/2013	N/A OP-4	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
OP-7	Diesel Engine for Water Pump	Caterpillar	C7	JTF19093	225 hp	225 hp	2/26/2013 6/11/2013	N/A OP-7	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
OP-8	Diesel Engine for Water Pump	Caterpillar	C7	JTF16844	225 hp	225 hp	5/29/2012 11/21/2012	N/A OP-8	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
ENV-120	Diesel Engine for Water Pump	Caterpillar	C6.6	66609306	225 hp	225 hp	7/27/2008 7/16/2008	N/A ENV-120	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
EMP-1	Diesel Engine for Water Pump	Caterpillar	3126	7AS10507	190 hp	190 hp	4/21/1998 5/7/1998	N/A EMP-1	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
EMP-2	Diesel Engine for Water Pump	Caterpillar	3126B	BEJ08982	200 hp	200 hp	1/12/2005 7/29/2005	N/A EMP-2	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
CE-1	Diesel Cold Start Compressor Engine	Ford-New Holland	N/A	544593-T26KK	100 hp	100 hp	1/1/1967 7/11/2005	N/A CE-1	20200102	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	N/A
PPG-1	Natural Gas/Diesel Generator Engine	Nordberg	FSG-1316-HSC	10301202	3,090 hp	3,090 hp	1/1/1967 7/11/2005	N/A PPG-1	20200402	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	SI/CI	N/A
PPG-3	Natural Gas/Diesel Generator Engine	Nordberg	FSG-1316-HSC	10301207	3,090 hp	3,090 hp	1/1/1967 7/11/2005	N/A PPG-3	20200402	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	SI/CI	N/A
PPG-4	Natural Gas/Diesel Generator Engine	Nordberg	FSG-1316-HSC	10301208	3,090 hp	3,090 hp	1/1/1967 7/11/2005	N/A PPG-4	20200402	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	SI/CI	N/A
PPG-7	Natural Gas/Diesel Generator Engine	Nordberg	FSG-1316-HSC	10301211	3,090 hp	3,090 hp	1/1/1967 7/11/2005	N/A PPG-7	20200402	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	SI/CI	N/A
PPG-8	Natural Gas/Diesel Generator Engine	Nordberg	FSG-1316-HSC	10301212	3,090 hp	3,090 hp	1/1/1971 7/11/2005	N/A PPG-8	20200402	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	SI/CI	N/A

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufacturer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] / Date of Construction/ Reconstruction[2]	Controlled by Unit # / Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
PPG-11	Natural Gas/Diesel Generator Engine	Nordberg	FSG-1316-HSC	10301283	3,090 hp	3,090 hp	1/1/1971 7/11/2005	N/A PPG-11	20200402	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	SI/CI	N/A
PPG-12	Natural Gas/Diesel Generator Engine	Nordberg	FSG-1316-HSC	10301304	3,090 hp	3,090 hp	1/1/1972 7/11/2005	N/A PPG-12	20200402	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	SI/CI	N/A
PPG-13	Natural Gas/Diesel Generator Engine	Nordberg	FSG-1316-HSC	10301305	3,090 hp	3,090 hp	1/1/1972 7/11/2005	N/A PPG-13	20200402	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	SI/CI	N/A
PPG-14	Natural Gas/Diesel Generator Engine	Nordberg	FSG-1316-HSC	10301306	3,090 hp	3,090 hp	1/1/1972 7/11/2005	N/A PPG-14	20200402	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	SI/CI	N/A
PPG-15	Diesel Generator Engine	Nordberg	FSG-1316-HSC	10301307	3,090 hp	3,090 hp	1/1/1972 7/11/2005	N/A PPG-15	20200402	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	SI/CI	N/A

[1] Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.
[2] Specify dates required to determine regulatory applicability.
[3] To properly account for power conversion efficiencies, generator set rated capacity shall be reported as the rated capacity of the engine in horsepower, not the kilowatt capacity of the generator set.
[4] "4SLB" means four stroke lean burn engine, "4SRB" means four stroke rich burn engine, "2SLB" means two stroke lean burn engine, "CI" means compression ignition, and "SI" means spark ignition

Table 2-B: Insignificant Activities[1] (20.2.70 NMAC) OR Exempted Equipment (20.2.72 NMAC)

All 20.2.70 NMAC (Title V) applications must list all Insignificant Activities in this table. All 20.2.72 NMAC applications must list Exempted Equipment in this table. If equipment listed on this table is exempt under 20.2.72.202.B.5, include emissions calculations and emissions totals for 202.B.5 "similar functions" units, operations, and activities in Section 6, Calculations. Equipment and activities exempted under 20.2.72.202 NMAC may not necessarily be Insignificant under 20.2.70 NMAC (and vice versa). Unit & stack numbering must be consistent throughout the application package. Per Exemptions Policy 02-012.00 (see http://www.env.nm.gov/aqb/permit/aqb_pol.html), 20.2.72.202.B NMAC Exemptions do not apply, but 20.2.72.202.A NMAC exemptions do apply to NOI facilities under 20.2.73 NMAC. List 20.2.72.301.D.4 NMAC Auxiliary Equipment for Streamline applications in Table 2-A. The List of Insignificant Activities (for TV) can be found online at http://www.env.nm.gov/aqb/forms/InsignificantListTitleV.pdf . TV sources may elect to enter both TV Insignificant Activities and Part 72 Exemptions on this form.

Unit Number	Source Description	Manufacturer	Model No.	Max Capacity	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5)	Date of Manufacture /Reconstruction[2]	For Each Piece of Equipment, Check Onc
			Serial No.	Capacity Units	Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Installation /Construction[2]	
Generac Emergency Generator 5	Emergency Generator	Generac	64380	15	20.2.72.202.B.3 NMAC	12/2014	☐ Existing (unchanged) ☐ To be Removed
			9343857	hp	Regulated under Title V	Nov-20	☑ **New/Additional** ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SPCC-TYR-261	6000 weight lube oil	Advanced Pacific Tank Manufacturing, Inc.	N/A	2,000	20.2.72.202.B.2 NMAC	Unknown	☑ Existing (unchanged) ☐ To be Removed
			N/A	gal	IA List Item #5	Sep-16	☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SPCC-TYR-264	Diesel Tank	Unknown	N/A	300	20.2.72.202.B.2 NMAC	Unknown	☑ Existing (unchanged) ☐ To be Removed
			N/A	gal	IA List Item #5	Aug-17	☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Generac Emergency Generator 1	Generac Guardian Series 5872	Generac	5872	14,000	20.2.72.202.B.3 NMAC	6/9/2014	☑ Existing (unchanged) ☐ To be Removed
			E897264613305	W	Regulated under Title V	7/25/2015	☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Generac Emergency Generator 2	Generac Guardian Series 5872	Generac	5872	14,000	20.2.72.202.B.3 NMAC	8/7/2015	☑ Existing (unchanged) ☐ To be Removed
			E922169515155	W	Regulated under Title V		☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Generac Emergency Generator 3	Generac Guardian Series 6462	Generac	6462	16,000	20.2.72.202.B.3 NMAC	10/2015	☑ Existing (unchanged) ☐ To be Removed
			9001396	W	Regulated under Title V		☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Generac Emergency Generator 4	Generac Guardian Series 6462	Generac	6462	16,000	20.2.72.202.B.3 NMAC	1/1/2016	☑ Existing (unchanged) ☐ To be Removed
			9972091	W	Regulated under Title V	5/2016	☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
IPG	Indian Peak Generator	Generac	OHVI	19	20.2.72.202.B.3 NMAC	7/24/2018	☑ Existing (unchanged) ☐ To be Removed
			3003527048	hp	Regulated under Title V	10/2018	☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
GO Generator Backup E1-128	Onan Genset	Onan Genset/Ford	LRG-425I6005A	97	20.2.72.202.B.3 NMAC	1/8/1999	☑ Existing (unchanged) ☐ To be Removed
			1494610899	hp	Regulated under Title V		☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SX/EW Fire Water Pump	Cummins Fire Water Pump	Cummins	Cummins	122	20.2.72.202.A.4 NMAC	5/2/2012	☑ Existing (unchanged) ☐ To be Removed
			73388396	hp	Regulated under Title V		☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SX Tankhouse Emergency Generator	Emergency Generator for Tankhouse Control Room	Caterpillar	DG60	67	20.2.72.202.B.3 NMAC	May 2019	☑ Existing (unchanged) ☐ To be Removed
			CT3700362	hp	Regulated under Title V	5/28/2019	☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Maintenance Area							
SPCC-TYR-001, -190	Diesel Storage Tanks	Unknown	N/A	500 to 550	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed
			N/A	gal	IA List Item #8		☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SPCC-TYR-002	Safety Kleen - Petroleum Based Solvent Storage Tank	Unknown	N/A	500	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed
			N/A	gal	IA List Item #5		☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SPCC-TYR-003	Motor Oil Storage Tank	Unknown	N/A	550	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed
			N/A	gal	IA List Item #5		☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SPCC-TYR-004, -005, -006, -007	Power Drive Fluid Storage Tanks	Unknown	N/A	550	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed
			N/A	gal	IA List Item #5		☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SPCC-TYR-014	SAE 15W-40 Motor Oil Storage Tank	Unknown	N/A	132	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed
			N/A	gal	IA List Item #5		☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SPCC-TYR-015	SAE 10W Motor Oil Storage Tank	Unknown	N/A	132	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed
			N/A	gal	IA List Item #5		☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

Unit Number	Source Description	Manufacturer	Model No. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
SPCC-TYR-016	SAE 30W Motor Oil Storage Tank	Unknown	N/A / N/A	132 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-012, -017, -018, -019, -020, -021, -022, -023, -024, -166, -167, -189, -201, -205, -206, -207, -208, -253; Drum Storage Areas A and P	Used Oil Storage Tanks	Unknown	N/A / N/A	55 to 5,000 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-177	Safety Kleen - Petroleum Based Solvent Storage Tank	Unknown	N/A / N/A	460 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-191, -192	Clean Oil Storage Tanks	Unknown	N/A / N/A	200 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
Drum Storage Areas B, C, Z, D, AA, Y; SPCC-TYR-263	Lube and Oil Storage Tanks and Drums	Unknown	N/A / N/A	55 to 2,000 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
Powerhouse Area Tanks							
SPCC-TYR-025, -026, -027, -028, -031, -033, -034, -037, -038, -041, -042, -043, -044, -045	Diesel Storage Tanks	Unknown	N/A / N/A	800 to 500,000 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-029, -059	Used Oil Storage Tank	Unknown	N/A / N/A	270 to 20,000 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-030, -046, -048, -049, -052, -053, -056, -058, -209, -210, -211, -212, -213, -214, -215, -216, -217, -218, -219, -220; Drum Storage Area W	Lube Oil Storage Tanks	Unknown	N/A / N/A	55 to 15,000 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-255	Oil Storage Tank	Unknown	N/A / N/A	55 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
Lube Shop Area Tanks							
SPCC-TYR-061	Unleaded Gasoline Storage Tank	Unknown	N/A / N/A	20,000 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-062, -063	Red Dyed Diesel Storage Tanks	Unknown	N/A / N/A	40,000 to 50,000 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-065, -074, -096, -097, -133, -238, -239, -240, -241, -242	Diesel Storage Tanks	Unknown	N/A / N/A	300 to 40,000 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-066, -086, -087, -088, -089, -104, -165, -184, -231, -232, -233, -234, -245, -246, -247; Drum Storage Area G, O	Used Oil Storage Tanks	Unknown	N/A / N/A	55 to 10,000 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-077	SAE 10 Motor Oil Storage Tank	Unknown	N/A / N/A	1,500 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-080, -083, -094	SAE 10W Motor Oil Storage Tanks	Unknown	N/A / N/A	450 to 2,700 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-073, -075, -079, -093, -237, -244	SAE 15W-40 Motor Oil Storage Tanks	Unknown	N/A / N/A	70 to 2,700 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced
SPCC-TYR-076, -081, -082, -095	SAE 30 Motor Oil Storage Tanks	Unknown	N/A / N/A	450 to 2,700 / gal	20.2.72.202.B.(2) NMAC / IA List Item #5		☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced

Unit Number	Source Description	Manufacturer	Model No.	Max Capacity	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5)	Date of Manufacture /Reconstruction[2]	For Each Piece of Equipment, Check Onc
			Serial No.	Capacity Units	Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Installation /Construction[2]	
SPCC-TYR-078	SAE 60 Motor Oil Storage Tank	Unknown	N/A	2,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-084	Oily Water Storage Tank	Unknown	N/A	10,000 (estimated)	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-174, -204	Megaplex XD5 #2 Grease Storage Tanks	Unknown	N/A	333 to 1,050	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-230	Gear Oil Storage Tank	Unknown	N/A	55	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-236; Drum Storage Area F	Turbine Oil Storage Tanks	Unknown	N/A	55 to 100	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-250, -251, -252	Lube Oil Storage Tanks	Unknown	N/A	150 to 250	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Drum Storage Area X	ATF and Lube Oil Storage Tank	Unknown	N/A	55 (2) drums	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-235	Oil Storage Tank	Unknown	N/A	70	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Magazine Area Tanks							
SPCC-TYR-090, -091	Diesel Storage Tanks	Unknown	N/A	1,000 to 9,500	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SX/EW Area Tanks							
SPCC-TYR-105, -106	Extractant Acorga M5910 Storage Tanks	Unknown	N/A	10,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-107	Diluent (Organic) - Conosol 170 Storage Tank	Unknown	N/A	34,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-109	Organic Makeup (Diluent-Conosol 170) Storage Tank	Unknown	N/A	13,500	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-110	Barren Organic Surge Tank Storage Tank	Unknown	N/A	120,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-111	Barren Organic Holding Tank Storage Tank	Unknown	N/A	120,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-112, -113	"Organic Gunk" Storage Tanks	Unknown	N/A	15,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-114, -115	Organic Recovery (Acorga M5910) Storage Tank	Unknown	N/A	12,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-116	Organic Wash (Acorga M5910) Storage Tank	Unknown	N/A	137,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-117	Acorga M5910 Storage Tank	Unknown	N/A	50,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		

Unit Number	Source Description	Manufacturer	Model No. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
SPCC-TYR-118, -120	Diesel Storage Tanks	Unknown	N/A	100 to 2,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-119	Unleaded Gasoline Storage Tank	Unknown	N/A	2,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-140, -141, -142, -143, -144, -145, -146, -147, -148, -149	Reagent Mix Storage Tanks	Unknown	N/A	Approx. 118,000 to 127,500	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Drum Storage Area H	Super Hydraulic Oil Storage Tank	Unknown	N/A	55	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Drum Storage Area R	Lube Oil Storage Tank	Unknown	N/A	55	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Drum Storage Area I	Super Hydraulic Oil, Used Oil, 90W Motor Oil, 10W Motor Oil Storage Tank	Unknown	N/A	55 (7 drums)	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Drum Storage Area K	Used Oil and Motor Oil Storage Tank	Unknown	N/A	55	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-249	Organic Recovery Storage Tank	Unknown	N/A	500	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Other Areas/Transformers							
SPCC-TYR-137A, -188, -254, -256, -257, -258, -260	Diesel Storage Tanks	Unknown	N/A	164 to 12,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Drum Storage Area M	Grease, Used Oil, Transformers, Used Absorbents Storage Tank	Unknown	N/A	55 (50 - 150 drums)	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
T1-T129 and misc. transformers	Transformer Oil Storage Tanks	Unknown	N/A	varies	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-103	Megaplex XD5 #2 Storage Tank	Unknown	N/A	540	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-172	Polyurea Grease #2 Storage Tank	Unknown	N/A	620	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-203, -248	Oily Water Storage Tanks	Unknown	N/A	2,000 to 20,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-243	Used Oil Storage Tank	Unknown	N/A	213	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-262	Grease Storage Tank	Unknown	N/A	625	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		

Unit Number	Source Description	Manufacturer	Model No. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
Mobile Service Tanks							
SPCC-TYR-151, -152, -153, -154, -155, -156, -157, -158, -159, -160, -161, -162, -163, -164, -170, -171, -173	Diesel Storage Tanks	Unknown	N/A	100 to 250	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-185, -186	Used Oil Storage Tanks	Unknown	N/A	130 to 500	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Service Vehicles							
LS 3, 5, 8, 15, 16, 17; FM 8	Misc. Storage Tanks w/ Vapor Pressure < 10 mmHg	Unknown	N/A	900 to 1,400	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
LS 23	Grease Storage Tank	Unknown	N/A	75	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
FM19	Grease, Used Oil, Lube	Unknown	N/A	1500	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
LS4, LS21; SPCC-TYR-268	Diesel Fuel Storage	Unknown	N/A	90 to 2,750	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
REC20	Diesel, Oil, and Grease Storage	Unknown	N/A	1000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Other Tanks							
SPCC-TYR-032, -035, -036, -039, -040, -125	Diesel Storage Tanks	Unknown	N/A	700 to 800	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-047, -050, -051, -054, -055, -057	Lube Oil Storage Tanks	Unknown	N/A	1,100 to 1,500	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-121	Oily Water Storage Tank	Unknown	N/A	20,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-194	Used Oil Storage Tank	Unknown	N/A	10,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
SPCC-TYR-202	Diesel Fuel Additive Storage Tank	Unknown	N/A	1,000	20.2.72.202.B.(2) NMAC		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	gal	IA List Item #5		
Non-Road Engines[3]							
NR1	Miscellaneous Pumps, Engines, Small Generators, Compressors	Varies	N/A	Varies	40 CFR 89; 40 CFR 90		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	hp	IA List Item #6		

[1] Insignificant activities exempted due to size or production rate are defined in 20.2.70.300.D.6, 20.2.70.7.Q NMAC, and the NMED/AQB List of Insignificant Activities, dated September 15, 2008. Emissions from these insignificant activities do not need to be reported, unless specifically requested.

[2] Specify date(s) required to determine regulatory applicability.

[3] For informational purposes only. These engines satisfy the federal definition of "non-road engine" under 40 CFR §§ 89 and 90 (for compression and spark-ignition engines, respectively) and are therefore regulated by EPA as mobile sources and are not subject to state NSR and Title V permitting for stationary sources.

Table 2-C: Emissions Control Equipment

Unit and stack numbering must correspond throughout the application package. Only list control equipment for TAPs if the TAP's maximum uncontrolled emissions rate is over its respective threshold as listed in 20.2.72 NMAC, Subpart V, Tables A and B. In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions.

Control Equipment Unit No.	Control Equipment Description	Date Installed	Controlled Pollutant(s)	Controlling Emissions for Unit Number(s)[1]	Efficiency (% Control by Weight)	Method used to Estimate Efficiency
N/A	Water application, water sprays, and other method(s) approved by NMED to control fugitive dust.	N/A	PM_{10}, $PM_{2.5}$	Mine Fugitives (Hauling)	88.8%	NMED guidance; WRAP guidance
				C&S Plant (formerly SP-7A) Fugitives	80%	NMED guidance
N/A	Air Fuel Ratio Controllers (AFRs) on each of the Nordberg engines that were specifically designed for the Tyrone Power House to reduce emissions.	2000	NOx, CO, VOC	PPG-1, 3, 4, 7, 8, 11-15	Unknown	N/A

[1] List each control device on a separate line. For each control device, list all emission units controlled by the control device.

Table 2-D: Maximum Emissions (under normal operating conditions)

☐ **This Table was intentionally left blank because it would be identical to Table 2-E.**

Maximum Emissions are the emissions at maximum capacity and prior to (in the absence of) pollution control, emission-reducing process equipment, or any other emission reduction. Calculate the hourly emissions using the worst case hourly emissions for each pollutant. For each pollutant, calculate the annual emissions as if the facility were operating at maximum plant capacity without pollution controls for 8760 hours per year, unless otherwise approved by the Department. List Hazardous Air Pollutants (HAP) & Toxic Air Pollutants (TAPs) in Table 2-I. Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		PM[1,2]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
SX/EW-1 (Fugitive)	-	-	-	-	5.15	22.54	-	-	-	-	-	-	-	-	-	-	-	-
SX/EW-2 (Fugitive)	-	-	-	-	-	-	-	-	1.82	7.98	1.82	7.98	-	-	-	-	-	-
SX/EW-3 (Fugitive)	-	-	-	-	0.95	4.15	-	-	-	-	-	-	-	-	-	-	-	-
SX/EW-4 (Fugitive)	-	-	-	-	0.32	1.39	-	-	-	-	-	-	-	-	-	-	-	-
B-748	0.36	1.56	0.21	0.90	0.022	0.096	0.044	0.19	0.019	0.084	0.019	0.084	0.019	0.084	-	-	-	-
B-951															-	-	-	-
B-3891	0.51	2.24	0.30	1.29	0.031	0.14	0.063	0.27	0.028	0.12	0.028	0.12	0.028	0.12	-	-	-	-
B-1454	0.51	2.24	0.30	1.29	0.031	0.14	0.063	0.27	0.028	0.12	0.028	0.12	0.028	0.12	-	-	-	-
SD-1	1.77	7.77	1.63	7.15	0.093	0.41	0.58	2.55	0.093	0.41	0.093	0.41	0.093	0.41	-	-	-	-
SD-2	1.77	7.77	1.63	7.15	0.093	0.41	0.58	2.55	0.093	0.41	0.093	0.41	0.093	0.41	-	-	-	-
ENV-101	3.88	16.97	0.84	3.67	0.31	1.37	0.26	1.12	0.28	1.20	0.28	1.20	0.28	1.20	-	-	-	-
ENV-111	3.88	16.97	0.84	3.67	0.31	1.37	0.26	1.12	0.28	1.20	0.28	1.20	0.28	1.20	-	-	-	-
ENV-117	1.01	4.40	0.22	0.94	0.053	0.23	0.22	0.98	0.052	0.23	0.052	0.23	0.052	0.23	-	-	-	-
ENV-122	1.29	5.65	1.03	4.50	0.068	0.30	0.26	1.12	0.062	0.27	0.062	0.27	0.062	0.27	-	-	-	-
ENV-123	2.19	9.61	1.22	5.36	0.12	0.51	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	-	-	-	-
Mine Blasting (Fugitive)	180.00	131.40	4,064.00	2,966.72	-	-	0.36	0.26	618.72	451.66	321.73	234.87	18.56	13.55	-	-	-	-
Mine Handling (Fugitive)	-	-	-	-	-	-	-	-	0.70	6.10	0.27	2.34	0.040	0.35	-	-	-	-
Mine Hauling (Fugitive) - M5	-	-	-	-	-	-	-	-	13,260.81	58,082.35	3,379.69	14,803.05	337.97	1,196.41	-	-	-	-
Reclamation Handling (Fugitive)	-	-	-	-	-	-	-	-	0.12	0.53	0.047	0.20	0.0070	0.031	-	-	-	-
Reclamation Hauling (Fugitive)	-	-	-	-	-	-	-	-	2,485.50	8,798.67	633.46	2,242.46	63.35	224.25	-	-	-	-
C&S Plant (formerly SP-7A) Handling (Fugitive)	-	-	-	-	-	-	-	-	40.89	89.56	15.75	34.50	2.37	5.18	-	-	-	-
C&S Plant (formerly SP-7A) Hauling (Fugitive)	-	-	-	-	-	-	-	-	83.15	147.18	21.19	37.51	2.12	3.75	-	-	-	-
SPCC-TYR-061 (GDF1)	-	-	-	-	2.41	10.57	-	-	-	-	-	-	-	-	-	-	-	-
SPCC-TYR-119 (GDF2)	-	-	-	-	0.39	1.70	-	-	-	-	-	-	-	-	-	-	-	-
OP-2	0.36	1.58	0.28	1.22	0.019	0.083	0.063	0.28	0.030	0.13	0.030	0.13	0.030	0.13	-	-	-	-
OP-4	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	-	-	-	-
OP-7	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	-	-	-	-
OP-8	1.33	5.82	1.22	5.36	0.074	0.32	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	-	-	-	-
ENV-120	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	-	-	-	-
EMP-1	2.72	11.91	3.37	14.75	0.38	1.68	0.37	1.61	0.16	0.70	0.16	0.70	0.16	0.70	-	-	-	-
EMP-2	1.95	8.54	1.09	4.77	0.10	0.45	0.39	1.70	0.062	0.27	0.062	0.27	0.062	0.27	-	-	-	-
CE-1	3.10	0.78	0.67	0.17	0.25	0.063	0.21	0.051	0.22	0.055	0.22	0.055	0.22	0.055	-	-	-	-
PPG-1,3,4,7,8,11-15	499.70	56.20	257.13	37.39	29.00	2.12	12.50	0.49	15.08	0.73	12.39	0.64	10.36	0.58	-	-	-	-
Totals w/ Fugitives	**710.31**	**308.88**	**4,339.64**	**3,082.41**	**40.39**	**50.96**	**18.39**	**24.13**	**16,508.54**	**67,591.50**	**4,388.11**	**17,370.28**	**436.52**	**1,450.84**	**-**	**-**	**-**	**-**
Totals w/o Fugitives	**530.31**	**177.48**	**275.64**	**115.69**	**33.98**	**22.88**	**18.03**	**23.86**	**16.82**	**7.47**	**14.14**	**7.38**	**12.11**	**7.32**	**-**	**-**	**-**	**-**

[1]**Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but PM is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

[2] The TSP NMAAQS standard was repealed on November 30, 2018. PM emissions are included for informational purposes only.

Table 2-E: Requested Allowable Emissions

Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		PM[1,2]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
SX/EW-1 (Fugitive)	-	-	-	-	5.15	22.54	-	-	-	-	-	-	-	-	-	-	-	-
SX/EW-2 (Fugitive)	-	-	-	-	-	-	-	-	1.82	7.98	1.82	7.98	-	-	-	-	-	-
SX/EW-3 (Fugitive)	-	-	-	-	0.95	4.15	-	-	-	-	-	-	-	-	-	-	-	-
SX/EW-4 (Fugitive)	-	-	-	-	0.32	1.39	-	-	-	-	-	-	-	-	-	-	-	-
B-748 B-951	0.36	1.56	0.21	0.90	0.022	0.096	0.044	0.19	0.019	0.084	0.019	0.084	0.019	0.084	-	-	-	-
B-3891	0.51	2.24	0.30	1.29	0.031	0.14	0.063	0.27	0.028	0.12	0.028	0.12	0.028	0.12	-	-	-	-
B-1454	0.51	2.24	0.30	1.29	0.031	0.14	0.063	0.27	0.028	0.12	0.028	0.12	0.028	0.12	-	-	-	-
SD-1	1.77	7.77	1.63	7.15	0.093	0.41	0.58	2.55	0.093	0.41	0.093	0.41	0.093	0.41	-	-	-	-
SD-2	1.77	7.77	1.63	7.15	0.093	0.41	0.58	2.55	0.093	0.41	0.093	0.41	0.093	0.41	-	-	-	-
ENV-101	3.88	16.97	0.84	3.67	0.31	1.37	0.26	1.12	0.28	1.20	0.28	1.20	0.28	1.20	-	-	-	-
ENV-111	3.88	16.97	0.84	3.67	0.31	1.37	0.26	1.12	0.28	1.20	0.28	1.20	0.28	1.20	-	-	-	-
ENV-117	1.01	4.40	0.22	0.94	0.053	0.23	0.22	0.98	0.052	0.23	0.052	0.23	0.052	0.23	-	-	-	-
ENV-122	1.29	5.65	1.03	4.50	0.068	0.30	0.26	1.12	0.062	0.27	0.062	0.27	0.062	0.27	-	-	-	-
ENV-123	2.19	9.61	1.22	5.36	0.12	0.51	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	-	-	-	-
Mine Blasting (Fugitive)	180.00	131.40	4064.00	2966.72	-	-	0.36	0.26	618.72	451.66	321.73	234.87	18.56	13.55	-	-	-	-
Mine Handling (Fugitive)	-	-	-	-	-	-	-	-	0.70	6.10	0.27	2.34	0.040	0.35	-	-	-	-
Mine Hauling (Fugitive) - M5	-	-	-	-	-	-	-	-	1485.21	6505.22	378.53	1657.94	37.85	134.00	-	-	-	-
Reclamation Handling (Fugitive)	-	-	-	-	-	-	-	-	0.12	0.53	0.047	0.20	0.0070	0.031	-	-	-	-
Reclamation Hauling (Fugitive)	-	-	-	-	-	-	-	-	278.38	985.45	70.95	251.16	7.09	25.12	-	-	-	-
C&S Plant (formerly SP-7A) Handling (Fugitive)	-	-	-	-	-	-	-	-	8.45	18.50	3.68	8.07	0.57	1.25	-	-	-	-
C&S Plant (formerly SP-7A) Hauling (Fugitive)	-	-	-	-	-	-	-	-	9.31	16.48	2.37	4.20	0.24	0.42	-	-	-	-
SPCC-TYR-061 (GDF1)	-	-	-	-	2.41	10.57	-	-	-	-	-	-	-	-	-	-	-	-
SPCC-TYR-119 (GDF2)	-	-	-	-	0.39	1.70	-	-	-	-	-	-	-	-	-	-	-	-
OP-2	0.36	1.58	0.28	1.22	0.019	0.083	0.063	0.28	0.030	0.13	0.030	0.13	0.030	0.13	-	-	-	-
OP-4	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	-	-	-	-
OP-7	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	-	-	-	-
OP-8	1.33	5.82	1.22	5.36	0.074	0.32	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	-	-	-	-
ENV-120	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	-	-	-	-
EMP-1	2.72	11.91	3.37	14.75	0.38	1.68	0.37	1.61	0.16	0.70	0.16	0.70	0.16	0.70	-	-	-	-
EMP-2	1.95	8.54	1.09	4.77	0.10	0.45	0.39	1.70	0.062	0.27	0.062	0.27	0.062	0.27	-	-	-	-
CE-1	3.10	0.78	0.67	0.17	0.25	0.063	0.21	0.05	0.22	0.055	0.22	0.055	0.22	0.06	-	-	-	-
PPG-1,3,4,7,8,11-15	499.70	56.20	257.13	37.39	29.00	2.12	12.50	0.49	15.08	0.73	12.39	0.64	10.36	0.58	-	-	-	-
Totals w/ Fugitives	**710.31**	**308.88**	**4,339.64**	**3,082.41**	**40.39**	**50.96**	**18.39**	**24.13**	**2,419.53**	**7,999.40**	**793.55**	**2,174.13**	**76.47**	**182.03**	**-**	**-**	**-**	**-**
Totals w/o Fugitives	**530.31**	**177.48**	**275.64**	**115.69**	**33.98**	**22.88**	**18.03**	**23.86**	**16.82**	**7.47**	**14.14**	**7.38**	**12.11**	**7.32**	**-**	**-**	**-**	**-**

[1] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but PM is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

[2] The TSP NMAAQS standard was repealed on November 30, 2018. PM emissions are included for informational purposes only.

Table 2-F: Additional Emissions during Startup, Shutdown, and Routine Maintenance (SSM)

☑ This table is intentionally left blank since all emissions at this facility due to routine or predictable startup, shutdown, or scehduled maintenance are no higher than those listed in Table 2-E and a malfunction emission limit is not already permitted or requested. If you are required to report GHG emissions as described in Section 6a, include any GHG emissions during Startup, Shutdown, and/or Scheduled Maintenance (SSM) in Table 2-P. Provide an explanations of SSM emissions in Section 6 and 6a.

All applications for facilities that have emissions during routine our predictable startup, shutdown or scheduled maintenance (SSM)[1], including NOI applications, must include in this table the Maximum Emissions during routine or predictable startup, shutdown and scheduled maintenance (20.2.7 NMAC, 20.2.72.203.A.3 NMAC, 20.2.73.200.D.2 NMAC). In Section 6 and 6a, provide emissions calculations for all SSM emissions reported in this table. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (https://www.env.nm.gov/aqb/permit/aqb_pol.html) for more detailed instructions. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		PM[2]		PM10[2]		PM2.5[2]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Totals																		

[1] **For instance**, if the short term steady-state Table 2-E emissions are 5 lb/hr and the SSM rate is 12 lb/hr, enter 7 lb/hr in this table. If the annual steady-state Table 2-E emissions are 21.9 TPY, and the number of scheduled SSM events result in annual emissions of 31.9 TPY, enter 10.0 TPY in the table below.

[2] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but it is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

Table 2-G: Stack Exit and Fugitive Emission Rates for Special Stacks

☐ I have elected to leave this table blank because this facility does not have any stacks/vents that split emissions from a single source or combine emissions from more than one source listed in table 2-A. Additionally, the emission rates of all stacks match the Requested allowable emission rates stated in Table 2-E.

Use this table to list stack emissions (requested allowable) from split and combined stacks. List Toxic Air Pollutants (TAPs) and Hazardous Air Pollutants (HAPs) in Table 2-I. List all fugitives that are associated with the normal, routine, and non-emergency operation of the facility. Unit and stack numbering must correspond throughout the application package. Refer to Table 2-E for instructions on use of the "-" symbol and on significant figures.

Stack No.	Serving Unit Number(s) from Table 2-A	NOx		CO		VOC		SOx		PM[1]		PM10		PM2.5		☐ H_2S or ☐ Lead	
		lb/hr	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**
SXWBOIL (common stack)	B-748 B-951	0.36	1.56	0.21	0.90	0.022	0.096	0.044	0.19	0.019	0.084	0.019	0.084	0.019	0.084	-	-
B-1454 (dual stacks)	B-1454	0.51	2.24	0.30	1.29	0.031	0.14	0.063	0.27	0.028	0.12	0.028	0.12	0.028	0.12	-	-
Totals:		**0.87**	**3.80**	**0.50**	**2.19**	**0.053**	**0.23**	**0.11**	**0.47**	**0.047**	**0.20**	**0.047**	**0.20**	**0.047**	**0.20**	**-**	**-**

[1] The TSP NMAAQS standard was repealed on November 30, 2018. PM emissions are included for informational purposes only.

Table 2-H: Stack Exit Conditions

Unit and stack numbering must correspond throughout the application package. Include the stack exit conditions for each unit that emits from a stack, including blowdown venting parameters and tank emissions. If the facility has multiple operating scenarios, complete a separate Table 2-H for each scenario and, for each, type scenario name here:

Stack Number	Serving Unit Number(s) from Table 2-A	Orientation (H-Horizontal V=Vertical)	Rain Caps (Yes or No)	Height Above Ground (ft)	Temp. (F)	Flow Rate		Moisture by Volume (%)	Velocity (ft/sec)	Inside Diameter (ft)
						(acfs)	(dscfs)			
SXWBOIL (B-748 & B-951)	Cathode Washing Hot Water Boilers (B-951 & B-748; common stack)	V	Yes	35.1	401	2.6	-	-	31.2	0.33
B-3891	New Heat Exchanger Hot Water Boiler (Serial # 963891)	V	Yes	15.0	450	1.0	-	-	0.45	1.67
B-1454	New Heat Exchanger Hot Water Boiler (Serial # 961454) (dual stacks)	V	Yes	15.0	450	0.80	-	-	0.45	1.50
SD-1	SD-1	V	Yes	8.0	900	12.9	-	-	138.6	0.34
SD-2	SD-2	V	Yes	8.0	900	12.9	-	-	138.6	0.34
ENV-101	ENV-101	V	Yes	9.8	923	12.2	-	-	136.4	0.34
ENV-111	ENV-111	V	Yes	9.8	923	12.2	-	-	136.4	0.34
ENV-117	ENV-117	V	Yes	8.0	900	12.5	-	-	129.4	0.35
ENV-122	ENV-122	V	Yes	9.8	900	11.8	-	-	128.9	0.34
ENV-123	ENV-123	V	Yes	8.0	833	16.8	-	-	87.5	0.50
OP-2	OP-2	V	Yes	8.0	833	12.5	-	-	114.6	0.37
OP-4	OP-4	V	Yes	8.0	833	15.4	-	-	162.4	0.35
OP-7	OP-7	V	Yes	8.0	833	16.8	-	-	87.5	0.50
OP-8	OP-8	V	Yes	8.0	833	16.8	-	-	87.5	0.50
ENV-120	ENV-120	V	Yes	8.0	833	15.4	-	-	162.4	0.35
EMP-1	EMP-1	V	Yes	8.0	833	16.8	-	-	87.5	0.50
EMP-2	EMP-2	V	Yes	8.0	833	16.8	-	-	87.5	0.50
CE-1	CE-1	V	Yes	25.0	886.7	0.0	-	-	0.0	3.30
PPG-1	PPG-1	V	Yes	60.7	830.9	435.8	-	-	108.3	2.26
PPG-3	PPG-3	V	Yes	60.7	830.9	435.8	-	-	108.3	2.26
PPG-4	PPG-4	V	Yes	60.7	830.9	435.8	-	-	108.3	2.26
PPG-7	PPG-7	V	Yes	60.7	830.9	435.8	-	-	108.3	2.26
PPG-8	PPG-8	V	Yes	60.7	830.9	435.8	-	-	108.3	2.26
PPG-11	PPG-11	V	Yes	60.7	830.9	435.8	-	-	108.3	2.26
PPG-12	PPG-12	V	Yes	60.7	830.9	435.8	-	-	108.3	2.26
PPG-13	PPG-13	V	Yes	60.7	830.9	435.8	-	-	108.3	2.26
PPG-14	PPG-14	V	Yes	60.7	830.9	435.8	-	-	108.3	2.26
PPG-15	PPG-15	V	Yes	60.7	830.9	435.8	-	-	108.3	2.26

Table 2-I: Stack Exit and Fugitive Emission Rates for HAPs and TAPs

In the table below, report the Potential to Emit for each HAP from each regulated emission unit listed in Table 2-A, only if the entire facility emits the HAP at a rate greater than or equal to one (1) ton per year For each such emission unit, HAPs shall be reported to the nearest 0.1 tpy. Each facility-wide Individual HAP total and the facility-wide Total HAPs shall be the sum of all HAP sources calculated to the nearest 0.1 ton per year. Per 20.2.72.403.A.1 NMAC, facilities not exempt [see 20.2.72.402.C NMAC] from TAP permitting shall report each TAP that has an uncontrolled emission rate in excess of its pounds per hour screening level specified in 20.2.72.502 NMAC. TAPs shall be reported using one more significant figure than the number of significant figures shown in the pound per hour threshold corresponding to the substance. Use the HAP nomenclature as it appears in Section 112 (b) of the 1990 CAAA and the TAP nomenclature as it listed in 20.2.72.502 NMAC. Include tank-flashing emissions estimates of HAPs in this table. For each HAP or TAP listed, fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected or the pollutant is emitted in a quantity less than the threshold amounts described above.

Stack No.	Unit No.(s)	Total HAPs		Ethylbenzene ☑ HAP or ☐ TAP		Toluene ☑ HAP or ☐ TAP		Xylenes ☑ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
N/A	SX/EW-1 (Fugitive)	1.65	7.23	0.65	2.87	0.14	0.60	0.85	3.74		
N/A	SX/EW-2 (Fugitive)	-	-	-	-	-	-	-	-		
N/A	SX/EW-3 (Fugitive)	0.30	1.33	0.12	0.53	0.03	0.11	0.16	0.69		
N/A	SX/EW-4 (Fugitive)	0.10	0.42	0.04	0.17	0.01	0.03	0.05	0.22		
SXWBOIL	B-748 B-951	4.65E-03	2.04E-02	-	-	8.37E-06	3.67E-05	-	-		
B-3891	B-3891	6.67E-03	2.92E-02	-	-	1.20E-05	5.26E-05	-	-		
B-1454	B-1454	6.67E-03	2.92E-02	-	-	1.20E-05	5.26E-05	-	-		
SD-1	SD-1	6.80E-03	2.98E-02	-	-	8.12E-05	3.56E-04	5.66E-04	2.48E-03		
SD-2	SD-2	6.80E-03	2.98E-02	-	-	8.12E-05	3.56E-04	5.66E-04	2.48E-03		
ENV-101	ENV-101	3.46E-03	1.52E-02	-	-	3.58E-04	1.57E-03	2.49E-04	1.09E-03		
ENV-111	ENV-111	3.46E-03	1.52E-02	-	-	3.58E-04	1.57E-03	2.49E-04	1.09E-03		
ENV-117	ENV-117	2.61E-03	1.14E-02	-	-	3.12E-05	1.37E-04	2.18E-04	9.53E-04		
ENV-122	ENV-122	3.46E-03	1.52E-02	-	-	3.58E-04	1.57E-03	2.49E-04	1.09E-03		
ENV-123	ENV-123	5.10E-03	2.23E-02	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03		
N/A	SPCC-TYR-061 (GDF1)	2.72E-01	1.19E+00	4.34E-03	1.90E-02	8.66E-02	3.79E-01	1.65E-02	7.25E-02		
N/A	SPCC-TYR-119 (GDF2)	4.38E-02	1.92E-01	7.00E-04	3.07E-03	1.40E-02	6.12E-02	2.67E-03	1.17E-02		
OP-2	OP-2	7.37E-04	3.23E-03	-	-	8.80E-06	3.86E-05	6.13E-05	2.69E-04		
OP-4	OP-4	5.10E-03	2.23E-02	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03		
OP-7	OP-7	5.10E-03	2.23E-02	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03		
OP-8	OP-8	5.10E-03	2.23E-02	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03		
ENV-120	ENV-120	5.10E-03	2.23E-02	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03		
EMP-1	EMP-1	4.31E-03	1.89E-02	-	-	5.15E-05	2.25E-04	3.59E-04	1.57E-03		
EMP-2	EMP-2	4.53E-03	1.99E-02	-	-	5.42E-05	2.37E-04	3.77E-04	1.65E-03		
CE-1	CE-1	2.77E-03	6.93E-04	-	-	2.86E-04	7.16E-05	2.00E-04	4.99E-05		
PPG-1,3,4,7,8,11-15	PPG-1,3,4,7,8,11-15	3.69E-01	1.11E-02	-	-	6.08E-02	1.82E-03	4.17E-02	1.25E-03		
Totals (w/ Fugitives):		**2.82**	**10.73**	**0.82**	**3.59**	**0.33**	**1.19**	**1.13**	**4.75**		
Totals (w/o Fugitives):		**0.77**	**1.74**	**0.0050**	**0.022**	**0.16**	**0.45**	**0.066**	**0.11**		

Table 2-J: Fuel

Specify fuel characteristics and usage. Unit and stack numbering must correspond throughout the application package.

Unit No.	Fuel Type (low sulfur Diesel, ultra low sulfur diesel, Natural Gas, Coal, …)	Fuel Source: purchased commercial, pipeline quality natural gas, residue gas, raw/field natural gas, process gas (e.g. SRU tail gas) or other	Specify Units				
			Lower Heating Value	Hourly Usage	Annual Usage	% Sulfur	% Ash
B-748	Propane	Purchased commercial	91.5 MMBtu/10^3 gal	13.7 gal	120,247 gal	N/A	N/A
B-951	Propane	Purchased commercial	91.5 MMBtu/10^3 gal	13.7 gal	120,247 gal	N/A	N/A
B-3891	Propane	Purchased commercial	91.5 MMBtu/10^3 gal	39.3 gal	344,656 gal	N/A	N/A
B-1454	Propane	Purchased commercial	91.5 MMBtu/10^3 gal	39.3 gal	344,656 gal	N/A	N/A
SD-1	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	14.5 gal	127,022 gal	0.0015%	N/A
SD-2	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	14.5 gal	127,022 gal	0.0015%	N/A
ENV-101	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	6.0 gal	52,560 gal	0.0015%	N/A
ENV-111	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	6.0 gal	52,560 gal	0.0015%	N/A
ENV-117	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	5.6 gal	48,831 gal	0.0015%	N/A
ENV-122	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	6.0 gal	52,560 gal	0.0015%	N/A
ENV-123	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	10.9 gal	95,267 gal	0.0015%	N/A
OP-2	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	0.98 gal	8,562 gal	0.0015%	N/A
OP-4	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	10.9 gal	95,267 gal	0.0015%	N/A
OP-7	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	10.9 gal	95,267 gal	0.0015%	N/A
OP-8	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	12.4 gal	108,765 gal	0.0015%	N/A
ENV-120	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	10.9 gal	95,267 gal	0.0015%	N/A
EMP-1	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	9.2 gal	80,447 gal	0.0015%	N/A
EMP-2	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	9.7 gal	84,682 gal	0.0015%	N/A
CE-1	Biodiesel/Diesel Blend	Purchased commercial	137,000 Btu/gal	158.0 gal	13,262 gal	0.0015%	N/A
Natural Gas Operation of Nordberg Engines							
PPG-1	Natural Gas	Purchased commercial	1,050 Btu/scf	20.97 Mscf	6,989.3 Mscf	0.05%	N/A
PPG-3	Natural Gas	Purchased commercial	1,050 Btu/scf	20.97 Mscf	6,989.3 Mscf	0.05%	N/A
PPG-4	Natural Gas	Purchased commercial	1,050 Btu/scf	20.97 Mscf	6,989.3 Mscf	0.05%	N/A
PPG-7	Natural Gas	Purchased commercial	1,050 Btu/scf	20.97 Mscf	6,989.3 Mscf	0.05%	N/A
PPG-8	Natural Gas	Purchased commercial	1,050 Btu/scf	20.97 Mscf	6,989.3 Mscf	0.05%	N/A
PPG-11	Natural Gas	Purchased commercial	1,050 Btu/scf	20.97 Mscf	6,989.3 Mscf	0.05%	N/A
PPG-12	Natural Gas	Purchased commercial	1,050 Btu/scf	20.97 Mscf	6,989.3 Mscf	0.05%	N/A
PPG-13	Natural Gas	Purchased commercial	1,050 Btu/scf	20.97 Mscf	6,989.3 Mscf	0.05%	N/A
PPG-14	Natural Gas	Purchased commercial	1,050 Btu/scf	20.97 Mscf	6,989.3 Mscf	0.05%	N/A
Diesel Operation of Nordberg Engines							
PPG-1	Diesel	Purchased commercial	137,000 Btu/gal	158 gal	13,262 gal	0.05%	N/A
PPG-3	Diesel	Purchased commercial	137,000 Btu/gal	159 gal	13,262 gal	0.05%	N/A
PPG-4	Diesel	Purchased commercial	137,000 Btu/gal	160 gal	13,262 gal	0.05%	N/A
PPG-7	Diesel	Purchased commercial	137,000 Btu/gal	161 gal	13,262 gal	0.05%	N/A
PPG-8	Diesel	Purchased commercial	137,000 Btu/gal	162 gal	13,262 gal	0.05%	N/A
PPG-11	Diesel	Purchased commercial	137,000 Btu/gal	163 gal	13,262 gal	0.05%	N/A
PPG-12	Diesel	Purchased commercial	137,000 Btu/gal	164 gal	13,262 gal	0.05%	N/A
PPG-13	Diesel	Purchased commercial	137,000 Btu/gal	165 gal	13,262 gal	0.05%	N/A
PPG-14	Diesel	Purchased commercial	137,000 Btu/gal	165 gal	13,262 gal	0.05%	N/A
PPG-15	Diesel	Purchased commercial	137,000 Btu/gal	166 gal	13,262 gal	0.05%	N/A

Table 2-K: Liquid Data for Tanks Listed in Table 2-L

For each tank, list the liquid(s) to be stored in each tank. If it is expected that a tank may store a variety of hydrocarbon liquids, enter "mixed hydrocarbons" in the Composition column for that tank and enter the corresponding data of the most volatile liquid to be stored in the tank. If tank is to be used for storage of different materials, list all the materials in the "All Calculations" attachment, run the newest version of TANKS on each, and use the material with the highest emission rate to determine maximum uncontrolled and requested allowable emissions rate. The permit will specify the most volatile category of liquids that may be stored in each tank. Include appropriate tank-flashing modeling input data. Use additional sheets if necessary. Unit and stack numbering must correspond throughout the application package.

Tank No.	SCC Code	Material Name	Composition	Liquid Density (lb/gal)	Vapor Molecular Weight (lb/lb*mol)	Average Annual Mininum Temperature		Average Annual Maximum Temperature	
						Temperature, T_{AN} (°F)	Vapor Pressure at T_{LA} (psia)	Temperature, T_{AX} (°F)	Vapor Pressure at T_{LA} (psia)
SPCC-TYR-061 (GDF1)	40400150	Gasoline	Mixed Hydrocarbons	6.17	66	46.2	6.554	76.6	6.554
SPCC-TYR-119 (GDF2)	40400150	Gasoline	Mixed Hydrocarbons	6.17	66	46.2	5.961	76.6	5.961

Table 2-L: Tank Data

Include appropriate tank-flashing modeling input data. Use an addendum to this table for unlisted data categories. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary. See reference Table 2-L2. Note: 1.00 bbl = 10.159 M3 = 42.0 gal

Tank No.	Date Installed	Materials Stored	Seal Type (refer to Table 2-LR below)	Roof Type (refer to Table 2-LR below)	Capacity		Diameter (M)	Vapor Space (M)	Color (from Table VI-C)		Paint Condition (from Table VI-C)	Annual Throughput (gal/yr)	Turn-overs (per year)
					(bbl)	(M^3)			Roof	Shell			
SPCC-TYR-061 (GDF1)	1984	Gasoline	N/A	FX	476	75.7	3.35	See calcs	OT: Red	OT: Red	Poor	119,400	5.9
SPCC-TYR-119 (GDF2)	2008	Gasoline	N/A	FX	48	7.6	1.58	See calcs	OT: Beige	OT: Beige	Poor	119,400	115.6

Table 2-L2: Liquid Storage Tank Data Codes Reference Table

Roof Type	Seal Type, Welded Tank Seal Type		Seal Type, Riveted Tank Seal Type		Roof, Shell Color	Paint Condition
FX: Fixed Roof	**Mechanical Shoe Seal**	**Liquid-mounted resilient seal**	**Vapor-mounted resilient seal**	**Seal Type**	**WH**: White	Good
IF: Internal Floating Roof	**A**: Primary only	**A**: Primary only	**A**: Primary only	**A**: Mechanical shoe, primary only	**AS**: Aluminum (specular)	Poor
EF: External Floating Roof	**B**: Shoe-mounted secondary	**B**: Weather shield	**B**: Weather shield	**B**: Shoe-mounted secondary	**AD**: Aluminum (diffuse)	
P: Pressure	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**LG**: Light Gray	
					MG: Medium Gray	
					BL: Black	
					OT: Other (specify)	

Note: 1.00 bbl = 0.159 M^3 = 42.0 gal

Table 2-M: Materials Processed and Produced (Use additional sheets as necessary.)

Material Processed				Material Produced			
Description	**Chemical Composition**	**Phase (Gas, Liquid, or Solid)**	**Quantity (specify units)[1]**	**Description**	**Chemical Composition**	**Phase**	**Quantity (specify units)[1]**
Mined Material	Copper, minerals, and trace metals	Solid	400,000 tons/day	Copper Cathode	Copper	Solid	225 tons/day

[1] Quantities specified here are for informational purposes only and are not intended to be used for permit conditions.

Table 2-N: CEM Equipment

Enter Continuous Emissions Measurement (CEM) Data in this table. If CEM data will be used as part of a federally enforceable permit condition, or used to satisfy the requirements of a state or federal regulation, include a copy of the CEM's manufacturer specification sheet in the Information Used to Determine Emissions attachment. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

Stack No.	Pollutant(s)	Manufacturer	Model No.	Serial No.	Sample Frequency	Averaging Time	Range	Sensitivity	Accuracy
N/A - Facility does not have CEM equipment.									

Table 2-O: Parametric Emissions Measurement Equipment

Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

Unit No.	Parameter/Pollutant Measured	Location of Measurement	Unit of Measure	Acceptable Range	Frequency of Maintenance	Nature of Maintenance	Method of Recording	Averaging Time
N/A - Facility does not have PEM equipment.								

Table 2-P: Greenhouse Gas Emissions

Applications submitted under 20.2.70, 20.2.72, & 20.2.74 NMAC are required to complete this Table. Power plants, Title V major sources, and PSD major sources must report and calculate all GHG emissions for each unit. Applicants must report potential emission rates in short tons per year (see Section 6.a for assistance). Include GHG emissions during Startup, Shutdown, and Scheduled Maintenance in this table. For minor source facilities that are not power plants, are not Title V, or are not PSD, there are three options for reporting GHGs 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHG as a second separate unit; OR 3) check the following box ☐ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

		CO_2 ton/yr	CH_4 ton/yr	N_2O ton/yr	SF_6 ton/yr	PFC/HFC ton/yr[2]							Total GHG Mass Basis metric ton/yr[4]	Total CO_2e metric ton/yr[5]
Unit No.	**GWPs [1]**	**1.00**	**25**	**298**	**22,800**	**footnote 3**								
B-748/B-951	mass GHG	1,521.81	0.073	0.015	-	-							1,521.9	
	CO_2e	1,521.81	1.82	4.33	-	-								1,528.0
B-3891	mass GHG	2,180.94	0.10	0.021	-	-							2,181.1	
	CO_2e	2,180.94	2.60	6.20	-	-								2,189.7
B-1454	mass GHG	2,180.94	0.10	0.021	-	-							2,181.1	
	CO_2e	2,180.94	2.60	6.20	-	-								2,189.7
SD-1	mass GHG	1,296.45	0.053	0.011	-	-							1,296.5	
	CO_2e	1,296.45	1.31	3.13	-	-								1,300.9
SD-2	mass GHG	1,296.45	0.053	0.011	-	-							1,296.5	
	CO2e	1,296.45	1.31	3.13	-	-								1,300.9
ENV-101	mass GHG	536.45	0.022	0.0044	-	-							536.5	
	CO2e	536.45	0.54	1.30	-	-								538.3
ENV-111	mass GHG	536.45	0.022	0.0044	-	-							536.5	
	CO_2e	536.45	0.54	1.30	-	-								538.3
ENV-117	mass GHG	498.39	0.020	0.0040	-	-							498.4	
	CO_2e	498.39	0.51	1.20	-	-								500.1
ENV-122	mass GHG	536.45	0.022	0.0044	-	-							536.5	
	CO2e	536.45	0.54	1.30	-	-								538.3
ENV-123	mass GHG	972.34	0.039	0.0079	-	-							972.4	
	CO2e	972.34	0.99	2.35	-	-								975.7
Mine Blasting (Fugitive)	mass GHG	27,452.71	1.11	0.22	-	-							27,454.0	
	CO_2e	27,452.71	27.84	66.37	-	-								27,546.9
OP-2	mass GHG	87.39	0.0035	0.00071	-	-							87.4	
	CO2e	87.39	0.089	0.21	-	-								87.7
OP-4	mass GHG	972.34	0.039	0.0079	-	-							972.4	
	CO_2e	972.34	0.99	2.35	-	-								975.7
OP-7	mass GHG	972.34	0.039	0.0079	-	-							972.4	
	CO_2e	972.34	0.99	2.35	-	-								975.7
OP-8	mass GHG	1,110.11	0.045	0.0090	-	-							1,110.2	
	CO_2e	1,110.11	1.13	2.68	-	-								1,113.9
ENV-120	mass GHG	972.34	0.039	0.0079	-	-							972.4	
	CO2e	972.34	0.99	2.35	-	-								975.7
EMP-1	mass GHG	821.09	0.033	0.0067	-	-							821.1	
	CO_2e	821.09	0.83	1.98	-	-								823.9
EMP-2	mass GHG	864.30	0.035	0.0070	-	-							864.3	
	CO_2e	864.30	0.88	2.09	-	-								867.3
CE-1	mass GHG	882.37	0.036	0.0072	-	-							882.4	
	CO2e	882.37	0.89	2.13	-	-								885.4
PPG-1,3,4,7,8,11-15	mass GHG	5,668.15	0.23	0.046	-	-							5,668.4	
	CO_2e	5,668.15	5.75	13.70	-	-								5,687.6
Total w/ Fugitives	**mass GHG**	**51,359.80**	**2.13**	**0.43**	**-**	**-**							**51,362.4**	
	CO_2e	**51,359.80**	**53.13**	**126.67**	**-**	**-**								**51,539.6**
Total w/o Fugitives	**mass GHG**	**23,907.09**	**1.01**	**0.20**	**-**	**-**							**23,908.3**	
	CO_2e	**23,907.09**	**25.30**	**60.30**	**-**	**-**								**23,992.7**

[1] **GWP** (Global Warming Potential): Applicants must use the most current GWPs codified in Table A-1 of 40 CFR part 98. GWPs are subject to change, therefore, applicants need to check 40 CFR 98 to confirm GWP values.

[2] For **HFCs** or **PFCs** describe the specific HFC or PFC compound and use a separate column for each individual compound.

[3] For each new compound, enter the appropriate GWP for each HFC or PFC compound from Table A-1 in 40 CFR 98.

[4] Green house gas emissions on a **mass basis** is the ton per year green house gas emission before adjustment with its GWP.

[5] **CO_2e** means Carbon Dioxide Equivalent and is calculated by multiplying the TPY mass emissions of the green house gas by its GWP.

Section 3

Application Summary

The **Application Summary** shall include a brief description of the facility and its process, the type of permit application, the applicable regulation (i.e. 20.2.72.200.A.X, or 20.2.73 NMAC) under which the application is being submitted, and any air quality permit numbers associated with this site. If this facility is to be collocated with another facility, provide details of the other facility including permit number(s). In case of a revision or modification to a facility, provide the lowest level regulatory citation (i.e. 20.2.72.219.B.1.d NMAC) under which the revision or modification is being requested. Also describe the proposed changes from the original permit, how the proposed modification will affect the facility's operations and emissions, de-bottlenecking impacts, and changes to the facility's major/minor status (both PSD & Title V).

The **Process Summary** shall include a brief description of the facility and its processes.

Startup, Shutdown, and Maintenance (SSM) routine or predictable emissions: Provide an overview of how SSM emissions are accounted for in this application. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on SSM emissions.

Freeport-McMoRan Tyrone Inc. (Tyrone) operates the Tyrone Mine, which is located near Tyrone, New Mexico within Grant County. The Tyrone Mine's major product is copper cathode, which is produced using the solution extraction/electrowinning (SX/EW) process. Boilers are used to heat water at the SX/EW process to rinse the copper cathode product. In addition to the SX/EW plant and associated processes, the Tyrone Mine operations include blasting; hauling and dumping of ore and waste rock; the emergency operation of a power plant; and environmental pumping systems.

Tyrone has prepared a significant permit revision application pursuant to 20.2.72.219.D.(1)(a) NMAC for its Tyrone Mine currently permitted under NSR Permit No. PSD2448-M6 and Title V Permit No. P147-R2M1. This significant permit application is being submitted to allow for three (3) new operating scenarios that encompass the following pits in various combinations: Emma, Burro Chief, Mohawk, and Little Rock 6. Tyrone is currently acquiring additional land outside of the Emma pit to provide an operational and safety buffer. Based on the one (1) Mohawk + Gettysburg operating scenario currently permitted in M5 and planned to be carried forward, the six (6) operating scenarios permitted in M6, and the three (3) operating scenarios proposed in this permit application (M7), Tyrone is requesting approval to mine under a total of 10 different operating scenarios. The emissions presented for each scenario in this application are based upon only that scenario being operated during a given day.

The emissions presented in this permit application include blasting, active mining material handling, and active mining haul roads associated with the three (3) new operating scenarios. One new exempted emergency generator has also been added to Table 2-B. No other changes from what was submitted in the M6 permit application are being requested in this permit application.

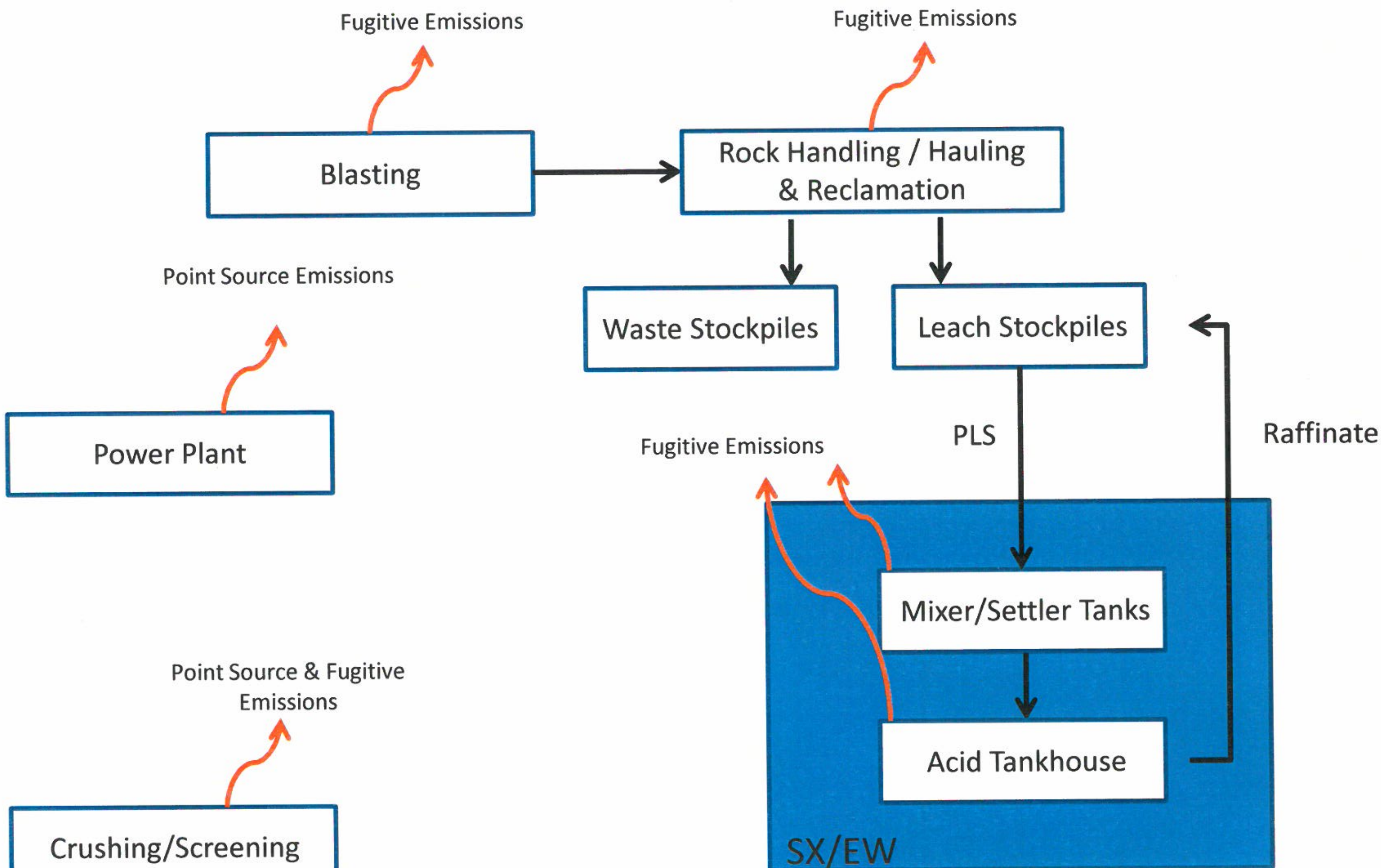
The facility will remain a Title V major and PSD minor source with the proposed fugitive emission changes. No stack emission changes are being requested in this permit application.

Section 4

Process Flow Sheet

A **process flow sheet** and/or block diagram indicating the individual equipment, all emission points and types of control applied to those points. The unit numbering system should be consistent throughout this application.

Please see the enclosed process flow sheet.



FREEPORT-McMoRAN COPPER & GOLD
Freeport-McMoRan Tyrone Inc.

Figure 1: Tyrone Mine Process Flow Diagram

Section 5

Plot Plan Drawn To Scale

A **plot plan drawn to scale** showing emissions points, roads, structures, tanks, and fences of property owned, leased, or under direct control of the applicant. This plot plan must clearly designate the restricted area as defined in UA1, Section 1-D.12. The unit numbering system should be consistent throughout this application.

Please see the enclosed plot plan.

Note:

1. C&S Plant N and C&S Plant S are the two possible locations for the C&S Plant. The worst-case location is C&S Plant N, which is what was modeled.
2. Engines were modeled at the worst-case locations as depicted in the map

FREEPORT-McMoRAN

Tyrone Mine

Title V & NSR Permit M7 Plot Plan

Scale:	As Noted	Date:	4-28-2021	Notes:
Dept.	Environmental Services			
Drawn By:	SMG	Checked By:		

Section 6

All Calculations

Show all calculations used to determine both the hourly and annual controlled and uncontrolled emission rates. All calculations shall be performed keeping a minimum of three significant figures. Document the source of each emission factor used (if an emission rate is carried forward and not revised, then a statement to that effect is required). If identical units are being permitted and will be subject to the same operating conditions, submit calculations for only one unit and a note specifying what other units to which the calculations apply. All formulas and calculations used to calculate emissions must be submitted. The "Calculations" tab in the UA2 has been provided to allow calculations to be linked to the emissions tables. Add additional "Calc" tabs as needed. If the UA2 or other spread sheets are used, all calculation spread sheet(s) shall be submitted electronically in Microsoft Excel compatible format so that formulas and input values can be checked. Format all spread sheets and calculations such that the reviewer can follow the logic and verify the input values. Define all variables. If calculation spread sheets are not used, provide the original formulas with defined variables. Additionally, provide subsequent formulas showing the input values for each variable in the formula. All calculations, including those calculations are imbedded in the Calc tab of the UA2 portion of the application, the printed Calc tab(s), should be submitted under this section.

Tank Flashing Calculations: The information provided to the AQB shall include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., NOI, permit, or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis. If Hysis is used, all relevant input parameters shall be reported, including separator pressure, gas throughput, and all other relevant parameters necessary for flashing calculation.

SSM Calculations: It is the applicant's responsibility to provide an estimate of SSM emissions or to provide justification for not doing so. In this Section, provide emissions calculations for Startup, Shutdown, and Routine Maintenance (SSM) emissions listed in the Section 2 SSM and/or Section 22 GHG Tables and the rational for why the others are reported as zero (or left blank in the SSM/GHG Tables). Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on calculating SSM emissions. If SSM emissions are greater than those reported in the Section 2, Requested Allowables Table, modeling may be required to ensure compliance with the standards whether the application is NSR or Title V. Refer to the Modeling Section of this application for more guidance on modeling requirements.

Glycol Dehydrator Calculations: The information provided to the AQB shall include the manufacturer's maximum design recirculation rate for the glycol pump. If GRI-Glycalc is used, the full input summary report shall be included as well as a copy of the gas analysis that was used.

Road Calculations: Calculate fugitive particulate emissions and enter haul road fugitives in Tables 2-A, 2-D and 2-E for:

1. If you transport raw material, process material and/or product into or out of or within the facility and have PER emissions greater than 0.5 tpy.
2. If you transport raw material, process material and/or product into or out of the facility more frequently than one round trip per day.

Significant Figures:
A. All emissions standards are deemed to have at least two significant figures, but not more than three significant figures.
B. At least 5 significant figures shall be retained in all intermediate calculations.
C. In calculating emissions to determine compliance with an emission standard, the following rounding off procedures shall be used:

- **(1)** If the first digit to be discarded is less than the number 5, the last digit retained shall not be changed;
- **(2)** If the first digit discarded is greater than the number 5, or if it is the number 5 followed by at least one digit other than the number zero, the last figure retained shall be increased by one unit; **and**
- **(3)** If the first digit discarded is exactly the number 5, followed only by zeros, the last digit retained shall be rounded upward if it is an odd number, but no adjustment shall be made if it is an even number.
- **(4)** The final result of the calculation shall be expressed in the units of the standard.

Control Devices: In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions. The applicant can indicate in this section of the application if they chose to not take credit for the reduction in emission rates. For notices of intent submitted under 20.2.73 NMAC, only uncontrolled emission rates can be considered to determine applicability unless the state or federal Acts require the control. This information is necessary to determine if federally enforceable conditions are necessary for the control device, and/or if the control device produces its own regulated pollutants or increases emission rates of other pollutants.

This section describes the emissions calculations only for the units that are being proposed as part of this permit application. Detailed information on the emission calculation inputs, assumptions, and emission factors are provided in the following tables.

Mine Blasting (Fugitive)
For the new operating scenarios, gaseous emissions from blasting are calculated based on the pounds of blasting agent used per blast per pit and the number of blasts per day per pit according to the table below. No pit will have more than two (2) blasts per day. Particulate matter emissions from blasting are based on a maximum blast area of 125,000 ft^2/blast. Only one scenario can be operated during a given day with both pits operating simultaneously except that only one blast can occur in an hour.

Operating Scenario	Pit Name	Maximum Blasting Agent Usage per Blast (lbs/blast)	Maximum No. of Blasts per Day	Maximum Daily Blasting Agent Usage (lbs/day)	Maximum Blast Area per Blast (ft^2/blast)
8, 9, 10	Emma	200,000	2	400,000	125,000
8	Burro Chief	200,000	2	400,000	125,000
9	Little Rock 6	100,000	1	100,000	125,000
10	Mohawk	150,000	2	300,000	125,000

There are no changes to the previously used emission factors. The NOx emission factor is the average of measurements from "NOx Emissions from Blasting Operations in Open-Cut Coal Mining" by Moetaz I. Attalla, Stuart J. Day, Tony Lange, William Lilley, and Scott Morgan (2008). The CO emission factor is the average of the measurements in "Factors Affecting Anfo Fumes Production" by James H. Rowland III and Richard Mainiero (2001). The SO_2 emissions are based on a diesel sulfur content of 15 ppm assuming complete conversion to SO_2. Particulate blasting emissions are based on emission factors from AP-42 Table 11.9-1. Greenhouse gas emissions associated with blasting are calculated using emission factors from 40 CFR 98 Subpart C, Tables C-1 and C-2 and global warming potentials from 40 CFR 98 Subpart A, Table A-1.

Mine Handling (Fugitive)
Mining material handling emissions are calculated based on emission factors from AP-42 Chapter 11.19.2 and a maximum mining material throughput that varies by pit. See the table below. The stockpile material handling emissions have been combined with the pit material handling such that the emissions from both activities are represented in this permit application as “Mining Material Handling”.

Operating Scenario	Pit Name	Maximum Mining Rates (tons/day)
8, 9, 10	Emma	200,000
8	Burro Chief	200,000
9	Little Rock 6	90,000
10	Mohawk	200,000

Mine Hauling (Fugitive)
Emissions from unpaved haul road truck traffic are calculated using the methodology from AP-42 Chapter 13.2.2. A control efficiency of 88.8%, consistent with the M5 and M6 calculations, was applied to the uncontrolled emissions, which is based on 80% control for base course and watering (NMED guidance, January 1, 2017) and 44% control for an average speed limit of 25 mph (WRAP Fugitive Dust Handbook, September 7, 2006).

Section 6.a

Green House Gas Emissions

(Submitting under 20.2.70, 20.2.72 20.2.74 NMAC)

Title V (20.2.70 NMAC), Minor NSR (20.2.72 NMAC), and PSD (20.2.74 NMAC) applicants must estimate and report greenhouse gas (GHG) emissions to verify the emission rates reported in the public notice, determine applicability to 40 CFR 60 Subparts, and to evaluate Prevention of Significant Deterioration (PSD) applicability. GHG emissions that are subject to air permit regulations consist of the sum of an aggregate group of these six greenhouse gases: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Calculating GHG Emissions:

1. Calculate the ton per year (tpy) GHG mass emissions and GHG CO_2e emissions from your facility.
2. GHG mass emissions are the sum of the total annual tons of greenhouse gases without adjusting with the global warming potentials (GWPs). GHG CO_2e emissions are the sum of the mass emissions of each individual GHG multiplied by its GWP found in Table A-1 in 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Emissions from routine or predictable start up, shut down, and maintenance must be included.
4. Report GHG mass and GHG CO_2e emissions in Table 2-P of this application. Emissions are reported in **short** tons per year and represent each emission unit's Potential to Emit (PTE).
5. All Title V major sources, PSD major sources, and all power plants, whether major or not, must calculate and report GHG mass and CO2e emissions for each unit in Table 2-P.
6. For minor source facilities that are not power plants, are not Title V, and are not PSD there are three options for reporting GHGs in Table 2-P: 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHGs as a second separate unit; 3) or check the following ☐ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

Sources for Calculating GHG Emissions:

- Manufacturer's Data
- AP-42 Compilation of Air Pollutant Emission Factors at http://www.epa.gov/ttn/chief/ap42/index.html
- EPA's Internet emission factor database WebFIRE at http://cfpub.epa.gov/webfire/
- 40 CFR 98 Mandatory Green House Gas Reporting except that tons should be reported in short tons rather than in metric tons for the purpose of PSD applicability.
- API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry. August 2009 or most recent version.
- Sources listed on EPA's NSR Resources for Estimating GHG Emissions at http://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases:

Global Warming Potentials (GWP):
Applicants must use the Global Warming Potentials codified in Table A-1 of the most recent version of 40 CFR 98 Mandatory Greenhouse Gas Reporting. The GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to that of one unit mass of CO_2 over a specified time period.

"Greenhouse gas" for the purpose of air permit regulations is defined as the aggregate group of the following six gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. **(20.2.70.7 NMAC, 20.2.74.7 NMAC).** You may also find GHGs defined in 40 CFR 86.1818-12(a).

Metric to Short Ton Conversion:
Short tons for GHGs and other regulated pollutants are the standard unit of measure for PSD and title V permitting programs. 40 CFR 98 Mandatory Greenhouse Reporting requires metric tons.
1 metric ton = 1.10231 short tons (per Table A-2 to Subpart A of Part 98 – Units of Measure Conversions)

Freeport-McMoRan Tyrone Inc.
Facility-Wide Emissions Summary

Uncontrolled Emissions

Unit	NOx		CO		VOC		SO_2		TSP		PM_{10}		$PM_{2.5}$		Total HAP		Ethylbenzene		Benzene		Hexane		2,2,4-Trimethylpentane		Toluene		Xylenes		Formaldehyde		CO_2	CH_4	N_2O	CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	metric tpy	metric tpy	metric tpy	metric tpy
SX/EW-1 (Fugitive)	-	-	-	-	5.15	22.54	-	-	-	-	-	-	-	-	1.65	7.23	6.55E-01	2.87E+00	6.92E-03	3.03E-02	-	-	-	-	1.36E-01	5.98E-01	8.53E-01	3.74E+00	-	-	-	-	-	-
SX/EW-2 (Fugitive)	-	-	-	-	-	-	-	-	1.82	7.98	1.82	7.98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SX/EW-3 (Fugitive)	-	-	-	-	0.95	4.15	-	-	-	-	-	-	-	-	0.30	1.33	1.21E-01	5.28E-01	1.28E-03	5.59E-03	-	-	-	-	2.51E-02	1.10E-01	1.57E-01	6.88E-01	-	-	-	-	-	-
SX/EW-4 (Fugitive)	-	-	-	-	0.32	1.39	-	-	-	-	-	-	-	-	0.097	0.42	3.85E-02	1.68E-01	3.88E-04	1.70E-03	-	-	-	-	7.69E-03	3.37E-02	5.01E-02	2.19E-01	-	-	-	-	-	-
Water Boiler B-748[1] Water Boiler B-951[1]	0.36	1.56	0.21	0.90	0.022	0.096	0.044	0.19	0.019	0.084	0.019	0.084	0.019	0.084	0.0047	0.020	-	-	-	-	-	-	-	-	8.37E-06	3.67E-05	-	-	1.85E-04	8.09E-04	1,521.81	0.073	0.015	1,527.95
Water Boiler B-3891	0.51	2.24	0.30	1.29	0.031	0.14	0.063	0.27	0.028	0.12	0.028	0.12	0.028	0.12	0.0067	0.029	-	-	-	-	-	-	-	-	1.20E-05	5.26E-05	-	-	2.65E-04	1.16E-03	2,180.94	0.10	0.021	2,189.74
Water Boiler B-1454	0.51	2.24	0.30	1.29	0.031	0.14	0.063	0.27	0.028	0.12	0.028	0.12	0.028	0.12	0.0067	0.029	-	-	-	-	-	-	-	-	1.20E-05	5.26E-05	-	-	2.65E-04	1.16E-03	2,180.94	0.10	0.021	2,189.74
SD-1	1.77	7.77	1.63	7.15	0.093	0.41	0.58	2.55	0.093	0.41	0.093	0.41	0.093	0.41	0.0068	0.030	-	-	-	-	-	-	-	-	8.12E-05	3.56E-04	5.66E-04	2.48E-03	2.34E-03	1.03E-02	1,296.45	0.053	0.011	1,300.90
SD-2	1.77	7.77	1.63	7.15	0.093	0.41	0.58	2.55	0.093	0.41	0.093	0.41	0.093	0.41	0.0068	0.030	-	-	-	-	-	-	-	-	8.12E-05	3.56E-04	5.66E-04	2.48E-03	2.34E-03	1.03E-02	1,296.45	0.053	0.011	1,300.90
ENV-101	3.88	16.97	0.84	3.67	0.31	1.37	0.26	1.12	0.28	1.20	0.28	1.20	0.28	1.20	0.0035	0.015	-	-	-	-	-	-	-	-	3.58E-04	1.57E-03	2.49E-04	1.09E-03	1.03E-03	4.52E-03	536.45	0.022	0.0044	538.29
ENV-111	3.88	16.97	0.84	3.67	0.31	1.37	0.26	1.12	0.28	1.20	0.28	1.20	0.28	1.20	0.0035	0.015	-	-	-	-	-	-	-	-	3.58E-04	1.57E-03	2.49E-04	1.09E-03	1.03E-03	4.52E-03	536.45	0.022	0.0044	538.29
ENV-117	1.01	4.40	0.22	0.94	0.053	0.23	0.22	0.98	0.052	0.23	0.052	0.23	0.052	0.23	0.0026	0.011	-	-	-	-	-	-	-	-	3.12E-05	1.37E-04	2.18E-04	9.53E-04	9.01E-04	3.95E-03	498.39	0.020	0.0040	500.10
ENV-122	1.29	5.65	1.03	4.50	0.068	0.30	0.26	1.12	0.062	0.27	0.062	0.27	0.062	0.27	0.0035	0.015	-	-	-	-	-	-	-	-	3.58E-04	1.57E-03	2.49E-04	1.09E-03	1.03E-03	4.52E-03	536.45	0.022	0.0044	538.29
ENV-123	2.19	9.61	1.22	5.36	0.12	0.51	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	0.0051	0.022	-	-	-	-	-	-	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03	1.76E-03	7.70E-03	972.34	0.039	0.0079	975.68
Mine Blasting (Fugitive)	180.00	131.40	4,064.0	2,966.72	-	-	0.36	0.26	618.72	451.66	321.73	234.87	18.56	13.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27,452.71	1.11	0.22	27,546.92
Mine Handling (Fugitive) (Pit and Stockpile)	-	-	-	-	-	-	-	-	0.70	6.10	0.27	2.34	0.040	0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mine Hauling (Fugitive)	-	-	-	-	-	-	-	-	3,596.43	20,172.52	916.60	5,141.23	91.66	514.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reclamation Handling (Fugitive)	-	-	-	-	-	-	-	-	0.12	0.53	0.047	0.20	0.0070	0.031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reclamation Hauling (Fugitive)	-	-	-	-	-	-	-	-	2,485.50	8,798.67	633.46	2,242.46	63.35	224.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C&S Plant (formerly SP-7A) Handling (Fugitive)	-	-	-	-	-	-	-	-	40.89	89.56	15.75	34.50	2.37	5.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C&S Plant (formerly SP-7A) Hauling (Fugitive)	-	-	-	-	-	-	-	-	83.15	147.18	21.19	37.51	2.12	3.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPCC-TYR-061 (GDF1)	-	-	-	-	2.41	10.57	-	-	-	-	-	-	-	-	0.27	1.19	4.34E-03	1.90E-02	8.33E-03	3.65E-02	2.59E-02	1.14E-01	1.30E-01	5.71E-01	8.67E-02	3.80E-01	1.66E-02	7.25E-02	-	-	-	-	-	-
SPCC-TYR-119 (GDF2)	-	-	-	-	0.39	1.70	-	-	-	-	-	-	-	-	0.044	0.19	7.01E-04	3.07E-03	1.34E-03	5.88E-03	4.18E-03	1.83E-02	2.10E-02	9.21E-02	1.40E-02	6.12E-02	2.67E-03	1.17E-02	-	-	-	-	-	-
OP-2	0.36	1.58	0.28	1.22	0.019	0.083	0.063	0.28	0.030	0.13	0.030	0.13	0.030	0.13	0.00074	0.0032	-	-	-	-	-	-	-	-	8.80E-06	3.86E-05	6.13E-05	2.69E-04	2.54E-04	1.11E-03	87.39	0.0035	0.00071	87.69
OP-4	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	0.0051	0.022	-	-	-	-	-	-	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03	1.76E-03	7.70E-03	972.34	0.039	0.0079	975.68
OP-7	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	0.0051	0.022	-	-	-	-	-	-	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03	1.76E-03	7.70E-03	972.34	0.039	0.0079	975.68
OP-8	1.33	5.82	1.22	5.36	0.074	0.32	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	0.0051	0.022	-	-	-	-	-	-	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03	1.76E-03	7.70E-03	1,110.11	0.045	0.0090	1,113.92
ENV-120	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	0.0051	0.022	-	-	-	-	-	-	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03	1.76E-03	7.70E-03	972.34	0.039	0.0079	975.68
EMP-1	2.72	11.91	3.37	14.75	0.38	1.68	0.37	1.61	0.16	0.70	0.16	0.70	0.16	0.70	0.0043	0.019	-	-	-	-	-	-	-	-	5.15E-05	2.25E-04	3.59E-04	1.57E-03	1.48E-03	6.50E-03	821.09	0.033	0.0067	823.90
EMP-2	1.95	8.54	1.09	4.77	0.10	0.45	0.39	1.70	0.062	0.27	0.062	0.27	0.062	0.27	0.0045	0.020	-	-	-	-	-	-	-	-	5.42E-05	2.37E-04	3.77E-04	1.65E-03	1.56E-03	6.84E-03	864.30	0.035	0.0070	867.27
CE-1	3.10	0.78	0.67	0.17	0.25	0.06	0.21	0.051	0.22	0.055	0.22	0.055	0.22	0.055	0.0028	0.00069	-	-	6.53E-04	1.63E-04	-	-	-	-	2.86E-04	7.16E-05	2.00E-04	4.99E-05	8.26E-04	2.07E-04	882.37	0.036	0.0072	885.39
PPG-1, 3, 4, 7, 8, 11-15	499.70	56.20	257.13	37.39	29.00	2.12	12.50	0.49	15.08	0.73	12.39	0.64	10.36	0.58	0.37	0.011	-	-	1.68E-01	5.04E-03	-	-	-	-	6.08E-02	1.82E-03	4.17E-02	1.25E-03	1.10E+01	2.56E-03	5,668.15	0.23	0.046	5,687.60
Total	**710.31**	**308.88**	**4,339.64**	**3,082.41**	**40.39**	**50.96**	**18.39**	**24.13**	**6,844.16**	**29,681.68**	**1,925.01**	**7,708.47**	**190.21**	**768.55**	**2.82**	**10.73**	**0.82**	**3.59**	**0.19**	**0.085**	**0.030**	**0.13**	**0.15**	**0.66**	**0.33**	**1.19**	**1.13**	**4.75**	**11.04**	**0.10**	**51,359.80**	**2.13**	**0.43**	**51,539.61**
Total w/o Fugitives[2]	**530.31**	**177.48**	**275.64**	**115.69**	**33.98**	**22.88**	**18.03**	**23.86**	**16.82**	**7.47**	**14.14**	**7.38**	**12.11**	**7.32**	**0.77**	**1.75**	**0.0050**	**0.022**	**0.18**	**0.048**	**0.030**	**0.13**	**0.15**	**0.66**	**0.16**	**0.45**	**0.07**	**0.11**	**11.04**	**0.10**	**23,907.09**	**1.01**	**0.20**	**23,992.69**

Footnotes:

[1] These two boilers share a common stack, so their emissions are combined.

[2] Fugitive criterial pollutant emissions do not count towards the TV and PSD applicability of the facility; therefore, they are not included in the permittable limit.

Freeport-McMoRan Tyrone Inc.
Facility-Wide Emissions Summary

Controlled Emissions

Unit	NOX		CO		VOC		SO_2		TSP		PM_{10}		$PM_{2.5}$		Total HAP		Ethylbenzene		Benzene		Hexane		2,2,4-Trimethylpentane		Toluene		Xylenes		Formaldehyde		CO_2	CH_4	N_2O	CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	metric tpy	metric tpy	metric tpy	metric tpy
SX/EW-1 (Fugitive)	-	-	-	-	5.15	22.54	-	-	-	-	-	-	-	-	1.65	7.23	6.55E-01	2.87E+00	6.92E-03	3.03E-02	-	-	-	-	1.36E-01	5.98E-01	8.53E-01	3.74E+00	-	-	-	-	-	-
SX/EW-2 (Fugitive)	-	-	-	-	-	-	-	-	1.82	7.98	1.82	7.98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SX/EW-3 (Fugitive)	-	-	-	-	0.95	4.15	-	-	-	-	-	-	-	-	0.30	1.33	1.21E-01	5.28E-01	1.28E-03	5.59E-03	-	-	-	-	2.51E-02	1.10E-01	1.57E-01	6.88E-01	-	-	-	-	-	-
SX/EW-4 (Fugitive)	-	-	-	-	0.32	1.39	-	-	-	-	-	-	-	-	0.097	0.42	3.85E-02	1.68E-01	3.88E-04	1.70E-03	-	-	-	-	7.69E-03	3.37E-02	5.01E-02	2.19E-01	-	-	-	-	-	-
Water Boiler B-748[1] Water Boiler B-951[1]	0.36	1.56	0.21	0.90	0.022	0.096	0.044	0.19	0.019	0.084	0.019	0.084	0.019	0.084	0.0047	0.020	-	-	-	-	-	-	-	-	8.37E-06	3.67E-05	-	-	1.85E-04	8.09E-04	1,521.81	0.073	0.015	1,527.95
Water Boiler B-3891	0.51	2.24	0.30	1.29	0.031	0.14	0.063	0.27	0.028	0.12	0.028	0.12	0.028	0.12	0.0067	0.029	-	-	-	-	-	-	-	-	1.20E-05	5.26E-05	-	-	2.65E-04	1.16E-03	2,180.94	0.10	0.021	2,189.74
Water Boiler B-1454	0.51	2.24	0.30	1.29	0.031	0.14	0.063	0.27	0.028	0.12	0.028	0.12	0.028	0.12	0.0067	0.029	-	-	-	-	-	-	-	-	1.20E-05	5.26E-05	-	-	2.65E-04	1.16E-03	2,180.94	0.10	0.021	2,189.74
SD-1	1.77	7.77	1.63	7.15	0.093	0.41	0.58	2.55	0.093	0.41	0.093	0.41	0.093	0.41	0.0068	0.030	-	-	-	-	-	-	-	-	8.12E-05	3.56E-04	5.66E-04	2.48E-03	2.34E-03	1.03E-02	1,296.45	0.053	0.011	1,300.90
SD-2	1.77	7.77	1.63	7.15	0.093	0.41	0.58	2.55	0.093	0.41	0.093	0.41	0.093	0.41	0.0068	0.030	-	-	-	-	-	-	-	-	8.12E-05	3.56E-04	5.66E-04	2.48E-03	2.34E-03	1.03E-02	1,296.45	0.053	0.011	1,300.90
ENV-101	3.88	16.97	0.84	3.67	0.31	1.37	0.26	1.12	0.28	1.20	0.28	1.20	0.28	1.20	0.0035	0.015	-	-	-	-	-	-	-	-	3.58E-04	1.57E-03	2.49E-04	1.09E-03	1.03E-03	4.52E-03	536.45	0.022	0.0044	538.29
ENV-111	3.88	16.97	0.84	3.67	0.31	1.37	0.26	1.12	0.28	1.20	0.28	1.20	0.28	1.20	0.0035	0.015	-	-	-	-	-	-	-	-	3.58E-04	1.57E-03	2.49E-04	1.09E-03	1.03E-03	4.52E-03	536.45	0.022	0.0044	538.29
ENV-117	1.01	4.40	0.22	0.94	0.053	0.23	0.22	0.98	0.052	0.23	0.052	0.23	0.052	0.23	0.0026	0.011	-	-	-	-	-	-	-	-	3.12E-05	1.37E-04	2.18E-04	9.53E-04	9.01E-04	3.95E-03	498.39	0.020	0.0040	500.10
ENV-122	1.29	5.65	1.03	4.50	0.068	0.30	0.26	1.12	0.062	0.27	0.062	0.27	0.062	0.27	0.0035	0.015	-	-	-	-	-	-	-	-	3.58E-04	1.57E-03	2.49E-04	1.09E-03	1.03E-03	4.52E-03	536.45	0.022	0.0044	538.29
ENV-123	2.19	9.61	1.22	5.36	0.115	0.51	0.44	1.91	0.0700	0.307	0.0700	0.307	0.070	0.31	0.0051	0.022	-	-	-	-	-	-	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03	1.76E-03	7.70E-03	972.34	0.039	0.0079	975.68
Mine Blasting (Fugitive)	180.00	131.40	4,064.00	2,966.72	-	-	0.36	0.26	618.72	451.66	321.73	234.87	18.56	13.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-			27,452.71	1.11	0.22	27,546.92
Mine Handling (Fugitive) (Pit and Stockpile)	-	-	-	-	-	-	-	-	0.70	6.10	0.27	2.34	0.040	0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mine Hauling (Fugitive)	-	-	-	-	-	-	-	-	402.80	2,259.32	102.66	575.82	10.27	57.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reclamation Handling (Fugitive)	-	-	-	-	-	-	-	-	0.12	0.53	0.047	0.20	0.0070	0.031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reclamation Hauling (Fugitive)	-	-	-	-	-	-	-	-	278.38	985.45	70.95	251.16	7.09	25.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C&S Plant (formerly SP-7A) Handling (Fugitive)	-	-	-	-	-	-	-	-	8.45	18.50	3.68	8.07	0.57	1.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C&S Plant (formerly SP-7A) Hauling (Fugitive)	-	-	-	-	-	-	-	-	9.31	16.48	2.37	4.20	0.24	0.42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPCC-TYR-061 (GDF1)	-	-	-	-	2.41	10.57	-	-	-	-	-	-	-	-	0.27	1.19	4.34E-03	1.90E-02	8.33E-03	3.65E-02	2.59E-02	1.14E-01	1.30E-01	5.71E-01	8.67E-02	3.80E-01	1.66E-02	7.25E-02	-	-	-	-	-	-
SPCC-TYR-119 (GDF2)	-	-	-	-	0.39	1.70	-	-	-	-	-	-	-	-	0.044	0.19	7.01E-04	3.07E-03	1.34E-03	5.88E-03	4.18E-03	1.83E-02	2.10E-02	9.21E-02	1.40E-02	6.12E-02	2.67E-03	1.17E-02	-	-	-	-	-	-
OP-2	0.36	1.58	0.28	1.22	0.019	0.083	0.063	0.28	0.030	0.13	0.030	0.13	0.030	0.13	0.00074	0.0032	-	-	-	-	-	-	-	-	8.80E-06	3.86E-05	6.13E-05	2.69E-04	2.54E-04	1.11E-03	87.39	0.0035	0.00071	87.69
OP-4	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	0.0051	0.022	-	-	-	-	-	-	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03	1.76E-03	7.70E-03	972.34	0.039	0.0079	975.68
OP-7	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	0.0051	0.022	-	-	-	-	-	-	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03	1.76E-03	7.70E-03	972.34	0.039	0.0079	975.68
OP-8	1.33	5.82	1.22	5.36	0.074	0.32	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	0.0051	0.022	-	-	-	-	-	-	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03	1.76E-03	7.70E-03	1,110.11	0.045	0.0090	1,113.92
ENV-120	1.33	5.82	1.22	5.36	0.070	0.31	0.44	1.91	0.070	0.31	0.070	0.31	0.070	0.31	0.0051	0.022	-	-	-	-	-	-	-	-	6.09E-05	2.67E-04	4.25E-04	1.86E-03	1.76E-03	7.70E-03	972.34	0.039	0.0079	975.68
EMP-1	2.72	11.91	3.37	14.75	0.38	1.68	0.37	1.61	0.160	0.70	0.16	0.70	0.16	0.70	0.0043	0.019	-	-	-	-	-	-	-	-	5.15E-05	2.25E-04	3.59E-04	1.57E-03	1.48E-03	6.50E-03	821.09	0.033	0.0067	823.90
EMP-2	1.95	8.54	1.09	4.77	0.10	0.45	0.39	1.70	0.062	0.27	0.062	0.27	0.062	0.27	0.0045	0.020	-	-	-	-	-	-	-	-	5.42E-05	2.37E-04	3.77E-04	1.65E-03	1.56E-03	6.84E-03	864.30	0.035	0.0070	867.27
CE-1	3.10	0.78	0.67	0.17	0.25	0.063	0.21	0.051	0.22	0.055	0.22	0.055	0.22	0.055	0.0028	0.00069	-	-	6.53E-04	1.63E-04	-	-	-	-	2.86E-04	7.16E-05	2.00E-04	4.99E-05	8.26E-04	2.07E-04	882.37	0.036	0.0072	885.39
PPG-1, 3, 4, 7, 8, 11-15	499.70	56.20	257.13	37.39	29.00	2.12	12.50	0.49	15.08	0.73	12.39	0.64	10.36	0.58	0.37	0.011	-	-	1.68E-01	5.04E-03	-	-	-	-	6.08E-02	1.82E-03	4.17E-02	1.25E-03	1.10E+01	2.56E-03	5,668.15	0.23	0.046	5,687.60
Total	**710.31**	**308.88**	**4,339.64**	**3,082.41**	**40.39**	**50.96**	**18.39**	**24.13**	**1,337.12**	**3,753.50**	**517.68**	**1,092.01**	**48.89**	**105.62**	**2.82**	**10.73**	**0.82**	**3.59**	**0.19**	**0.085**	**0.030**	**0.13**	**0.15**	**0.66**	**0.33**	**1.19**	**1.13**	**4.75**	**11.04**	**0.097**	**51,359.80**	**2.13**	**0.43**	**51,539.61**
Total w/o Fugitives[2]	**530.31**	**177.48**	**275.64**	**115.69**	**33.98**	**22.88**	**18.03**	**23.86**	**16.82**	**7.47**	**14.14**	**7.38**	**12.11**	**7.32**	**0.77**	**1.75**	**0.0050**	**0.022**	**0.18**	**0.048**	**0.030**	**0.13**	**0.15**	**0.66**	**0.16**	**0.45**	**0.066**	**0.11**	**11.04**	**0.097**	**23,907.09**	**1.01**	**0.20**	**23,992.69**

Footnotes:

[1] These two boilers share a common stack.

[2] Fugitive emissions do not count towards the TV and PSD applicability of the facility; therefore, they are not included in the permittable limit.

Freeport-McMoRan Tyrone Inc.
Blasting Emissions

Table 1: Input Parameters

Maximum Blasting Operational Scenario[a]	800,000	lbs blasting agent/day	*See Table 3 below*
	125,000	ft^2 blast area/blast	*See Table 3 below*
	365	days/yr	
	200,000	lbs blasting agent/blast event	*See Table 3 below*
	146,000	tons blasting agent/year	
Maximum Diesel Fuel in Blasting Agent	6%	blasting agent fuel oil %	
	6.5	lb/gal density	
	0.138	MMBtu/gal	*40 CFR 98, Subpart C, Table C–1 (default HHV for GHG calculations)*
	7,385	gal/day	
	1,846	gal/blast event	
	2,695,385	gal/yr	

Footnotes:

[a] Based on both pits within a scenario operating during the day.

Table 2: Maximum Emissions from Blasting

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Reference	Maximum Operational Scenario[a] Potential Emission Rates (lb/hr)	(lb/day)	(ton/yr)	
Uncontrolled and Controlled[b]							
NO_x	1.8	lb/ton blasting agent	1	180.00	720.00	131.40	
CO	40.64	lb/ton blasting agent	2	4,064.00	16,256.00	2,966.72	
SO_2	0.0036	lb/ton blasting agent	3	0.36	1.44	0.26	
TSP	618.72	lb/blast event	4	618.72	2,474.87	451.66	
PM_{10}	321.73	lb/blast event	4	321.73	1,286.93	234.87	
$PM_{2.5}$	18.56	lb/blast event	4	18.56	74.25	13.55	
CO_2	162.71	lb/MMBtu	5	41,454.01	165,816.04	30,261.43	27,452.71 metric tons/yr
N_2O	0.0013	lb/MMBtu	6	0.34	1.35	0.25	0.22 metric tons/yr
CH_4	0.0066	lb/MMBtu	6	1.68	6.73	1.23	1.11 metric tons/yr
CO_2e[c]	--	--	--	41,596.26	166,385.06	30,365.27	27,546.92 metric tons/yr

Emission Factor References:

1. NOx emission factor is the average of measurements from "NOx Emissions from Blasting Operations in Open-Cut Coal Mining" by Moetaz I. Attalla, Stuart J. Day, Tony Lange, William Lilley, and Scott Morgan (2008).
2. CO emission factor is the average of the measurements in "Factors Affecting Anfo Fumes Production" by James H. Rowland III and Richard Mainiero (2001).
3. SO_2 emission factor is based on a stoichiometric conversion of all the sulfur in the diesel fuel in ANFO to SO_2. The conversion was based on 6% fuel oil in the blasting agent and a diesel fuel sulfur content of 15 ppm.
4. PM emission factors are based on emission factors from AP-42, Chapter 11.9, Table 11.9-1 (July 1998).
5. CO_2 emission factor is based on 40 CFR 98 Subpart C, Table C–1 for Distillate Fuel Oil No. 2. The emission factor is converted from kg/MMBtu to lb/MMBtu using a conversion factor of 2.2 lb/kg
6. N_2O and CH_4 emission factors are based on 40 CFR 98 Subpart C, Table C–2 for Petroleum Products. The emission factors are converted from kg/MMBtu to lb/MMBtu using a conversion factor of 2.2 lb/kg.

Footnotes:

[a] Because only one pit can be blasted in an hour, the maximum hourly emissions are based on the maximum emissions at an individual pit; whereas the maximum daily and annual emissions are based on the maximum of the sum of both pits operating within each scenario.

[b] For blasting, uncontrolled emissions equal controlled emissions because no additional control measures are applied during blasting.

[c] Calculated based on a Global Warming Potentail (GWP) of 1 for CO_2, 298 for N_2O, and 25 for CH_4 as per 40 CFR 98, Table A-1.

Table 3: Proposed Mining Scenarios

Operating Scenario	Pit Name	Maximum Blasting Agent Usage per Blast (lbs/blast)	Maximum No. of Blasts per Day	Maximum Daily Blasting Agent Usage (lbs/day)	Maximum Blast Area per Blast (ft^2/blast)
8, 9, 10	Emma	200,000	2	400,000	125,000
8	Burro Chief	200,000	2	400,000	125,000
9	Little Rock 6	100,000	1	100,000	125,000
10	Mohawk	150,000	2	300,000	125,000

Scenarios 8 through 10 are being proposed in addition to the M5 and M6 scenarios as potential operating scenarios. None of the scenarios can operate simultaneously.

Table 4: Scenario-Specific Blasting Emission Rates

Mining Area	NOx			CO			SO_2			TSP			PM_{10}			$PM_{2.5}$		
	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)
Scenario 8																		
Emma	180.00	360.00	65.70	4,064.00	8,128.00	1,483.36	0.36	0.72	0.13	618.72	1,237.44	225.83	321.73	643.47	117.43	18.56	37.12	6.77
Burro Chief	180.00	360.00	65.70	4,064.00	8,128.00	1,483.36	0.36	0.72	0.13	618.72	1,237.44	225.83	321.73	643.47	117.43	18.56	37.12	6.77
Scenario 9																		
Emma	180.00	360.00	65.70	4,064.00	8,128.00	1,483.36	0.36	0.72	0.13	618.72	1,237.44	225.83	321.73	643.47	117.43	18.56	37.12	6.77
Little Rock 6	90.00	90.00	16.43	2,032.00	2,032.00	370.84	0.18	0.18	0.03	618.72	618.72	112.92	321.73	321.73	58.72	18.56	18.56	3.39
Scenario 10																		
Emma	180.00	360.00	65.70	4,064.00	8,128.00	1,483.36	0.36	0.72	0.13	618.72	1,237.44	225.83	321.73	643.47	117.43	18.56	37.12	6.77
Mohawk	135.00	270.00	49.28	3,048.00	6,096.00	1,112.52	0.27	0.54	0.10	618.72	1,237.44	225.83	321.73	643.47	117.43	18.56	37.12	6.77

Freeport-McMoRan Tyrone Inc.
Mining Material Handling Emissions

Table 1: Input Parameters

Uncontrolled Emission Factors	PM_{10}	1.60E-05	lb/ton[1]
	Ratio of $PM_{2.5}$ / PM_{10}	0.15	[2]
	$PM_{2.5}$	2.40E-06	lb/ton[2]
	Ratio of TSP / PM_{10}	2.61	[3]
	TSP	4.18E-05	lb/ton[3]
Hours of Operation	24	hours/day	
	365	days/year	
	8,760	hours/year	

Footnotes:

[1] The PM_{10} emission factor is based on AP-42, Chapter 11.19.2, Table 11.19.2-2 Crushed Stone Processing Operations (August 2004) for Truck Unloading - Fragmented Stone. The Truck Unloading emission factor is used for truck loading and truck unloading since the quantity of emissions from unloading would essentially be the same as loading. No TSP or $PM_{2.5}$ emission factors for Truck Unloading are provided in the AP-42 table.

[2] The $PM_{2.5}$ emission factor was calculated from the available PM_{10} emission factor using the ratio of 0.15 $PM_{2.5}$ / PM_{10} as recommended in the AP-42 *Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors* (November 2006).

[3] An uncontrolled TSP emission factor was calculated based on an average of the TSP/PM_{10} ratios using the available uncontrolled emission factors in AP-42 Table 11.19.2-2. The associated ratios are: Tertiary Crushing (0.0054/0.0024 = 2.25); Fines Crushing (0.0390/0.0150 = 2.60); Screening (0.025/0.0087 = 2.87; and Conveyor Transfer Point (0.0030/0.00110 = 2.73). The average of these ratios is 2.61.

Table 2: Maximum Emissions from Mine Material Handling

Pollutant	**Maximum Operational Scenario Potential Emission Rates[1]**		
	(lb/hr)	**(lb/day)**	**(ton/yr)**
Uncontrolled and Controlled[2]			
TSP	0.70	33.41	6.10
PM_{10}	0.27	12.80	2.34
$PM_{2.5}$	0.040	1.92	0.35

Footnotes:

[1] Because only one pit can be blasted in an hour, the maximum hourly emissions are based on the maximum emissions at an individual pit; whereas the maximum daily and annual emissions are based on the maximum of the sum of both pits operating within each scenario.

[2] Uncontrolled emissions equal controlled emissions for these activities.

Table 3: Proposed Mining Scenarios

Operating Scenario	**Pit Name**	**Maximum Mining Rates (tons/day)**	**No. of Handling Steps[1]**
8, 9, 10	Emma	200,000	2
8	Burro Chief	200,000	2
9	Little Rock 6	90,000	2
10	Mohawk	200,000	2

Scenarios 8 through 10 are being proposed in addition to the M5 and M6 scenarios as potential operating scenarios. None of the scenarios can operate simultaneously.

Footnotes:

[1] The handling instances consists of truck loading at the pit and truck unloading at the waste or leach stockpile.

Table 4: Scenario-Specific Mining Material Handling Emission Rates

Mining Area *(Material Origination)*	Worst-Case Stockpiles in the Model *(Material Destination)*	Maximum Mining Rates (tons/day)	No. of Handling Steps[1]	Maximum Hourly Emission Rates (lb/hr)[2]			Maximum Daily Emission Rates (lb/day)[2]			Maximum Annual Emission Rates (ton/yr)[2]		
				TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Scenario 8												
Emma	6DO	200,000	2	0.70	0.27	0.040	16.70	6.40	0.96	3.05	1.17	0.18
Burro Chief	5AW	200,000	2	0.70	0.27	0.040	16.70	6.40	0.96	3.05	1.17	0.175
Scenario 9												
Emma	GEO	200,000	2	0.70	0.27	0.040	16.70	6.40	0.96	3.05	1.17	0.18
Little Rock 6	4CO	90,000	2	0.31	0.12	0.018	7.52	2.88	0.43	1.37	0.53	0.079
Scenario 10												
Emma	1BO	200,000	2	0.70	0.27	0.040	16.70	6.40	0.96	3.05	1.17	0.18
Mohawk	6AO	200,000	2	0.70	0.27	0.040	16.70	6.40	0.96	3.05	1.17	0.18

Footnotes:

[1] The handling steps consist of truck loading at the pit and truck unloading at the waste or leach stockpile.

[2] Uncontrolled emissions equal controlled emissions for these activities.

Table 1: Input Parameters

Mining Haul Truck Inputs	**Truck Type**		**Large (Cat 793)**	
	Empty Vehicle Weight (tons)		170.6	
	Max Load Capacity (tons)		297.0	
	Full Vehicle Weight (tons)		467.6	
	Average Vehicle Weight (tons)[1]		319.1	
Mining Haul Road Inputs	Silt Content (%)		4.8	
	Control Efficiency (%)[2]		88.8	
	No. of Precip. Days, P[3]		70	
	Hours of Operation (hrs/day)		24	
	Hours of Operation (days/yr)		365	
	Hours of Operation (hrs/yr)		8,760	
Emission Factor Equation Inputs[4]	**Constant**	**TSP**	**PM_{10}**	**$PM_{2.5}$**
	k (lb/VMT)	4.9	1.5	0.15
	a	0.7	0.9	0.9
	b	0.45	0.45	0.45
Calculated Emission Factors	**Pollutant**	**Uncontrolled**	**Controlled**	
	TSP (lb/VMT)	21.07	2.36	
	PM_{10} (lb/VMT)	5.37	0.60	
	$PM_{2.5}$ (lb/VMT)	0.54	0.060	

Footnotes:

[1] AP-42 13.2.2 (Unpaved Roads) Equation 1a is applicable to industrial roads with a mean vehicle weight from 2 to 290 tons. The Average Vehicle Weight is based on the haul trucks being full traveling in one direction and being empty traveling in the other direction.

[2] The combined control efficiency of 88.8% is based on 80% control for base course and watering (NMED guidance, January 1, 2017) and 44% control for an average speed of 25 mph (WRAP Fugitive Dust Handbook, September 7, 2006).

[3] This refers to the number of days in a year with at least 0.01 inches of precipitation and is based on Figure 13.2.2-1 in AP-42. This factor is only taken into account in the annual emissions calculation.

[4] These emission equation constants are provided in Table 13.2.2-2 in AP-42 for Industrial Roads (Equation 1a).

Table 2: Maximum Emissions from Mine Hauling

Pollutant	**<u>Maximum</u> Operational Scenario Potential Emission Rates[1]**		
	(lb/hr)	**(lb/day)**	**(ton/yr)**
Uncontrolled			
TSP	3,596.43	136,762.88	20,172.52
PM_{10}	916.60	34,855.83	5,141.23
$PM_{2.5}$	91.66	3,485.58	514.12
Controlled			
TSP	402.80	15,317.44	2,259.32
PM_{10}	102.66	3,903.85	575.82
$PM_{2.5}$	10.27	390.39	57.58

Footnotes:

[1] Because only one pit can be blasted in an hour, the maximum hourly emissions are based on the maximum emissions at an individual pit; whereas the maximum daily and annual emissions are based on the maximum of the sum of both pits operating within each scenario.

Table 3: Scenario-Specific Mine Hauling Uncontrolled Emission Rates

Mining Area *(Material Origination)*	Worst-Case Stockpiles in the Model *(Material Destination)*	Worst-Case Haul Roads in the Model	Total Length of Worst-Case Roads (ft, one-way)	Maximum Haulage Rate (tons/day)	Max No. of Trips/Day	Max No. of Trips/Hour	VMT/hr*	Maximum Uncontrolled Hourly Emission Rates (lb/hr)			Maximum Uncontrolled Daily Emission Rates (lb/day)			Maximum Uncontrolled Annual Emission Rates (ton/yr)		
								TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Scenario 8																
Emma	6DO	27, 27A, 27B	9,386	200,000	673.4	28.1	99.8	2,102.0	535.7	53.6	50,449	12,857	1,286	7,441.2	1,896.5	189.6
Burro Chief	5AW	6, 7, 11E, 11F, 12B, 30A, 30B	16,060	200,000	673.4	28.1	170.7	3,596.4	916.6	91.7	86,314	21,998	2,200	12,731.4	3,244.8	324.5
Scenario 9																
Emma	GEO	25A, 27, 27B	6,888	200,000	673.4	28.1	73.2	1,542.5	393.1	39.3	37,019	9,435	943	5,460.3	1,391.6	139.2
Little Rock 6	4CO	16A, 18, 18C, 18D, 18E, 18G, 18I, 18J	27,158	90,000	303.0	12.6	62.5	1,317.9	335.9	33.6	31,630	8,061	806	4,665.4	1,189.0	118.9
Scenario 10																
Emma	1BO	25A, 25B, 27, 27B	8,317	200,000	673.4	28.1	88.4	1,862.5	474.7	47.5	44,700	11,392	1,139	6,593.3	1,680.4	168.0
Mohawk	6AO	8, 11C, 11E, 11F, 12B	9,080	200,000	303.0	12.6	62.5	1,317.9	335.9	33.6	31,630	8,061	806	4,665.4	1,189.0	118.9

Table 4: Scenario-Specific Mine Hauling Controlled Emission Rates

Mining Area *(Material Origination)*	Worst-Case Stockpiles in the Model *(Material Destination)*	Worst-Case Haul Roads in the Model	Total Length of Worst-Case Roads (ft, one-way)	Maximum Haulage Rate (tons/day)	Max No. of Trips/Day	Max No. of Trips/Hour	VMT/hr*	Maximum Controlled Hourly Emission Rates (lb/hr)			Maximum Controlled Daily Emission Rates (lb/day)			Maximum Controlled Annual Emission Rates (ton/yr)		
								TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Scenario 8																
Emma	6DO	27, 27A, 27B	9,386	200,000	673.4	28.1	99.8	235.4	60.0	6.0	5,650	1,440	144	833.4	212.4	21.2
Burro Chief	5AW	6, 7, 11E, 11F, 12B, 30A, 30B	16,060	200,000	673.4	28.1	170.7	402.8	102.7	10.3	9,667	2,464	246	1,425.9	363.4	36.3
Scenario 9																
Emma	GEO	25A, 27, 27B	6,888	200,000	673.4	28.1	73.2	172.8	44.0	4.4	4,146	1,057	106	611.6	155.9	15.6
Little Rock 6	4CO	16A, 18, 18C, 18D, 18E, 18G, 18I, 18J	27,158	90,000	303.0	12.6	62.5	147.6	37.6	3.8	3,543	903	90	522.5	133.2	13.3
Scenario 10																
Emma	1BO	25A, 25B, 27, 27B	8,317	200,000	673.4	28.1	88.4	208.6	53.2	5.3	5,006	1,276	128	738.4	188.2	18.8
Mohawk	6AO	8, 11C, 11E, 11F, 12B	9,080	200,000	303.0	12.6	62.5	147.6	37.6	3.8	3,543	903	90	522.5	133.2	13.3

Table 5: Individual Mining Haul Road Uncontrolled Emissions

Haul Road	Total Length of Road (ft, one-way)	Max Haulage Rate (tons/day)	Max No. of Trips/Day	Max No. of Trips/Hour	VMT/hr*	Uncontrolled Hourly Emission Rates (lb/hr)			Uncontrolled Daily Emission Rates (lb/day)			Uncontrolled Annual Emission Rates (ton/yr)		
						TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Road4	2,809	200,000	673.4	28.1	29.9	629.1	160.3	16.0	15,098	3,848	385	2,226.9	567.6	56.8
Road4A	885	200,000	673.4	28.1	9.4	198.1	50.5	5.0	4,754	1,212	121	701.2	178.7	17.9
Road5A	6,321	200,000	673.4	28.1	67.2	1,415.6	360.8	36.1	33,974	8,659	866	5,011.1	1,277.2	127.7
Road5B	3,501	200,000	673.4	28.1	37.2	783.9	199.8	20.0	18,815	4,795	480	2,775.2	707.3	70.7
Road5C	3,320	200,000	673.4	28.1	35.3	743.5	189.5	18.9	17,843	4,548	455	2,631.8	670.8	67.1
Road6	2,927	200,000	673.4	28.1	31.1	655.4	167.0	16.7	15,731	4,009	401	2,320.3	591.3	59.1
Road7	3,729	200,000	673.4	28.1	39.6	835.2	212.8	21.3	20,044	5,108	511	2,956.4	753.5	75.3
Road8	1,255	200,000	673.4	28.1	13.3	281.0	71.6	7.2	6,745	1,719	172	994.8	253.5	25.4
Road9	4,112	200,000	673.4	28.1	43.7	920.9	234.7	23.5	22,101	5,633	563	3,260.0	830.8	83.1
Road10	6,905	200,000	673.4	28.1	73.4	1,546.3	394.1	39.4	37,111	9,458	946	5,473.8	1,395.1	139.5
Road11	3,625	200,000	673.4	28.1	38.5	811.8	206.9	20.7	19,483	4,965	497	2,873.7	732.4	73.2
Road11A	714	200,000	673.4	28.1	7.6	159.8	40.7	4.1	3,835	977	98	565.7	144.2	14.4
Road11B2	1,306	200,000	673.4	28.1	13.9	292.6	74.6	7.5	7,022	1,790	179	1,035.7	264.0	26.4
Road11C	3,010	200,000	673.4	28.1	32.0	674.2	171.8	17.2	16,180	4,124	412	2,386.6	608.3	60.8
Road11D	1,683	200,000	673.4	28.1	17.9	377.0	96.1	9.6	9,048	2,306	231	1,334.5	340.1	34.0
Road11E	1,191	200,000	673.4	28.1	12.7	266.7	68.0	6.8	6,401	1,631	163	944.1	240.6	24.1
Road11F	1,158	200,000	673.4	28.1	12.3	259.3	66.1	6.6	6,223	1,586	159	917.9	233.9	23.4
Road11G	1,847	200,000	673.4	28.1	19.6	413.6	105.4	10.5	9,927	2,530	253	1,464.3	373.2	37.3
Road12B	2,466	200,000	673.4	28.1	26.2	552.1	140.7	14.1	13,251	3,377	338	1,954.6	498.1	49.8
Road13	2,905	200,000	673.4	28.1	30.9	650.6	165.8	16.6	15,614	3,979	398	2,303.1	587.0	58.7
Road13A	4,311	200,000	673.4	28.1	45.8	965.3	246.0	24.6	23,168	5,905	590	3,417.3	870.9	87.1
Road13B	1,533	200,000	673.4	28.1	16.3	343.3	87.5	8.7	8,238	2,100	210	1,215.1	309.7	31.0
Road15	2,689	200,000	673.4	28.1	28.6	602.2	153.5	15.3	14,454	3,684	368	2,132.0	543.4	54.3
Road16A	6,397	200,000	673.4	28.1	68.0	1,432.5	365.1	36.5	34,379	8,762	876	5,071.0	1,292.4	129.2
Road16B	1,587	200,000	673.4	28.1	16.9	355.3	90.6	9.1	8,527	2,173	217	1,257.8	320.6	32.1
Road17	3,498	200,000	673.4	28.1	37.2	783.4	199.7	20.0	18,802	4,792	479	2,773.3	706.8	70.7
Road18	8,193	200,000	673.4	28.1	87.1	1,834.8	467.6	46.8	44,035	11,223	1,122	6,495.2	1,655.4	165.5
Road18C	1,083	200,000	673.4	28.1	11.5	242.5	61.8	6.2	5,821	1,483	148	858.6	218.8	21.9
Road18D	3,290	90,000	303.0	12.6	15.7	331.5	84.5	8.4	7,957	2,028	203	1,173.7	299.1	29.9
Road18E	5,156	90,000	303.0	12.6	24.7	519.6	132.4	13.2	12,471	3,178	318	1,839.4	468.8	46.9
Road18F	917	200,000	673.4	28.1	9.7	205.4	52.4	5.2	4,930	1,257	126	727.2	185.3	18.5
Road18G	1,030	90,000	303.0	12.6	4.9	103.8	26.5	2.6	2,492	635	64	367.5	93.7	9.4
Road18H	4,052	80,000	269.4	11.2	17.2	362.9	92.5	9.3	8,711	2,220	222	1,284.8	327.5	32.7
Road18I	512	200,000	673.4	28.1	5.4	114.7	29.2	2.9	2,753	702	70	406.0	103.5	10.3
Road18J	1,497	200,000	673.4	28.1	15.9	335.3	85.4	8.5	8,046	2,051	205	1,186.8	302.5	30.2
Road19	6,258	200,000	673.4	28.1	66.5	1,401.3	357.1	35.7	33,632	8,571	857	4,960.7	1,264.3	126.4
Road19B	5,724	200,000	673.4	28.1	60.8	1,281.9	326.7	32.7	30,765	7,841	784	4,537.8	1,156.5	115.7
Road20	5,737	200,000	673.4	28.1	61.0	1,284.6	327.4	32.7	30,832	7,858	786	4,547.7	1,159.0	115.9
Road20A	1,107	200,000	673.4	28.1	11.8	247.9	63.2	6.3	5,949	1,516	152	877.5	223.7	22.4
Road21	6,121	200,000	673.4	28.1	65.1	1,370.8	349.4	34.9	32,900	8,385	838	4,852.7	1,236.8	123.7
Road22	3,001	200,000	673.4	28.1	31.9	672.0	171.3	17.1	16,129	4,111	411	2,379.0	606.3	60.6
Road23	1,910	200,000	673.4	28.1	20.3	427.8	109.0	10.9	10,266	2,616	262	1,514.2	385.9	38.6
Road25A	3,028	200,000	673.4	28.1	32.2	678.1	172.8	17.3	16,275	4,148	415	2,400.6	611.8	61.2
Road25B	1,429	200,000	673.4	28.1	15.2	320.0	81.6	8.2	7,681	1,958	196	1,132.9	288.7	28.9
Road26	1,995	200,000	673.4	28.1	21.2	446.8	113.9	11.4	10,723	2,733	273	1,581.6	403.1	40.3
Road26A	5,535	200,000	673.4	28.1	58.8	1,239.6	315.9	31.6	29,751	7,582	758	4,388.2	1,118.4	111.8
Road26B	2,301	200,000	673.4	28.1	24.5	515.2	131.3	13.1	12,364	3,151	315	1,823.7	464.8	46.5
Road26C	1,560	200,000	673.4	28.1	16.6	349.4	89.0	8.9	8,385	2,137	214	1,236.7	315.2	31.5
Road26D	1,902	200,000	673.4	28.1	20.2	425.9	108.5	10.9	10,222	2,605	261	1,507.7	384.3	38.4
Road27	2,637	200,000	673.4	28.1	28.0	590.6	150.5	15.1	14,175	3,613	361	2,090.9	532.9	53.3
Road27A	5,527	200,000	673.4	28.1	58.7	1,237.7	315.4	31.5	29,705	7,571	757	4,381.5	1,116.7	111.7
Road27B	1,222	200,000	673.4	28.1	13.0	273.7	69.8	7.0	6,568	1,674	167	968.8	246.9	24.7
Road27C	1,565	200,000	673.4	28.1	16.6	350.5	89.3	8.9	8,411	2,144	214	1,240.6	316.2	31.6
Road28	7,518	200,000	673.4	28.1	79.9	1,683.5	429.1	42.9	40,405	10,298	1,030	5,959.7	1,518.9	151.9
Road30	5,493	200,000	673.4	28.1	58.4	1,230.1	313.5	31.4	29,523	7,524	752	4,354.7	1,109.8	111.0
Road30A	1,895	200,000	673.4	28.1	20.1	424.3	108.1	10.8	10,183	2,595	260	1,502.0	382.8	38.3
Road30B	2,695	200,000	673.4	28.1	28.6	603.4	153.8	15.4	14,482	3,691	369	2,136.1	544.4	54.4
Road30C	518	200,000	673.4	28.1	5.5	116.1	29.6	3.0	2,786	710	71	410.9	104.7	10.5

Table 6: Individual Mining Haul Road Controlled Emissions

Haul Road	Total Length of Road (ft, one-way)	Max Haulage Rate (tons/day)	Max No. of Trips/Day	Max No. of Trips/Hour	VMT/hr*	Controlled Hourly Emission Rates (lb/hr)			Controlled Daily Emission Rates (lb/day)			Controlled Annual Emission Rates (ton/yr)		
						TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Road4	2,809	200,000	673.4	28.1	29.9	70.5	18.0	1.8	1,691	431	43	249.4	63.6	6.4
Road4A	885	200,000	673.4	28.1	9.4	22.2	5.7	0.6	532	136	14	78.5	20.0	2.0
Road5A	6,321	200,000	673.4	28.1	67.2	158.5	40.4	4.0	3,805	970	97	561.2	143.0	14.3
Road5B	3,501	200,000	673.4	28.1	37.2	87.8	22.4	2.2	2,107	537	54	310.8	79.2	7.9
Road5C	3,320	200,000	673.4	28.1	35.3	83.3	21.2	2.1	1,998	509	51	294.8	75.1	7.5
Road6	2,927	200,000	673.4	28.1	31.1	73.4	18.7	1.9	1,762	449	45	259.9	66.2	6.6
Road7	3,729	200,000	673.4	28.1	39.6	93.5	23.8	2.4	2,245	572	57	331.1	84.4	8.4
Road8	1,255	200,000	673.4	28.1	13.3	31.5	8.0	0.8	755	193	19	111.4	28.4	2.8
Road9	4,112	200,000	673.4	28.1	43.7	103.1	26.3	2.6	2,475	631	63	365.1	93.1	9.3
Road10	6,905	200,000	673.4	28.1	73.4	173.2	44.1	4.4	4,156	1,059	106	613.1	156.2	15.6
Road11	3,625	200,000	673.4	28.1	38.5	90.9	23.2	2.3	2,182	556	56	321.9	82.0	8.2
Road11A	714	200,000	673.4	28.1	7.6	17.9	4.6	0.5	430	109	11	63.4	16.1	1.6
Road11B2	1,306	200,000	673.4	28.1	13.9	32.8	8.4	0.8	786	200	20	116.0	29.6	3.0
Road11C	3,010	200,000	673.4	28.1	32.0	75.5	19.2	1.9	1,812	462	46	267.3	68.1	6.8
Road11D	1,683	200,000	673.4	28.1	17.9	42.2	10.8	1.1	1,013	258	26	149.5	38.1	3.8
Road11E	1,191	200,000	673.4	28.1	12.7	29.9	7.6	0.8	717	183	18	105.7	26.9	2.7
Road11F	1,158	200,000	673.4	28.1	12.3	29.0	7.4	0.7	697	178	18	102.8	26.2	2.6
Road11G	1,847	200,000	673.4	28.1	19.6	46.3	11.8	1.2	1,112	283	28	164.0	41.8	4.2
Road12B	2,466	200,000	673.4	28.1	26.2	61.8	15.8	1.6	1,484	378	38	218.9	55.8	5.6
Road13	2,905	200,000	673.4	28.1	30.9	72.9	18.6	1.9	1,749	446	45	257.9	65.7	6.6
Road13A	4,311	200,000	673.4	28.1	45.8	108.1	27.6	2.8	2,595	661	66	382.7	97.5	9.8
Road13B	1,533	200,000	673.4	28.1	16.3	38.4	9.8	1.0	923	235	24	136.1	34.7	3.5
Road15	2,689	200,000	673.4	28.1	28.6	67.5	17.2	1.7	1,619	413	41	238.8	60.9	6.1
Road16A	6,397	200,000	673.4	28.1	68.0	160.4	40.9	4.1	3,850	981	98	567.9	144.7	14.5
Road16B	1,587	200,000	673.4	28.1	16.9	39.8	10.1	1.0	955	243	24	140.9	35.9	3.6
Road17	3,498	200,000	673.4	28.1	37.2	87.7	22.4	2.2	2,106	537	54	310.6	79.2	7.9
Road18	8,193	200,000	673.4	28.1	87.1	205.5	52.4	5.2	4,932	1,257	126	727.5	185.4	18.5
Road18C	1,083	200,000	673.4	28.1	11.5	27.2	6.9	0.7	652	166	17	96.2	24.5	2.5
Road18D	3,290	90,000	303.0	12.6	15.7	37.1	9.5	0.9	891	227	23	131.5	33.5	3.4
Road18E	5,156	90,000	303.0	12.6	24.7	58.2	14.8	1.5	1,397	356	36	206.0	52.5	5.3
Road18F	917	200,000	673.4	28.1	9.7	23.0	5.9	0.6	552	141	14	81.4	20.8	2.1
Road18G	1,030	90,000	303.0	12.6	4.9	11.6	3.0	0.3	279	71	7	41.2	10.5	1.0
Road18H	4,052	80,000	269.4	11.2	17.2	40.7	10.4	1.0	976	249	25	143.9	36.7	3.7
Road18I	512	200,000	673.4	28.1	5.4	12.8	3.3	0.3	308	79	8	45.5	11.6	1.2
Road18J	1,497	200,000	673.4	28.1	15.9	37.5	9.6	1.0	901	230	23	132.9	33.9	3.4
Road19	6,258	200,000	673.4	28.1	66.5	156.9	40.0	4.0	3,767	960	96	555.6	141.6	14.2
Road19B	5,724	200,000	673.4	28.1	60.8	143.6	36.6	3.7	3,446	878	88	508.2	129.5	13.0
Road20	5,737	200,000	673.4	28.1	61.0	143.9	36.7	3.7	3,453	880	88	509.3	129.8	13.0
Road20A	1,107	200,000	673.4	28.1	11.8	27.8	7.1	0.7	666	170	17	98.3	25.0	2.5
Road21	6,121	200,000	673.4	28.1	65.1	153.5	39.1	3.9	3,685	939	94	543.5	138.5	13.9
Road22	3,001	200,000	673.4	28.1	31.9	75.3	19.2	1.9	1,806	460	46	266.5	67.9	6.8
Road23	1,910	200,000	673.4	28.1	20.3	47.9	12.2	1.2	1,150	293	29	169.6	43.2	4.3
Road25A	3,028	200,000	673.4	28.1	32.2	76.0	19.4	1.9	1,823	465	46	268.9	68.5	6.9
Road25B	1,429	200,000	673.4	28.1	15.2	35.8	9.1	0.9	860	219	22	126.9	32.3	3.2
Road26	1,995	200,000	673.4	28.1	21.2	50.0	12.8	1.3	1,201	306	31	177.1	45.1	4.5
Road26A	5,535	200,000	673.4	28.1	58.8	138.8	35.4	3.5	3,332	849	85	491.5	125.3	12.5
Road26B	2,301	200,000	673.4	28.1	24.5	57.7	14.7	1.5	1,385	353	35	204.3	52.1	5.2
Road26C	1,560	200,000	673.4	28.1	16.6	39.1	10.0	1.0	939	239	24	138.5	35.3	3.5
Road26D	1,902	200,000	673.4	28.1	20.2	47.7	12.2	1.2	1,145	292	29	168.9	43.0	4.3
Road27	2,637	200,000	673.4	28.1	28.0	66.2	16.9	1.7	1,588	405	40	234.2	59.7	6.0
Road27A	5,527	200,000	673.4	28.1	58.7	138.6	35.3	3.5	3,327	848	85	490.7	125.1	12.5
Road27B	1,222	200,000	673.4	28.1	13.0	30.7	7.8	0.8	736	187	19	108.5	27.7	2.8
Road27C	1,565	200,000	673.4	28.1	16.6	39.3	10.0	1.0	942	240	24	139.0	35.4	3.5
Road28	7,518	200,000	673.4	28.1	79.9	188.6	48.1	4.8	4,525	1,153	115	667.5	170.1	17.0
Road30	5,493	200,000	673.4	28.1	58.4	137.8	35.1	3.5	3,307	843	84	487.7	124.3	12.4
Road30A	1,895	200,000	673.4	28.1	20.1	47.5	12.1	1.2	1,141	291	29	168.2	42.9	4.3
Road30B	2,695	200,000	673.4	28.1	28.6	67.6	17.2	1.7	1,622	413	41	239.2	61.0	6.1
Road30C	518	200,000	673.4	28.1	5.5	13.0	3.3	0.3	312	80	8	46.0	11.7	1.2

Table 1: Input Parameters

Uncontrolled Emission Factors	PM_{10}	1.60E-05	lb/ton[1]
	Ratio of $PM_{2.5}$ / PM_{10}	0.15	[2]
	$PM_{2.5}$	2.40E-06	lb/ton[2]
	Ratio of TSP / PM_{10}	2.61	[3]
	TSP	4.18E-05	lb/ton[3]
Hours of Operation	24	hours/day	
	365	days/year	
	8,760	hours/year	

Footnotes:

[1] The PM_{10} emission factor is based on AP-42, Chapter 11.19.2, Table 11.19.2-2 Crushed Stone Processing Operations (August 2004) for Truck Unloading - Fragmented Stone. The Truck Unloading emission factor is used for truck loading and truck unloading since the quantity of emissions from unloading would essentially be the same as loading. No TSP or $PM_{2.5}$ emission factors for Truck Unloading are provided in the AP-42 table.

[2] The $PM_{2.5}$ emission factor was calculated from the available PM_{10} emission factor using the ratio of 0.15 $PM_{2.5}$ / PM_{10} as recommended in the AP-42 *Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors* (November 2006).

[3] An uncontrolled TSP emission factor was calculated based on an average of the TSP/PM_{10} ratios using the available uncontrolled emission factors in AP-42 Table 11.19.2-2. The associated ratios are: Tertiary Crushing (0.0054/0.0024 = 2.25); Fines Crushing (0.0390/0.0150 = 2.60); Screening (0.025/0.0087 = 2.87; and Conveyor Transfer Point (0.0030/0.00110 = 2.73). The average of these ratios is 2.61.

Table 2: Maximum Emissions from Reclamation Material Handling

Pollutant	Maximum Operational Scenario Potential Emission Rates[1] (lb/hr)	(lb/day)	(ton/yr)
Uncontrolled and Controlled[2]			
TSP	0.12	2.92	0.53
PM_{10}	0.047	1.12	0.20
$PM_{2.5}$	0.0070	0.17	0.031

Footnotes:

[1] The maximum emissions are based on the maximum of the sum of both reclamation areas operating within each active mining scenario.

[2] Uncontrolled emissions equal controlled emissions for these activities.

Table 3: Scenario-Specific Reclamation Material Handling Emission Rates

Reclamation Area	Maximum Reclamation Rates (tons/day)	No. of Handling Instances[1]	Maximum Hourly Emission Rates (lb/hr)[2]			Maximum Daily Emission Rates (lb/day)[2]			Maximum Annual Emission Rates (ton/yr)[2]		
			TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Scenario 2 - Mohawk + Copper Mountain											
P-Plant	15,000	2	0.052	0.020	0.0030	1.25	0.48	0.072	0.23	0.088	0.013
2A/2B Stockpile	20,000	2	0.070	0.027	0.0040	1.67	0.64	0.096	0.30	0.12	0.018
Scenario 3 - Mohawk + Little Rock 6											
1A/1B Stockpile	20,000	2	0.070	0.027	0.0040	1.67	0.64	0.096	0.30	0.12	0.018
Thickener	15,000	2	0.052	0.020	0.0030	1.25	0.48	0.072	0.23	0.09	0.013
Scenario 4 - Mohawk + Copper Leach											
1A/1B Stockpile	20,000	2	0.070	0.027	0.0040	1.67	0.64	0.096	0.30	0.12	0.018
Thickener	15,000	2	0.052	0.020	0.0030	1.25	0.48	0.072	0.23	0.09	0.013
Scenario 5 - Burro Chief + Little Rock 6											
Launder Line	5,000	2	0.017	0.007	0.0010	0.42	0.16	0.024	0.076	0.029	0.0044
2A/2B Stockpile	20,000	2	0.070	0.027	0.0040	1.67	0.64	0.096	0.30	0.12	0.018
Scenario 6 - Burro Chief + Copper Leach											
Launder Line	5,000	2	0.017	0.007	0.0010	0.42	0.16	0.024	0.076	0.029	0.0044
2A/2B Stockpile	20,000	2	0.070	0.027	0.0040	1.67	0.64	0.096	0.30	0.12	0.018
Scenario 7 - Mohawk + Burro Chief											
CLW Stockpile	15,000	2	0.052	0.020	0.0030	1.25	0.48	0.072	0.23	0.088	0.013
2A/2B Stockpile	20,000	2	0.070	0.027	0.0040	1.67	0.64	0.096	0.30	0.12	0.018

Footnotes:

[1] Handling instances consist of truck loading at the material origination location and truck unloading at the material destination location (i.e., the reclamation area).

[2] Uncontrolled emissions are equal to controlled emissions for these activities.

Table 4: Individual Reclamation Material Handling Emissions

Reclamation Area	Maximum Reclamation Rates (tons/day)	No. of Handling Instances[1]	Hourly Emission Rates (lb/hr)[2]			Daily Emission Rates (lb/day)[2]			Annual Emission Rates (ton/yr)[2]		
			TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Launder Line	5,000	2	0.017	0.007	0.0010	0.42	0.16	0.02	0.08	0.03	0.004
Thickener	15,000	2	0.052	0.020	0.0030	1.25	0.48	0.07	0.23	0.09	0.013
P-Plant	15,000	2	0.052	0.020	0.0030	1.25	0.48	0.07	0.23	0.09	0.013
1A/1B Stockpile	20,000	2	0.070	0.027	0.0040	1.67	0.64	0.10	0.30	0.12	0.018
2A/2B Stockpile	20,000	2	0.070	0.027	0.0040	1.67	0.64	0.10	0.30	0.12	0.018
CLW Stockpile	15,000	2	0.052	0.020	0.0030	1.25	0.48	0.07	0.23	0.09	0.013

Footnotes:

[1] Handling instances consist of truck loading at the material origination location and truck unloading at the reclamation area.

[2] Uncontrolled emissions are equal to controlled emissions for these activities.

Freeport-McMoRan Tyrone Inc.
Reclamation Haul Road Emissions

Table 1: Input Parameters

	Truck Type		Small Trucks[1]	Large Trucks	
Reclamation Haul Truck Inputs	Empty Vehicle Weight (tons)		33.0	170.6	
	Max Load Capacity (tons)		37.6	297.0	
	Full Vehicle Weight (tons)		68.5	467.6	
	Average Vehicle Weight (tons)[2]		50.7	319.1	
Reclamation Haul Road Inputs	Silt Content (%)		4.8		
	Control Efficiency (%)[3]		88.8		
	No. of Precip. Days, P[4]		70		
	Hours of Operation (hrs/day)		24		
	Hours of Operation (days/year)		365		
	Hours of Operation (hrs/yr)		8,760		
Emission Factor Equation Inputs[5]	**Constant**	**TSP**	**PM_{10}**	**$PM_{2.5}$**	
	k (lb/VMT)	4.9	1.5	0.15	
	a	0.7	0.9	0.9	
	b	0.45	0.45	0.45	
Calculated Emission Factors	**Pollutant**	**Small Trucks**		**Large Trucks**	
		Uncontrolled	**Controlled**	**Uncontrolled**	**Controlled**
	TSP (lb/VMT)	9.21	1.03	21.07	2.36
	PM_{10} (lb/VMT)	2.35	0.26	5.37	0.60
	$PM_{2.5}$ (lb/VMT)	0.23	0.026	0.54	0.060

Footnotes:

[1] Both Cat 730s and Cat 769s small vehicles can operate on the reclamation roads, so for the small vehicle routes, we are representing the emissions based on an average of the Cat 730 and Cat 769 specifications.

[2] The Average Vehicle Weight is based on the haul trucks being full traveling in one direction and being empty traveling in the other direction.

[3] The combined control efficiency of 88.8% is based on 80% control for base course and watering (NMED guidance, January 1, 2017) and 44% control for an average speed limit of 25 mph (WRAP Fugitive Dust Handbook, September 7, 2006).

[4] This refers to the number of days in a year with at least 0.01 inches of precipitation and is based on Figure 13.2.2-1 in AP-42. This factor is only taken into account in the annual emissions calculation.

[5] These emission equation constants are provided in Table 13.2.2-2 in AP-42 for Industrial Roads (Equation 1a).

Table 2: Maximum Emissions from Reclamation Hauling

Pollutant	**Maximum Operational Scenario Potential Emission Rates[1]**		
	(lb/hr)	**(lb/day)**	**(ton/yr)**
Uncontrolled			
TSP	2,485.50	59,651.99	8,798.67
PM_{10}	633.46	15,203.10	2,242.46
$PM_{2.5}$	63.35	1,520.31	224.25
Controlled			
TSP	278.38	6,681.02	985.45
PM_{10}	70.95	1,702.75	251.16
$PM_{2.5}$	7.09	170.27	25.12

Footnotes:

[1] The maximum emissions are based on the maximum of the sum of both reclamation areas operating within each active mining scenario.

Table 3: Scenario-Specific Reclamation Hauling Uncontrolled Emission Rates

Reclamation Area	Road Numbers	Total Length of Road (ft, one-way)	Vehicle Type on Reclamation Route	Maximum Reclamation Rates (tons/day)	Max No. of Trips/Day	Max No. of Trips/Hour	VMT/hr	Maximum Uncontrolled Hourly Emission Rates (lb/hr)[2]			Maximum Uncontrolled Daily Emission Rates (lb/day)[2]			Maximum Uncontrolled Annual Emission Rates (ton/yr)[2]		
								TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Scenario 2 - Mohawk + Copper Mountain																
P-Plant	RECPPR1,2,3	3,947	Small	15,000	398.9	16.6	24.9	228.9	58.3	5.8	5,494.4	1,400.3	140.0	810.4	206.5	20.7
2A/2B Stockpile	REC2ALR1,2	18,191	Large	20,000	67.3	2.8	19.3	407.4	103.8	10.4	9,776.9	2,491.8	249.2	1,442.1	367.5	36.8
Scenario 3 - Mohawk + Little Rock 6																
Thickener	RECTHR1,3	2,759	Small	15,000	398.9	16.6	17.4	160.0	40.8	4.1	3,840.5	978.8	97.9	566.5	144.4	14.4
1A/1B Stockpile	REC1ALR1	12,877	Large	20,000	67.3	2.8	13.7	288.4	73.5	7.3	6,920.8	1,763.9	176.4	1,020.8	260.2	26.0
Scenario 4 - Mohawk + Copper Leach																
Thickener	RECTHR1,3	2,759	Small	15,000	398.9	16.6	17.4	160.0	40.8	4.1	3,840.5	978.8	97.9	566.5	144.4	14.4
1A/1B Stockpile	REC1ALR1	12,877	Large	20,000	67.3	2.8	13.7	288.4	73.5	7.3	6,920.8	1,763.9	176.4	1,020.8	260.2	26.0
Scenario 5 - Burro Chief + Little Rock 6																
Launder Line	RECLLR1,2	23,261	Small	5,000	133.0	5.5	48.8	449.7	114.6	11.5	10,793.0	2,750.7	275.1	1,592.0	405.7	40.6
2A/2B Stockpile	REC2ALR1,2	18,191	Large	20,000	67.3	2.8	19.3	407.4	103.8	10.4	9,776.9	2,491.8	249.2	1,442.1	367.5	36.8
Scenario 6 - Burro Chief + Copper Leach																
Launder Line	RECLLR1,2	23,261	Small	5,000	133.0	5.5	48.8	449.7	114.6	11.5	10,793.0	2,750.7	275.1	1,592.0	405.7	40.6
2A/2B Stockpile	REC2ALR1,2	18,191	Large	20,000	67.3	2.8	19.3	407.4	103.8	10.4	9,776.9	2,491.8	249.2	1,442.1	367.5	36.8
Scenario 7 - Mohawk + Burro Chief																
CLW Stockpile	RECCLWR2,6	35,830	Small	15,000	398.9	16.6	225.6	2,078.1	529.6	53.0	49,875.1	12,711.3	1,271.1	7,356.6	1,874.9	187.5
2A/2B Stockpile	REC2ALR1,2	18,191	Large	20,000	67.3	2.8	19.3	407.4	103.8	10.4	9,776.9	2,491.8	249.2	1,442.1	367.5	36.8

Table 4: Scenario-Specific Reclamation Hauling Controlled Emission Rates

Reclamation Area	Road Numbers	Total Length of Road (ft, one-way)	Vehicle Type on Reclamation Route	Maximum Reclamation Rates (tons/day)	Max No. of Trips/Day	Max No. of Trips/Hour	VMT/hr	Maximum Controlled Hourly Emission Rates (lb/hr)[2]			Maximum Controlled Daily Emission Rates (lb/day)[2]			Maximum Controlled Annual Emission Rates (ton/yr)[2]		
								TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Scenario 2 - Mohawk + Copper Mountain																
P-Plant	RECPPR1,2,3	3,947	Small	15,000	398.9	16.6	24.9	25.6	6.5	0.7	615.4	156.8	15.7	90.8	23.1	2.3
2A/2B Stockpile	REC2ALR1,2	18,191	Large	20,000	67.3	2.8	19.3	45.6	11.6	1.2	1,095.0	279.1	27.9	161.5	41.2	4.1
Scenario 3 - Mohawk + Little Rock 6																
Thickener	RECTHR1,3	2,759	Small	15,000	398.9	16.6	17.4	17.9	4.6	0.5	430.1	109.6	11.0	63.4	16.2	1.6
1A/1B Stockpile	REC1ALR1	12,877	Large	20,000	67.3	2.8	13.7	32.3	8.2	0.8	775.1	197.6	19.8	114.3	29.1	2.9
Scenario 4 - Mohawk + Copper Leach																
Thickener	RECTHR1,3	2,759	Small	15,000	398.9	16.6	17.4	17.9	4.6	0.5	430.1	109.6	11.0	63.4	16.2	1.6
1A/1B Stockpile	REC1ALR1	12,877	Large	20,000	67.3	2.8	13.7	32.3	8.2	0.8	775.1	197.6	19.8	114.3	29.1	2.9
Scenario 5 - Burro Chief + Little Rock 6																
Launder Line	RECLLR1,2	23,261	Small	5,000	133.0	5.5	48.8	50.4	12.8	1.3	1,208.8	308.1	30.8	178.3	45.4	4.5
2A/2B Stockpile	REC2ALR1,2	18,191	Large	20,000	67.3	2.8	19.3	45.6	11.6	1.2	1,095.0	279.1	27.9	161.5	41.2	4.1
Scenario 6 - Burro Chief + Copper Leach																
Launder Line	RECLLR1,2	23,261	Small	5,000	133.0	5.5	48.8	50.4	12.8	1.3	1,208.8	308.1	30.8	178.3	45.4	4.5
2A/2B Stockpile	REC2ALR1,2	18,191	Large	20,000	67.3	2.8	19.3	45.6	11.6	1.2	1,095.0	279.1	27.9	161.5	41.2	4.1
Scenario 7 - Mohawk + Burro Chief																
CLW Stockpile	RECCLWR2,6	35,830	Small	15,000	398.9	16.6	225.6	232.8	59.3	5.9	5,586.0	1,423.7	142.4	823.9	210.0	21.0
2A/2B Stockpile	REC2ALR1,2	18,191	Large	20,000	67.3	2.8	19.3	45.6	11.6	1.2	1,095.0	279.1	27.9	161.5	41.2	4.1

Table 5: Individual Reclamation Haul Road Uncontrolled Emissions

Reclamation Area	Road Number	Total Length of Road (ft, one-way)	Vehicle Type on Reclamation Route	Maximum Reclamation Rates (tons/day)	Max No. of Trips/Day	Max No. of Trips/Hour	VMT/hr	Uncontrolled Hourly Emission Rates (lb/hr)			Uncontrolled Daily Emission Rates (lb/day)			Uncontrolled Annual Emission Rates (ton/yr)		
								TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Launder Line	RECLLR1,2	23,261	Small	5,000	133.0	5.5	48.8	449.7	114.6	11.5	10,793.0	2,750.7	275.1	1,592.0	405.7	40.6
	RECLLR1,3	52,068		5,000	133.0	5.5	109.3	1,006.6	256.6	25.7	24,159.2	6,157.3	615.7	3,563.5	908.2	90.8
Thickener	RECTHR1,2	14,271	Small	15,000	398.9	16.6	89.9	827.7	211.0	21.1	19,865.6	5,063.0	506.3	2,930.2	746.8	74.7
	RECTHR1,4	18,150		15,000	398.9	16.6	114.3	1,052.7	268.3	26.8	25,265.0	6,439.1	643.9	3,726.6	949.8	95.0
	RECTHR1,3	2,759		15,000	398.9	16.6	17.4	160.0	40.8	4.1	3,840.5	978.8	97.9	566.5	144.4	14.4
P-Plant	RECPPR1,2,3	3,947	Small	15,000	398.9	16.6	24.9	228.9	58.3	5.8	5,494.4	1,400.3	140.0	810.4	206.5	20.7
	RECPPR1,6,4,3	5,350		15,000	398.9	16.6	33.7	310.3	79.1	7.9	7,447.7	1,898.1	189.8	1,098.5	280.0	28.0
	RECPPR1,6,5	11,185		15,000	398.9	16.6	70.4	648.7	165.3	16.5	15,569.0	3,968.0	396.8	2,296.4	585.3	58.5
1A/1B Stockpile	REC1ALR1	12,877	Large	20,000	67.3	2.8	13.7	288.4	73.5	7.3	6,920.8	1,763.9	176.4	1,020.8	260.2	26.0
	REC1ASR1	7,849	Small (in-pit)	15,000	398.9	16.6	49.4	455.3	116.0	11.6	10,926.3	2,784.7	278.5	1,611.6	410.7	41.1
2A/2B Stockpile	REC2ALR1,3	8,099	Large	20,000	67.3	2.8	8.6	181.4	46.2	4.6	4,353.1	1,109.4	110.9	642.1	163.6	16.4
	REC2ALR1,2	18,191		20,000	67.3	2.8	19.3	407.4	103.8	10.4	9,776.9	2,491.8	249.2	1,442.1	367.5	36.8
	REC2ASR1,2	8,779	Small	15,000	398.9	16.6	55.3	509.2	129.8	13.0	12,219.7	3,114.3	311.4	1,802.4	459.4	45.9
	REC2ASR1,3	22,299		15,000	398.9	16.6	140.4	1,293.3	329.6	33.0	31,039.8	7,910.9	791.1	4,578.4	1,166.9	116.7
CLW Stockpile	RECCLWR1	1,583	Small	15,000	398.9	16.6	10.0	91.8	23.4	2.3	2,204.0	561.7	56.2	325.1	82.9	8.3
	RECCLWR2,4	22,310		15,000	398.9	16.6	140.5	1,294.0	329.8	33.0	31,054.9	7,914.8	791.5	4,580.6	1,167.4	116.7
	RECCLWR3,4	12,839		15,000	398.9	16.6	80.8	744.6	189.8	19.0	17,871.2	4,554.7	455.5	2,636.0	671.8	67.2
	RECCLWR2,5	21,613		15,000	398.9	16.6	136.1	1,253.6	319.5	31.9	30,085.4	7,667.7	766.8	4,437.6	1,131.0	113.1
	RECCLWR3,5	12,142		15,000	398.9	16.6	76.5	704.2	179.5	17.9	16,901.6	4,307.6	430.8	2,493.0	635.4	63.5
	RECCLWR2,6	35,830		15,000	398.9	16.6	225.6	2,078.1	529.6	53.0	49,875.1	12,711.3	1,271.1	7,356.6	1,874.9	187.5
	RECCLWR3,6	26,359		15,000	398.9	16.6	166.0	1,528.8	389.6	39.0	36,691.4	9,351.3	935.1	5,412.0	1,379.3	137.9

Table 6: Individual Reclamation Haul Road Controlled Emissions

Reclamation Area	Road Number	Total Length of Road (ft, one-way)	Vehicle Type on Reclamation Route	Max Haulage Rate (tons/day)	Max No. of Trips/Day	Max No. of Trips/Hour	VMT/hr	Controlled Hourly Emission Rates (lb/hr)			Controlled Daily Emission Rates (lb/day)			Controlled Annual Emission Rates (ton/yr)		
								TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Launder Line	RECLLR1,2	23,261	Small	5,000	133.0	5.5	48.8	50.4	12.8	1.3	1,208.8	308.1	30.8	178.3	45.4	4.5
	RECLLR1,3	52,068		5,000	133.0	5.5	109.3	112.7	28.7	2.9	2,705.8	689.6	69.0	399.1	101.7	10.2
Thickener	RECTHR1,2	14,271	Small	15,000	398.9	16.6	89.9	92.7	23.6	2.4	2,224.9	567.1	56.7	328.2	83.6	8.4
	RECTHR1,4	18,150		15,000	398.9	16.6	114.3	117.9	30.0	3.0	2,829.7	721.2	72.1	417.4	106.4	10.6
	RECTHR1,3	2,759		15,000	398.9	16.6	17.4	17.9	4.6	0.5	430.1	109.6	11.0	63.4	16.2	1.6
P-Plant	RECPPR1,2,3	3,947	Small	15,000	398.9	16.6	24.9	25.6	6.5	0.7	615.4	156.8	15.7	90.8	23.1	2.3
	RECPPR1,6,4,3	5,350		15,000	398.9	16.6	33.7	34.8	8.9	0.9	834.1	212.6	21.3	123.0	31.4	3.1
	RECPPR1,6,5	11,185		15,000	398.9	16.6	70.4	72.7	18.5	1.9	1,743.7	444.4	44.4	257.2	65.6	6.6
1A/1B Stockpile	REC1ALR1	12,877	Large	20,000	67.3	2.8	13.7	32.3	8.2	0.8	775.1	197.6	19.8	114.3	29.1	2.9
	REC1ASR1	7,849	Small (in-pit)	15,000	398.9	16.6	49.4	51.0	13.0	1.3	1,223.7	311.9	31.2	180.5	46.0	4.6
2A/2B Stockpile	REC2ALR1,3	8,099	Large	20,000	67.3	2.8	8.6	20.3	5.2	0.5	487.5	124.3	12.4	71.9	18.3	1.8
	REC2ALR1,2	18,191		20,000	67.3	2.8	19.3	45.6	11.6	1.2	1,095.0	279.1	27.9	161.5	41.2	4.1
	REC2ASR1,2	8,779	Small	15,000	398.9	16.6	55.3	57.0	14.5	1.5	1,368.6	348.8	34.9	201.9	51.4	5.1
	REC2ASR1,3	22,299		15,000	398.9	16.6	140.4	144.9	36.9	3.7	3,476.5	886.0	88.6	512.8	130.7	13.1
CLW Stockpile	RECCLWR1	1,583	Small	15,000	398.9	16.6	10.0	10.3	2.6	0.3	246.8	62.9	6.3	36.4	9.3	0.9
	RECCLWR2,4	22,310		15,000	398.9	16.6	140.5	144.9	36.9	3.7	3,478.2	886.5	88.6	513.0	130.8	13.1
	RECCLWR3,4	12,839		15,000	398.9	16.6	80.8	83.4	21.3	2.1	2,001.6	510.1	51.0	295.2	75.2	7.5
	RECCLWR2,5	21,613		15,000	398.9	16.6	136.1	140.4	35.8	3.6	3,369.6	858.8	85.9	497.0	126.7	12.7
	RECCLWR3,5	12,142		15,000	398.9	16.6	76.5	78.9	20.1	2.0	1,893.0	482.5	48.2	279.2	71.2	7.1
	RECCLWR2,6	35,830		15,000	398.9	16.6	225.6	232.8	59.3	5.9	5,586.0	1,423.7	142.4	823.9	210.0	21.0
	RECCLWR3,6	26,359		15,000	398.9	16.6	166.0	171.2	43.6	4.4	4,109.4	1,047.3	104.7	606.1	154.5	15.4

Freeport-McMoRan Tyrone Inc.
Crushing and Screening Plant Material Handling Emissions

Table 1: Input Parameters

GCP-2 Quarrying, Crushing, and Screening Facilities Operational Constraints (9/12/2006)	Hourly Production Rate (tons/hour)	600
	Daily Operating Hours (hours/day)	12
	Daily Production Rate (tons/day)	7,200
	Annual Operating Hours (hours/year)	4,380
	Annual Production Rate (tons/year)	2,628,000
Aggregate Handling Emission Factor Equation Inputs[1]	Particle Size Multiplier, k (TSP)	0.74
	Particle Size Multiplier, k (PM_{10})	0.35
	Particle Size Multiplier, k ($PM_{2.5}$)	0.053
	Mean Wind Speed, U (mph)[2]	7.6
	Material Moisture Content, M (%)[2]	4.3

Footnotes:

[1] AP-42, Chapter 13.2.4, Equation 1 (November 2006). This is an uncontrolled emission factor equation.

[2] Historically used average wind speed and material moisture content.

Table 2: Maximum Crushing and Screening Material Handling Uncontrolled Emission Rates

Activity	Uncontrolled Emission Factors (lb/ton)			Emission Factor Reference	No. of Handling Instances	Maximum Uncontrolled Hourly Emission Rates (lb/hr)			Maximum Uncontrolled Daily Emission Rates (lb/day)			Maximum Uncontrolled Annual Emission Rates (ton/yr)		
	TSP	PM_{10}	$PM_{2.5}$			TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Crushing	5.40E-03	2.40E-03	3.60E-04	1,2	2	6.48	2.88	0.43	77.76	34.56	5.18	14.19	6.31	0.95
Screening	2.50E-02	8.70E-03	1.31E-03	1,2	1	15.00	5.22	0.78	180.00	62.64	9.40	32.85	11.43	1.71
Conveyor Transfers	3.00E-03	1.10E-03	1.65E-04	1,2	8	14.40	5.28	0.79	172.80	63.36	9.50	31.54	11.56	1.73
Drop onto Pile	1.39E-03	6.59E-04	9.98E-05	3	6	5.01	2.37	0.36	60.17	28.46	4.31	10.98	5.19	0.79
					Total Uncontrolled Emissions =	**40.89**	**15.75**	**2.37**	**490.73**	**189.02**	**28.39**	**89.56**	**34.50**	**5.18**

Emission Factor References:

1 AP-42, Chapter 11.19.2, Crushed Stone Processing Operations (August 2004).

2 The $PM_{2.5}$ emission factor was calculated from the available PM_{10} emission factors using the ratio of 0.15 $PM_{2.5}$ / PM_{10} as recommended in the AP-42 Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors (Nove

3 AP-42, Chapter 13.2.4, Aggregate Handling and Storage Piles, Equation 1 (November 2006).

Table 3: Maximum Crushing and Screening Material Handling Controlled Emission Rates

Activity	Controlled Emission Factors (lb/ton)			Emission Factor Reference	No. of Handling Instances	Maximum Controlled Hourly Emission Rates (lb/hr)			Maximum Controlled Daily Emission Rates (lb/day)			Maximum Controlled Annual Emission Rates (ton/yr)		
	TSP	PM_{10}	$PM_{2.5}$			TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Crushing	1.20E-03	5.40E-04	1.00E-04	1	2	1.44	0.65	0.12	17.28	7.78	1.44	3.15	1.42	0.26
Screening	2.20E-03	7.40E-04	5.00E-05	1	1	1.32	0.44	0.03	15.84	5.33	0.36	2.89	0.97	0.07
Conveyor Transfers	1.40E-04	4.60E-05	1.30E-05	1	8	0.67	0.22	0.06	8.06	2.65	0.75	1.47	0.48	0.14
Drop onto Pile	1.39E-03	6.59E-04	9.98E-05	2	6	5.01	2.37	0.36	60.17	28.46	4.31	10.98	5.19	0.79
					Total Controlled Emissions =	**8.45**	**3.68**	**0.57**	**101.35**	**44.21**	**6.86**	**18.50**	**8.07**	**1.25**

Emission Factor References:

1 AP-42, Chapter 11.19.2, Crushed Stone Processing Operations (August 2004). Controls include wet suppression techniques.

2 AP-42, Chapter 13.2.4, Aggregate Handling and Storage Piles, Equation 1 (November 2006).

Freeport-McMoRan Tyrone Inc.
Crushing and Screening Plant Haul Road Emissions

Table 1: Input Parameters

Crushing and Screening Plant Haul Truck Inputs	**Truck Type**		**Small Trucks[1]**	**Large Trucks**
	Empty Vehicle Weight (tons)		33.0	170.6
	Max Load Capacity (tons)		35.5	297.0
	Full Vehicle Weight (tons)		68.5	467.6
	Average Vehicle Weight (tons)[2]		184.9	
Crushing and Screening Plant Haul Road Inputs	Silt Content (%)		4.8	
	Control Efficiency (%)[3]		88.8	
	No. of Precip. Days, P[4]		70	
	Hours of Operation (hrs/day)		12	
	Hours of Operation (days/year)		365	
	Hours of Operation (hrs/yr)		4,380	
Emission Factor Equation Inputs[5]	**Constant**	**TSP**	**PM_{10}**	**$PM_{2.5}$**
	k (lb/VMT)	4.9	1.5	0.15
	a	0.7	0.9	0.9
	b	0.45	0.45	0.45
Calculated Emission Factors	**Pollutant**	**Uncontrolled**	**Controlled**	
	TSP (lb/VMT)	16.48	1.85	
	PM_{10} (lb/VMT)	4.20	0.47	
	$PM_{2.5}$ (lb/VMT)	0.42	0.047	

Footnotes:

[1] Both Cat 730s and Cat 769s small trucks can haul material to the crushing and screening plant, so the average of the small truck capacities are used to represent the small trucks.

[2] AP-42 13.2.2 (Unpaved Roads) Equation 1a is applicable to industrial roads with a mean vehicle weight from 2 to 290 tons. The Average Vehicle Weight is based on the haul trucks being full traveling in one direction and being empty traveling in the other direction and 50% small haul trucks and 50% large haul trucks.

[3] The combined control efficiency of 88.8% is based on 80% control for base course and watering (NMED guidance, January 1, 2017) and 44% control for an average speed limit of 25 mph (WRAP Fugitive Dust Handbook, September 7, 2006).

[4] This refers to the number of days in a year with at least 0.01 inches of precipitation and is based on Figure 13.2.2-1 in AP-42. This factor is only taken into account in the annual emissions calculation.

[5] These emission equation constants are provided in Table 13.2.2-2 in AP-42 for Industrial Roads (Equation 1a).

Table 2: Maximum Crushing and Screening Hauling Uncontrolled Emission Rates

Haul Road	Total Length of Road (ft, one-way)	Max Haulage Rate (tons/day)	Average No. of Trips/Day	Average No. of Trips/Hour	Average VMT/hr	Maximum Uncontrolled Hourly Emission Rates (lb/hr)			Maximum Uncontrolled Daily Emission Rates (lb/day)			Maximum Uncontrolled Annual Emission Rates (ton/yr)		
						TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Crushing and Screening Plant (CSROADN)	3,690	7,200	43.3	3.6	5.0	83.15	21.19	2.12	997.81	254.30	25.43	147.18	37.51	3.75

Table 3: Maximum Crushing and Screening Hauling Controlled Emission Rates

Haul Road	Total Length of Road (ft, one-way)	Max Haulage Rate (tons/day)	Average No. of Trips/Day	Average No. of Trips/Hour	Average VMT/hr	Maximum Controlled Hourly Emission Rates (lb/hr)			Maximum Controlled Daily Emission Rates (lb/day)			Maximum Controlled Annual Emission Rates (ton/yr)		
						TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Crushing and Screening Plant (CSROADN)	3,690	7,200	43.3	3.6	5.0	9.31	2.37	0.24	111.75	28.48	2.85	16.48	4.20	0.42

Freeport-McMoRan Tyrone Inc.
GDF1 and GDF2 VOC and HAP Emissions

Table 1: Maximum VOC Emissions

Emission Unit	Tank Size (gal)	Maximum Gasoline Usage Rate[1]		Maximum VOC Emissions[2]	
		gal/month	gal/yr	Total Losses (ton/yr)	Total Losses (lb/hr)
GDF1	20,000	9,950	119,400	10.57	2.41
GDF2	2,000	9,950	119,400	1.70	0.39
			Total =	**12.28**	**2.80**

Footnotes:

[1] Based on an estimated maximum gasoline usage rate.

[2] Based on the GDF calculation methodology in AP-42 Chapter 7 (June 2020). Separate tables detailing the tank VOC emission calculations are provided.

Table 2: Gasoline HAP Constituents

Constituent	% by weight[1]
Benzene	0.35
n-Hexane	1.07
Toluene	3.59
o,m,p-Xylene	0.69
Ethylbenzene	0.18
2,2,4-Trimethylpentane	5.40

Footnotes:

[1] Based on the maximum of the SPECIATE 5.0 database HAP percentages for non-ethanol gasoline (2009 sampling data, profile no. 8762, gasoline headspace vapor, data quality "A") and 10% ethanol gasoline (2009 sampling data, profile no. 8763, gasoline headspace vapor, data quality "A") since Tyrone's gasoline can be 10% or less ethanol.

Table 3: Maximum HAP Emissions

Emission Unit	Benzene		n-Hexane		Toluene		Xylene		Ethylbenzene		2,2,4-Trimethylpentane		Total HAPs	
	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr
GDF1	0.036	0.0083	0.11	0.026	0.38	0.087	0.073	0.017	0.019	0.0043	0.57	0.13	1.19	0.27
GDF2	0.0059	0.0013	0.018	0.0042	0.061	0.014	0.012	0.0027	0.0031	0.00070	0.092	0.021	0.19	0.044
Total	**0.042**	**0.0097**	**0.13**	**0.030**	**0.44**	**0.10**	**0.084**	**0.019**	**0.022**	**0.0050**	**0.66**	**0.15**	**1.38**	**0.32**

Footnotes:

[1] Based on applying the gasoline HAP constituent percentages in Table 2 to the total tank VOC emissions in Table 1.

Tyrone Mine
VOC Emissions from GDF1
AP-42 Chapter 7 (June 2020)

Tank Information

Tank identification	GDF1 (SPCC-TYR-061)
Description	Horizontal 20,000-Gallon Gasoline Tank
Location (city)	Tyrone Mine (Tyrone, New Mexico)

Tank Summary	**Value**	**Units**	**Description**
Fuel type	Gasoline (RVP 10)	select one	Type of fuel stored in the tank.
Storage tank position	Above	select one	Fixed roof structure.
Actual hours operated	8,760	hours/year	Number of hours the tank is used.
Potential throughput	**119,400**	**gal/yr**	
VOC calculated emissions	**5.29**	**ton/yr**	Amount of VOCs potentially released over a 12-month period.
VOC potential emissions	**10.57**	**ton/yr**	Calculated VOC emissions x 2.

Physical Properties of the Tank		**Value**	**Units**	**Description**
Shell length	H_S	28.3	feet	This is actual length of the tank.
Shell diameter	D	11.0	feet	This is the actual width of the cylindrical shell.
Shell radius	R_S	5.5	feet	Calculated radius
Shell effective height	H_E	8.64	feet	Calculated effective height of the tank.
Shell effective diameter	D_E	19.92	feet	Calculated effective diameter of the cylindrical shell.
Maximum liquid height	H_{LX}	8.64	feet	Maximum height of the liquid within the tank shell. If unknown, assume pi*D/4
Average liquid height	H_L	5.50	feet	Average height of the liquid within the tank shell. If unknown, assume D/2.
Minimum liquid height	H_{LN}	0.00	feet	Minimum height of the liquid within the tank shell. If unknown, assume 0.
Working volume		20,141	gallons	Calculated volume
Turnovers per year	N	5.9	dimensionless	Equation 1-36 in AP-42 (June 2020)
Shell color/shade		Red/Primer shade	select one	Tank shell color and shade are used to identify paint solar absorptance.
Shell condition		Aged	select one	Tank condition is used to identify paint solar absorptance. Only aboveground.
Paint solar absorptance	α	0.91	dimensionless	Insert value from table 7.1-6. Paint effectiveness in absorbing radiant energy.
Vacuum setting	P_{BV}	-0.03	psig	Vacuum setting is a value set for the tank at the facility.
Pressure setting	P_{BP}	0.03	psig	Breather vent pressure is a reading from the tank monitoring system.

Weather Data		**Value**	**Units**	**Description**
Nearest major city		Deming, NM		Nearest major city to the tank location.
Average annual maximum temperature	T_{AX}	76.6	°F	Average over a calendar year.
Average annual minimum temperature	T_{AN}	46.2	°F	Average over a calendar year.
Atmospheric pressure	P_A	12.54	psia	Average for the location.
Solar insolation	I	1,772	Btu/(ft^2·day)	Total for a horizontal surface.

Calculation of VOC Emissions = Total Losses (L_T)		**Calculated value**		**Notes (equations are from AP-42, Chapter 7)**
Total losses	L_T	**10,572.3**	**lb/yr**	Equation 1-1
Standing storage losses	L_S	**9,374.5**	**lb/yr**	Equation 1-2
Working losses	L_W	**1,197.9**	**lb/yr**	Equation 1-35
Annual net throughput	Q	2,842.9	bbl/yr	Equation 1-37
Working loss turnover factor	K_N	1.00	dimensionless	Saturation; turnovers >36 = (180 + N) / 6N; turnovers at 36 or lower = 1
Stock vapor density	W_V	0.075	lb/ft^3	Equation 1-22
Vapor Molecular Weight at 60 °F	M_V	66	lb/lb-mole	Table 7.1-2
Vapor pressure	P_{VA}	6.554	psia	Calculated based on T_{LA}.
Vapor space volume	V_V	1346.30	ft^3	Equation 1-3
Vapor space tank outage	H_{VO}	4.32	feet	Equation 1-16, note for H_{VO} horizontal
Vapor space expansion factor	K_E	0.636	dimensionless	Equation 1-5
Vented vapor saturation factor	K_S	0.40	dimensionless	Equation 1-21
Working loss product factor	K_P	1	dimensionless	Assume value of 1 for gasoline or diesel.
Ideal gas constant	R	10.731	psia*ft^3/lb-mole*°R	Constant, Equation 1-22
Average vapor temperature	T_V	537.06	°R	Equation 1-33
Daily average liquid surface temperature	T_{LA}	532.07	°R	Equation 1-28
Daily vapor temperature range	ΔT_V	53.53	°R	Equation 1-7
Daily ambient temperature range	ΔT_A	30.40	°R	Equation 1-11
Daily maximum ambient temperature	T_{AX}	536.30	°R	Table 7-1-7. Conversion factor: Rankine = Fahrenheit + 459.7
Daily minimum ambient temperature	T_{AN}	505.90	°R	Table 7-1-7. Conversion factor: Rankine = Fahrenheit + 459.7
Daily average ambient temperature	T_{AA}	521.10	°R	Equation 1-30
Liquid bulk temperature	T_B	525.94	°R	Equation 1-31
Daily vapor pressure range	ΔP_V	3.26	psia	Equation 1-9
Breather vent pressure setting range	ΔP_B	0.06	psi	Equation 1-10
Vapor pressure equation constant	A	11.724	dimensionless	Table 7.1-2
Vapor pressure equation constant	B	5237.3	°R	Table 7.1-2
Vapor pressure at T_{LX}	P_{VX}	8.3492	psia	Equation 1-9, note 5
Vapor pressure at T_{LN}	P_{VN}	5.0870	psia	Equation 1-9, note 5
Maximum T_{LA}	T_{LX}	545.45	°R	Equation 1-9, note to Figure 7.1-17
Minimum T_{LA}	T_{LN}	518.68	°R	Equation 1-9, note to Figure 7.1-17

Tyrone Mine
VOC Emissions from GDF2
AP-42 Chapter 7 (June 2020)

Tank Information

Tank identification	GDF2 (SPCC-TYR-119)
Description	Vertical Fixed Roof 2,000-Gallon Gasoline Tank
Location (city)	Tyrone Mine (Tyrone, New Mexico)

Tank Summary	**Value**	**Units**	**Description**
Fuel type	Gasoline (RVP 10)	select one	Type of fuel stored in the tank.
Type of roof	Cone	select one	Fixed roof structure.
Actual hours operated	8,760	hours/year	Number of hours the tank is used.
Potential throughput	**119,400**	**gal/yr**	
VOC calculated emissions	**0.43**	**ton/yr**	Amount of VOCs potentially released over a 12-month period.
VOC potential emissions	**1.70**	**ton/yr**	Calculated VOC emissions x 4.

Physical Properties of the Tank		**Value**	**Units**	**Description**
Shell height	H_S	8.58	feet	This is actual length of the tank.
Shell diameter	D	5.17	feet	This is the width of the cylindrical shell.
Shell radius	R_S	2.58	feet	Calculated radius
Maximum liquid height	H_{LX}	7.58	feet	Maximum height of the liquid within the tank shell. If unknown, assume Hs - 1.
Average liquid height	H_L	4.29	feet	Average height of the liquid within the tank shell. If unknown, assume H/2.
Minimum liquid height	H_{LN}	1.00	feet	Minimum height of the liquid within the tank shell. If unknown, assume 1.
Working volume		1,189.2	gallons	Calculated volume
Turnovers per year	N	115.6	dimensionless	Equation 1-36 in AP-42 (June 2020)
Shell color/shade		Beige/Cream	select one	Tank shell color and shade are used to identify paint solar absorptance.
Shell condition		Aged	select one	Tank condition is used to identify paint solar absorptance.
Paint solar absorptance	α	0.49	dimensionless	Insert value from table 7.1-6. Paint effectiveness in absorbing radiant energy.
Roof height	H_R	0.02	feet	Calculated roof height.
Dome roof radius	R_R	--	feet	Calculated radius. Only applies to a "Dome" roof.
Cone roof slope	S_R	0.0625	ft/ft	If unknown = 0.0625. If known, insert value. Only applies to a "Cone" roof.
Vacuum setting	P_{BV}	-0.03	psig	Vacuum setting is a value set for the tank at the facility.
Pressure setting	P_{BP}	0.03	psig	Breather vent pressure is a reading from the tank monitoring system.

Weather Data		**Value**	**Units**	**Description**
Nearest major city		Deming, NM	Select one	Nearest major city to the tank location.
Average annual maximum temperature	T_{AX}	76.6	°F	Average over a calendar year.
Average annual minimum temperature	T_{AN}	46.2	°F	Average over a calendar year.
Atmospheric pressure	P_A	12.54	psia	Average for the location.
Solar insolation	I	1,772	Btu/(ft^2·day)	Total for a horizontal surface.

Calculation of VOC Emission = Total Losses (L_T)		**Calculated value**		**Notes (equations are from AP-42, Chapter 7)**
Total losses	L_T	**852.5**	**lb/yr**	Equation 1-1
Standing storage losses	L_S	**381.8**	**lb/yr**	Equation 1-2
Working losses	L_W	**470.7**	**lb/yr**	Equation 1-35
Annual net throughput	Q	2,842.9	bbl/yr	Equation 1-37
Working loss turnover factor	K_N	0.43	dimensionless	Saturation; turnovers >36 = (180 + N) / 6 * N; turnovers at 36 or lower = 1
Stock vapor density	W_V	0.069	lb/ft^3	Equation 1-22
Vapor Molecular Weight at 60 °F	M_V	66	lb/lb-mole	Table 7.1-2
Vapor pressure	P_{VA}	5.961	psia	Calculated based on T_{LA}.
Vapor space volume	V_V	90.09	ft^3	Equation 1-3
Vapor space roof outage	H_{RO}	0.01	feet	Equation 1-17 Cone; Equation 1-19 Dome
Vapor space tank outage	H_{VO}	4.30	feet	Equation 1-16, vertical
Vapor space expansion factor	K_E	0.40		Equation 1-5
Vented vapor saturation factor	K_S	0.42	dimensionless	Equation 1-21
Working loss product factor	K_P	1	dimensionless	Assume value of 1 for gasoline or diesel.
Ideal gas constant	R	10.731	psia*ft^3/lb-mole*°R	Constant, Equation 1-22
Average vapor temperature	T_V	529.68	°R	Equation 1-33
Daily average liquid surface temperature	T_{LA}	526.99	°R	Equation 1-28
Daily vapor temperature range	ΔT_V	38.65	°R	Equation 1-7
Daily ambient temperature range	ΔT_A	30.40	°R	Equation 1-11
Daily maximum ambient temperature	T_{AX}	536.29	°R	Table 7-1-7. Conversion factor: Rankine = Fahrenheit + 459.7
Daily minimum ambient temperature	T_{AN}	505.88	°R	Table 7-1-7. Conversion factor: Rankine = Fahrenheit + 459.7
Daily average ambient temperature	T_{AA}	521.09	°R	Equation 1-30
Liquid bulk temperature	T_B	523.69	°R	Equation 1-31
Daily vapor pressure range	ΔP_V	2.18	psia	Equation 1-9
Breather vent pressure setting range	ΔP_B	0.06	psi	Equation 1-10
Vapor pressure equation constant	A	11.724	dimensionless	Table 7.1-2
Vapor pressure equation constant	B	5237.3	°R	Table 7.1-2
Vapor pressure at T_{LX}	P_{VX}	7.13	psia	Equation 1-9, note 5
Vapor pressure at T_{LN}	P_{VN}	4.95	psia	Equation 1-9, note 5
Maximum T_{LA}	T_{LX}	536.65	°R	Equation 1-9, note to Figure 7.1-17
Minimum T_{LA}	T_{LN}	517.33	°R	Equation 1-9, note to Figure 7.1-17

Freeport-McMoRan Tyrone Inc.

SX/EW Plant - Chemical Constituent Concentrations for SX/EW Extractants and Diluents

Please note that the information provided in the table below is considered CONFIDENTIAL BUSINESS INFORMATION by the chemical suppliers that provided the information.

	Chemical Concentration [ppm]						
Reagent Name	Benzene	Toluene	Ethylbenzene	Total Xylene	1,2,4 - TMB	1,3,5 - TMB	Other VOC
Extractants							
ACORGA M5640	5	17.9	23.3	34.8			
ACORGA M5774	5	17.9	23.3	34.8			
ACORGA M5850	5	17.9	23.3	34.8			
ACORGA M5910	3.35	7.25	3.4	8.6	6.35	3.35	13.9
Diluents							
Conosol 170ES	50	50	50	50			
SX-80	5.4	110	530	690	2100	830	
Escaid 110		169					

Data for ACORGA extractants provided by Cytec.
Data for Conosol 170ES provided by Calumet Specialty Products.
Data for SX-80 provided by Chevron Phillips.
Blank cells indicate that data for this chemical was not available from the chemical supplier.
1,2,4 - TMB = 1,2,4-trimethylbenzene
1,3,5 - TMB = 1,3,5-trimethylbenzene
Other VOCs represented by octane, heptane, hexane, and pentane.

Freeport-McMoRan Tyrone Inc.
SX/EW-1 - Plant Mixer/Settler Tank Emissions

The combination of chemicals which results in the highest emission rate is represented in the permit application.
The following calculations are based on the BHP Copper VOC study conducted in 1997.

Emissions from the use of ACORGA M5774 also represent emissions from the use of ACORGA M5640 and ACORGA M5850 since the chemical constituents are the same for all three extractants.

number of tanks	10	area of each tank	6,137	ft^2	total area	61,366	ft^2

Chemical Product	Percent
SX-80	90%
ACORGA M5774	10%

Component	D cm^2/sec	MW g/gmole	Ci ppm	Ci g/m^3	Ch ppm	Ch g/m^3	Diff F g/m^2-s	Emission Rate ton/yr-ft^2	Emission Rate lb/hr	Emission Rate tons/year
Benzene	0.090	78.11	5.360	0.017	0.0018	5.71E-06	1.53E-07	4.94E-07	0.007	0.030
Toluene	0.080	92.14	100.790	0.377	0.0668	2.50E-04	3.02E-06	9.74E-06	0.14	0.60
Ethylbenzene	0.070	106.2	479.330	2.067	0.0568	2.45E-04	1.45E-05	4.67E-05	0.65	2.87
Total Xylene	0.070	106.2	624.480	2.693	0.0371	1.60E-04	1.89E-05	6.09E-05	0.85	3.74
Total HAPs									**1.65**	**7.23**
1,2,4 - trimethylbenzene	0.060	120.2	1890.00	9.23	0.023	1.12E-04	5.54E-05	1.79E-04	2.51	10.97
1,3,5 - trimethylbenzene	0.060	120.2	747.00	3.65	0.010	4.93E-05	2.19E-05	7.07E-05	0.99	4.34
Other VOCs	0.000	0.0	0.00	0.0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00
Total VOCs									**5.15**	**22.54**

$$\text{DiffF} = (Ci - Ch) \times D / H$$

Where: D = constituent diffusivity (from EPA Reference Link for Estimated Diffusion Coefficients in Air and Water; Assumed Pressure of 1 atm, and Temperature of 25.84 deg. C per 1995 met. data)

MW = constituent molecular weight

Ci = constituent concentration at liquid surface, ppm. (from manufacturer data)

Ci, g/m^3, calculated from ideal gas law. Conservative temperature of 25.84 deg. C used based on 1995 meteorological data (Average plus Standard Deviation).

Ch = constituent concentration at 1 meter, ppm. Assumed same as BHP's measured concentrations at H=1 m

H = distance above liquid surface = 1 m from BHP study

	Concentration in ppm							
Chemical	Benzene	Toluene	Ethylbenzene	Xylene	1,2,4 - tmb	1,3,5 - tmb	Other	Notes
SX-80	5.4	110	530	690	2100	830	0	confidential information supplied by Chevron Phillips
ACORGA M5774	5.00	17.90	23.30	34.80	0.00	0.00	0.00	confidential information supplied by Cytec
Organic in ppm	5.36	100.79	479.33	624.48	1890.00	747.00	0.00	composite concentration, Ci

Freeport-McMoRan Tyrone Inc.
SX/EW-1 - Plant Mixer/Settler Tank Emissions

The combination of chemicals which results in the highest emission rate is represented in the permit application.

Chemical Product	Percent
Conosol 170ES	90%
ACORGA M5774	10%

Component	D cm^2/sec	MW g/gmole	Ci ppm	Ci g/m^3	Ch ppm	Ch g/m^3	Diff F g/m^2-s	Emission Rate ton/yr-ft^2	Emission Rate lb/hr	Emission Rate tons/year
Benzene	0.090	78.11	45.500	0.145	0.0018	5.73E-06	1.30E-06	4.21E-06	0.059	0.258
Toluene	0.080	92.14	46.790	0.176	0.0668	2.51E-04	1.40E-06	4.53E-06	0.06	0.278
Ethylbenzene	0.070	106.2	47.330	0.205	0.0568	2.46E-04	1.43E-06	4.62E-06	0.06	0.284
Total Xylene	0.070	106.2	48.480	0.210	0.0371	1.61E-04	1.47E-06	4.74E-06	0.07	0.291
Total HAPs									**0.25**	**1.11**
1,2,4 - trimethylbenzene	0.060	120.2	0.00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00
1,3,5 - trimethylbenzene	0.060	120.2	0.00	0.00	0.000	0.00E+00	0.00E+00	0.00E+00	0.00	0.00
Other VOCs	0.000	0.0	0.00	0.0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00
Total VOCs									**0.25**	**1.11**

$$\text{DiffF} = (Ci - Ch) \times D / H$$

Where: D = constituent diffusivity (from EPA Reference Link for Estimated Diffusion Coefficients in Air and Water; Assumed Pressure of 1 atm, and Temperature of 25.84 deg. C per 1995 met. data)

MW = constituent molecular weight

Ci = constituent concentration at liquid surface, ppm. (from manufacturer data)

Ci, g/m^3, calculated from ideal gas law. Conservative temperature of 25.84 deg. C used based on 1995 meteorological data (Average plus Standard Deviation).

Ch = constituent concentration at 1 meter, ppm. Assumed same as BHP's measured concentrations at H=1 m

H = distance above liquid surface = 1 m from BHP study

	Concentration in ppm							
Chemical	Benzene	Toluene	Ethylbenzene	Xylene	1,2,4 - tmb	1,3,5 - tmb	Other	Notes
Conosol 170ES	50	50	50	50	0	0	0	confidential information supplied by Calumet Specialty Products
ACORGA M5774	5.00	17.90	23.30	34.80	0.00	0.00	0.00	confidential information supplied by Cytec
Organic in ppm	45.50	46.79	47.33	48.48	0.00	0.00	0.00	composite concentration, Ci

Freeport-McMoRan Tyrone Inc.
SX/EW-1 - Plant Mixer/Settler Tank Emissions

The combination of chemicals which results in the highest emission rate is represented in the permit application.

Chemical Product	Percent
Conosol 170ES	95%
ACORGA M5910	5%

Component	D cm^2/sec	MW g/gmole	Ci ppm	Ci g/m^3	Ch ppm	Ch g/m^3	Diff F g/m^2-s	Emission Rate $ton/yr\text{-}ft^2$	Emission Rate lb/hr	Emission Rate tons/year
Benzene	0.090	78.11	47.714	0.152	0.0018	5.73E-06	1.37E-06	4.42E-06	0.062	0.271
Toluene	0.080	92.14	47.905	0.180	0.0668	2.51E-04	1.44E-06	4.64E-06	0.07	0.285
Ethylbenzene	0.070	106.2	47.717	0.206	0.0568	2.46E-04	1.44E-06	4.66E-06	0.07	0.286
Total Xylene	0.070	106.2	47.971	0.208	0.0371	1.61E-04	1.45E-06	4.69E-06	0.07	0.288
Total HAPs									**0.26**	**1.13**
1,2,4 - trimethylbenzene	0.060	120.2	0.31	0.00	0.02	1.13E-04	8.47E-09	2.74E-08	3.83E-04	1.68E-03
1,3,5 - trimethylbenzene	0.060	120.2	0.16	0.00	0.010	4.95E-05	4.53E-09	1.46E-08	2.05E-04	8.97E-04
Other VOCs	0.070	112.1	0.68	0.0	0.00	0.00E+00	2.18E-08	7.03E-08	9.85E-04	4.32E-03
Total VOCs									**0.26**	**1.14**

$$\text{DiffF} = (Ci - Ch) \times D / H$$

Where: D = constituent diffusivity (from EPA Reference Link for Estimated Diffusion Coefficients in Air and Water; Assumed Pressure of 1 atm, and Temperature of 25.84 deg. C per 1995 met. data)

MW = constituent molecular weight

Ci = constituent concentration at liquid surface, ppm. (from manufacturer data)

Ci, g/m^3, calculated from ideal gas law. Conservative temperature of 25.84 deg. C used based on 1995 meteorological data (Average plus Standard Deviation).

Ch = constituent concentration at 1 meter, ppm. Assumed same as BHP's measured concentrations at H=1 m

H = distance above liquid surface = 1 m from BHP study

	Concentration in ppm							
Chemical	Benzene	Toluene	Ethylbenzene	Xylene	1,2,4 - tmb	1,3,5 - tmb	Other	Notes
Conosol 170ES	50	50	50	50	0	0	0	confidential information supplied by Calumet Specialty Products
ACORGA M5910	3.35	7.25	3.40	8.60	6.35	3.35	13.90	confidential information supplied by Cytec
Organic in ppm	47.71	47.91	47.72	47.97	0.31	0.16	0.68	composite concentration, Ci

Freeport-McMoRan Tyrone Inc.
SX/EW-1 - Plant Mixer/Settler Tank Emissions

The combination of chemicals which results in the highest emission rate is represented in the permit application.

Chemical Product	Percent
SX-80	90%
ACORGA M5910	10%

Component	D cm^2/sec	MW g/gmole	Ci ppm	Ci g/m^3	Ch ppm	Ch g/m^3	Diff F g/m^2-s	Emission Rate $ton/yr-ft^2$	Emission Rate lb/hr	Emission Rate tons/year
Benzene	0.090	78.11	5.195	0.016	0.0018	5.71E-06	1.48E-07	4.79E-07	0.007	0.029
Toluene	0.080	92.14	99.725	0.373	0.0668	2.50E-04	2.98E-06	9.64E-06	0.14	0.591
Ethylbenzene	0.070	106.2	477.340	2.059	0.0568	2.45E-04	1.44E-05	4.65E-05	0.65	2.856
Total Xylene	0.070	106.2	621.860	2.682	0.0371	1.60E-04	1.88E-05	6.06E-05	0.85	3.720
Total HAPs									**1.64**	**7.20**
1,2,4 - trimethylbenzene	0.060	120.2	1890.64	9.23	0.023	1.12E-04	5.54E-05	1.79E-04	2.51	10.98
1,3,5 - trimethylbenzene	0.060	120.2	747.34	3.65	0.010	4.93E-05	2.19E-05	7.07E-05	0.99	4.34
Other VOCs	0.070	112.1	1.39	0.01	1.69E+01	0.00E+00	4.43E-08	1.43E-07	0.00	0.01
Total VOCs									**5.14**	**22.52**

$$\text{DiffF} = (Ci - Ch) \times D / H$$

Where: D = constituent diffusivity (from EPA Reference Link for Estimated Diffusion Coefficients in Air and Water; Assumed Pressure of 1 atm, and Temperature of 25.84 deg. C per 1995 met. data)

MW = constituent molecular weight

Ci = constituent concentration at liquid surface, ppm. (from manufacturer data)

Ci, g/m^3, calculated from ideal gas law. Conservative temperature of 25.84 deg. C used based on 1995 meteorological data (Average plus Standard Deviation).

Ch = constituent concentration at 1 meter, ppm. Assumed same as BHP's measured concentrations at H=1 m

H = distance above liquid surface = 1 m from BHP study

	Concentration in ppm							
Chemical	Benzene	Toluene	Ethylbenzene	Xylene	1,2,4 - tmb	1,3,5 - tmb	Other	Notes
SX-80	5.4	110	530	690	2100	830	0	confidential information supplied by Chevron Phillips
ACORGA M5910	3.35	7.25	3.40	8.60	6.35	3.35	13.90	confidential information supplied by Cytec
Organic in ppm	5.20	99.73	477.34	621.86	1890.64	747.34	1.39	composite concentration, Ci

Freeport-McMoRan Tyrone Inc.
SX/EW-1 - Plant Mixer/Settler Tank Emissions

The combination of chemicals which results in the highest emission rate is represented in the permit application.

Chemical Product	Percent
Escaid 110	95%
ACORGA M5910	5%

Component	D cm^2/sec	MW g/gmole	Ci ppm	Ci g/m^3	Ch ppm	Ch g/m^3	Diff F g/m^2-s	Emission Rate ton/yr-ft^2	Emission Rate tons/year	Emission Rate lb/hr
Benzene	0.093	78.11	0.175	0.001	0.0018	5.73E-06	5.14E-09	1.66E-08	0.001	0.000
Toluene	0.083	92.14	160.557	0.603	0.0668	2.51E-04	5.02E-06	1.62E-05	0.995	0.23
Ethylbenzene	0.076	106.2	0.177	0.001	0.0568	2.46E-04	3.97E-09	1.28E-08	0.001	0.00
Total Xylene	0.076	106.2	0.449	0.002	0.0371	1.61E-04	1.35E-08	4.37E-08	0.003	0.00
Total HAPs									**1.00**	**0.23**
1,2,4 - trimethylbenzene	0.070	120.2	0.33	0.00	0.02	1.13E-04	1.06E-08	3.42E-08	0.00	0.00
1,3,5 - trimethylbenzene	0.070	120.2	0.17	0.00	0.010	4.95E-05	5.67E-09	1.83E-08	0.00	0.00
Other VOCs	0.070	112.1	0.73	0.00	16.92	0.00E+00	2.32E-08	7.49E-08	0.00	0.00
Total VOCs									**1.01**	**0.23**

$$\text{DiffF} = (Ci - Ch) \times D/H$$

Where: D = constituent diffusivity (from EPA Reference Link for Estimated Diffusion Coefficients in Air and Water; Assumed Pressure of 1 atm, and Temperature of 25.84 deg. C per 1995 met. data)

MW = constituent molecular weight

Ci = constituent concentration at liquid surface, ppm. (from manufacturer data)

Ci, g/m^3, calculated from ideal gas law. Conservative temperature of 25.84 deg. C used based on 1995 meteorological data (Average plus Standard Deviation).

Ch = constituent concentration at 0.61 meter, ppm. Assumed same as BHP's measured concentrations at H=1 m

H = distance above liquid surface = 1 m per BHP Study

	Concentration in ppm							
Chemical	Benzene	Toluene	Ethylbenzene	Xylene	1,2,4 - tmb	1,3,5 - tmb	Other	Notes
Escaid 110	0	169	0	0	0	0	0	confidential information supplied
ACORGA M5910	3.35	7.25	3.40	8.60	6.35	3.35	13.90	confidential information supplied
Organic in ppm	0.17	160.56	0.18	0.45	0.33	0.17	0.73	composite concentration, Ci

Freeport-McMoRan Tyrone Inc.

SX/EW-2 - Sulfuric Acid Emissions Estimates for the Tyrone SX/EW Tank House

Parameter	Value	Units
A1 (Inlet Area)	1647	sqft
A2 (Outlet Area)	2625	sqft
H (Height separating inlet from outlet)	38.9	ft
Ti (Inside Temperature)	523	deg R
To (Outside Temperature)	515	deg R
h (Natural plane calculation)	**27.79**	ft
Cw (Orifice Constant)	0.55	-
Aw (Area of windward openings)	730	sqft
V (Wind speed)	10	MPH
Qw (Wind effect calc.)	**353,320**	cfm
A (Area)	1647	sqft
Cs (Coefficient of Openings)	0.55	-
h (Natural plane calculation)	27.79	ft
Ti (Inside Temperature)	523	deg R
dT (Temperature difference)	8	deg R
Fc (Correction Factor)	1.18	-
Qs (Thermal effect calc.)	**335,353**	cfm
Qtotal (combined wind & thermal)	**487,131**	**cfm**
H2SO4 Concentration	1	mg/cm
H2SO4 Concentration	6.237E-08	lb/cf
ACID MIST EMISSIONS (as PM10)	**15,969**	**lb/yr**
	7.98	**TPY**

1.82 lb/hr based on 8,760 hr/yr

Conversions:

1 lb = 454 grams
1 ft = 0.3048 m
cf = cubic foot
cm = cubic meter
cfm = cubic feet per minute

Freeport-McMoRan Tyrone Inc.
SX/EW-3 - 2,000,000 Gallon Raffinate Tank Emissions

The following calculations are based on the BHP Copper VOC study conducted in 1997.
Emissions from the use of ACORGA M5774 also represent emissions from the use of ACORGA M5640 and ACORGA M5850 since the chemical constituents are the same for all three extractants. SX-80 and ACORGA M5774 were used as the reagent mix in calculating emissions due to yielding the highest representative emissions.

Number of tanks	1	area of each tank	11,304	ft^2	total area	11,304	ft^2

Chemical Product	Percent
SX-80	90%
ACORGA M5774	10%

Component	D cm^2/sec	MW g/gmole	Ci ppm	Ci g/m^3	Ch ppm	Ch g/m^3	Diff F g/m^2-s	Emission Rate ton/yr-ft^2	Emission Rate lb/hr	Emission Rate tons/yr
Benzene	0.090	78.11	5.360	0.017	0.0018	5.71E-06	1.53E-07	4.94E-07	1.28E-03	5.59E-03
Toluene	0.080	92.14	100.790	0.377	0.0668	2.50E-04	3.02E-06	9.74E-06	2.51E-02	1.10E-01
Ethylbenzene	0.070	106.2	479.330	2.067	0.0568	2.45E-04	1.45E-05	4.67E-05	1.21E-01	5.28E-01
Total Xylene	0.070	106.2	624.480	2.693	0.0371	1.60E-04	1.89E-05	6.09E-05	1.57E-01	6.88E-01
Total HAPs									**0.30**	**1.33**
1,2,4 - trimethylbenzene	0.060	120.2	1890.00	9.23	0.023	1.12E-04	5.54E-05	1.79E-04	4.62E-01	2.02E+00
1,3,5 - trimethylbenzene	0.060	120.2	747.00	3.65	0.010	4.93E-05	2.19E-05	7.07E-05	1.82E-01	7.99E-01
Other VOCs	0.000	0.0	0.00	0.0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total VOCs									**0.95**	**4.15**

$$\text{DiffF} = (Ci - Ch) \times D / H$$

Where: D = constituent diffusivity (from EPA Reference Link for Estimated Diffusion Coefficients in Air and Water; Assumed Pressure of 1 atm, and Temperature of 25.84 deg. C per 1995 met. data)
MW = constituent molecular weight
Ci = constituent concentration at liquid surface, ppm. (from manufacturer data)
Ci, g/m^3, calculated from ideal gas law. Conservative temperature of 25.84 deg. C used based on 1995 meteorological data (Average plus Standard Deviation).
Ch = constituent concentration at 1 meter, ppm. Assumed same as BHP's measured concentrations at H=1 m
H = distance above liquid surface = 1 m per BHP Study

	Concentration in ppm							
Chemical	Benzene	Toluene	Ethylbenzene	Xylene	1,2,4 - tmb	1,3,5 - tmb	Other	Notes
SX-80	5.4	110	530	690	2100	830	0.00	confidential information supplied by Chevron Phillips
ACORGA M5774	5.00	17.90	23.30	34.80	0.00	0.00	0.00	confidential information supplied by Cytec
Organic in ppm	5.36	100.79	479.33	624.48	1890.00	747.00	0.00	composite concentration, Ci

Freeport-McMoRan Tyrone Inc.
SX/EW 4 - 400,000 Gallon Raffinate Tank Emissions

The following calculations are based on the BHP Copper VOC study conducted in 1997.
Emissions from the use of ACORGA M5774 also represent emissions from the use of ACORGA M5640 and ACORGA M5850 since the chemical constituents are the same for all three extractants. SX-80 and ACORGA M5774 were used as the reagent mix in calculating emissions due to yielding the highest representative emissions.

Number of tanks	1	area of each tank	3,320.0	ft^2	total area	3,320.0	ft^2

Chemical Product	Percent
SX-80	90%
ACORGA M5774	10%

Component	D cm^2/sec	MW g/gmole	Ci ppm	Ci g/m^3	Ch ppm	Ch g/m^3	Diff F g/m^2-s	Emission Rate ton/yr-ft^2	Emission Rate lb/hr	Emission Rate tons/year
Benzene	0.093	78.11	5.360	0.017	0.0011	3.49E-06	1.59E-07	5.12E-07	3.88E-04	1.70E-03
Toluene	0.083	92.14	100.790	0.377	0.0065	2.41E-05	3.14E-06	1.01E-05	7.69E-03	3.37E-02
Ethylbenzene	0.076	106.2	479.330	2.067	0.0010	4.31E-06	1.57E-05	5.07E-05	3.85E-02	1.68E-01
Total Xylene	0.076	106.2	624.480	2.693	0.0020	8.54E-06	2.05E-05	6.61E-05	5.01E-02	2.19E-01
Total HAPs									**0.10**	**0.42**
1,2,4 - trimethylbenzene	0.070	120.2	1890.00	9.23	0.0022	1.07E-05	6.47E-05	2.09E-04	1.58E-01	6.94E-01
1,3,5 - trimethylbenzene	0.070	120.2	747.00	3.65	0.001	5.03E-06	2.56E-05	8.27E-05	6.27E-02	2.75E-01
Other VOCs	0.000	0.0	0.00	0.0	3.98	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total VOCs									**0.32**	**1.39**

$$\mathrm{DiffF} = (Ci - Ch) \times D / H$$

Where: D = constituent diffusivity (from EPA Reference Link for Estimated Diffusion Coefficients in Air and Water; Assumed Pressure of 1 atm, and Temperature of 25.84 deg. C per 1995 met. data)
MW = constituent molecular weight
Ci = constituent concentration at liquid surface, ppm. (from manufacturer data)
Ci, g/m^3, calculated from ideal gas law. Conservative temperature of 25.84 deg. C used based on 1995 meteorological data (Average plus Standard Deviation).
Ch = constituent concentration at 1 meter, ppm. Assumed same as BHP's measured concentrations at H=1 m
H = distance above liquid surface = 1 m per BHP Study

	Concentration in ppm							
Chemical	Benzene	Toluene	Ethylbenzene	Xylene	1,2,4 - tmb	1,3,5 - tmb	Other	Notes
SX-80	5.4	110	530	690	2100	830	0	confidential information supplied by Chevron Phillips
ACORGA M5774	5.00	17.90	23.30	34.80	0.00	0.00	0.00	confidential information supplied by Cytec
Organic in ppm	5.36	100.79	479.33	624.48	1890.00	747.00	0.00	composite concentration, Ci

Freeport-McMoRan Tyrone Inc.
Cathode Washing Hot Water Boilers (B-951 and B-748) Emissions

Table 1: Input Parameters

Fuel Type =	Propane	
Maximum Heat Capacity (B-951) =	1.256	MMBtu/hr
Maximum Heat Capacity (B-748) =	1.256	MMBtu/hr
Maximum Heat Capacity (total) =	2.512	MMBtu/hr
Propane Heating Value =	91.5	MMBtu/10^3 gal
Annual Operating Hours =	8,760	hr/yr
Maximum Propane Usage (each) =	13.7	gal/hr
Maximum Propane Usage (each) =	329.4	gal/day
Maximum Propane Usage (each) =	120,246.6	gal/yr
Maximum Propane Usage (total) =	27.5	gal/hr
Maximum Propane Usage (total) =	658.9	gal/day
Maximum Propane Usage (total) =	240,493.1	gal/yr

Table 2: Maximum Emission Rates

Pollutant	Emission Factors	Emission Factor Ref	Conversion Factors[a]	Converted Emission Factors	Maximum Total Emission Rates		
					lb/hr	lb/day	tpy
NOx	13 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.14 lb/MMBtu	0.36	8.57	1.56
CO	7.5 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.082 lb/MMBtu	0.21	4.94	0.90
SO_2	1.59 lb/10^3 gallons	1,2	91.5 MMBtu/10^3 gal	0.017 lb/MMBtu	0.044	1.05	0.19
VOC	0.8 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.0087 lb/MMBtu	0.022	0.53	0.096
PM	0.7 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.0077 lb/MMBtu	0.019	0.46	0.084
Hexane	1.8 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	1.76E-03 lb/MMBtu	0.0022	0.05	0.000
Formaldehyde	7.5E-02 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	7.35E-05 lb/MMBtu	0.00018	0.0044	0.00081
Toluene	3.4E-03 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	3.33E-06 lb/MMBtu	8.37E-06	0.00020	3.67E-05
Total HAPs[c]	1.89 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	0.0019 lb/MMBtu	0.0047	0.11	0.020
CO_2	62.87 kg/MMBtu	4	2.2 lb/kg	138.31 lb/MMBtu	347.44	8,338.67	1,521.81
CH_4	0.003 kg/MMBtu	4	2.2 lb/kg	0.0066 lb/MMBtu	0.017	0.40	0.073
N_2O	0.0006 kg/MMBtu	4	2.2 lb/kg	0.0013 lb/MMBtu	0.0033	0.080	0.015
CO_2e	63.12 kg/MMBtu	5	2.2 lb/kg	138.87 lb/MMBtu	348.85	8,372.34	1,527.95

Emission Factor References:

1. AP-42, Table 1.5-1 (7/08). The emission factor for methane has been subtracted from the TOC emission factor to represent VOC emissions since TOC includes VOCs plus "exempt" compounds such as methane and ethane.
2. Per the Gas Processors Association, the sulfur content in commercial propane is 254 ppmv as S. Using the ideal gas law conversion factor of 359.05 scf/lb-mol at 32°F and 1 atm and a molecular weight of 32.065 lb/lb-mol for sulfur, the sulfur content for propane is 15.9 grains/100 ft^3.
3. AP-42, Tables 1.4-3 and 1.4-4 (7/98). The emission factors for natural gas combustion are used since there are no HAP emission factors for propane combustion. The three highest HAPs hexane, formaldehyde, and toluene are listed in the table.
4. 40 CFR 98, Subpart C, Tables C-1 and C-2. The emission factors for CH_4 and N_2O are based on the "Petroleum Products" category, which is not propane-specific.
5. 40 CFR 98, Subpart A, Table A-1. Global Warming Potentials are 1 for CO_2, 25 for CH_4, and 298 for N_2O. Emissions are reported in short tons. To convert to metric tons, divide the short tons by 1.1.

Footnotes:

[a] The higher heating values for propane and natural gas are used to convert the corresponding emission factors to lb/MMBtu.
[b] These emissions represent both boilers combined since they exhaust out a common stack.
[c] Includes HAPs not listed in the table.

Freeport-McMoRan Tyrone Inc.
Heat Exchanger Hot Water Boiler (B-3891) Emissions

Table 1: Input Parameters

Fuel Type =	Propane	
Maximum Heat Capacity =	3.6	MMBtu/hr
Propane Heating Value =	91.5	MMBtu/10^3 gal
Annual Operating Hours =	8,760	hr/yr
Maximum Propane Usage =	39.3	gal/hr
Maximum Propane Usage =	944.3	gal/day
Maximum Propane Usage =	344,655.7	gal/yr

Table 2: Maximum Emission Rates

Pollutant	Emission Factors	Emission Factor Ref	Conversion Factors[a]	Converted Emission Factors	Maximum Emission Rates		
					lb/hr	lb/day	tpy
NOx	13 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.14 lb/MMBtu	0.51	12.28	2.24
CO	7.5 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.082 lb/MMBtu	0.30	7.08	1.29
SO_2	1.59 lb/10^3 gallons	1,2	91.5 MMBtu/10^3 gal	0.017 lb/MMBtu	0.063	1.50	0.27
VOC	0.8 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.0087 lb/MMBtu	0.031	0.76	0.14
PM	0.7 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.0077 lb/MMBtu	0.028	0.66	0.12
Hexane	1.8 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	1.76E-03 lb/MMBtu	0.0064	0.15	0.028
Formaldehyde	7.5E-02 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	7.35E-05 lb/MMBtu	0.00026	0.0064	0.0012
Toluene	3.4E-03 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	3.33E-06 lb/MMBtu	0.000012	0.00029	0.000053
Total HAPs[b]	1.89 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	0.00185 lb/MMBtu	0.0067	0.16	0.029
CO_2	62.87 kg/MMBtu	4	2.2 lb/kg	138.31 lb/MMBtu	497.93	11,950.33	2,180.94
CH_4	0.003 kg/MMBtu	4	2.2 lb/kg	0.0066 lb/MMBtu	0.024	0.57	0.10
N_2O	0.0006 kg/MMBtu	4	2.2 lb/kg	0.0013 lb/MMBtu	0.0048	0.11	0.021
CO_2e	63.12 kg/MMBtu	5	2.2 lb/kg	138.87 lb/MMBtu	499.94	11,998.57	2,189.74

Emission Factor References:

1. AP-42, Table 1.5-1 (7/08). The emission factor for methane has been subtracted from the TOC emission factor to represent VOC emissions since TOC includes VOCs plus "exempt" compounds such as methane and ethane.
2. Per the Gas Processors Association, the sulfur content in commercial propane is 254 ppmv as S. Using the ideal gas law conversion factor of 359.05 scf/lb-mol at 32°F and 1 atm and a molecular weight of 32.065 lb/lb-mol for sulfur, the sulfur content for propane is 15.9 grains/100 ft^3.
3. AP-42, Tables 1.4-3 and 1.4-4 (7/98). The emission factors for natural gas combustion are used since there are no HAP emission factors for propane combustion. The three highest HAPs hexane, formaldehyde, and toluene are listed in the table.
4. 40 CFR 98, Subpart C, Tables C-1 and C-2. The emission factors for CH_4 and N_2O are based on the "Petroleum Products" category, which is not propane-specific.
5. 40 CFR 98, Subpart A, Table A-1. Global Warming Potentials are 1 for CO_2, 25 for CH_4, and 298 for N_2O. Emissions are reported in short tons. To convert to metric tons, divide the short tons by 1.1.

Footnotes:

[a] The higher heating values for propane and natural gas are used to convert the corresponding emission factors to lb/MMBtu.

[b] Includes HAPs not listed in the table.

Freeport-McMoRan Tyrone Inc.
Heat Exchanger Hot Water Boiler (B-1454) Emissions

Table 1: Input Parameters

Fuel Type =	Propane	
Maximum Heat Capacity =	3.6	MMBtu/hr
Propane Heating Value =	91.5	MMBtu/10^3 gal
Annual Operating Hours =	8,760	hr/yr
Maximum Propane Usage =	39.3	gal/hr
Maximum Propane Usage =	944.3	gal/day
Maximum Propane Usage =	344,655.7	gal/yr

Table 2: Maximum Emission Rates

Pollutant	Emission Factors	Emission Factor Ref	Conversion Factors[a]	Converted Emission Factors	Maximum Emission Rates		
					lb/hr	lb/day	tpy
NOx	13 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.14 lb/MMBtu	0.51	12.28	2.24
CO	7.5 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.082 lb/MMBtu	0.30	7.08	1.29
SO_2	1.59 lb/10^3 gallons	1,2	91.5 MMBtu/10^3 gal	0.017 lb/MMBtu	0.063	1.50	0.27
VOC	0.8 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.0087 lb/MMBtu	0.031	0.76	0.14
PM	0.7 lb/10^3 gallons	1	91.5 MMBtu/10^3 gal	0.0077 lb/MMBtu	0.028	0.66	0.12
Hexane	1.8 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	1.76E-03 lb/MMBtu	0.0064	0.15	0.028
Formaldehyde	7.5E-02 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	7.35E-05 lb/MMBtu	0.00026	0.0064	0.0012
Toluene	3.4E-03 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	3.33E-06 lb/MMBtu	0.000012	0.00029	0.000053
Total HAPs[b]	1.89 lb/MMscf nat gas	3	1,020 MMBtu/MMscf	0.0019 lb/MMBtu	0.0067	0.16	0.029
CO_2	62.87 kg/MMBtu	4	2.2 lb/kg	138.31 lb/MMBtu	497.93	11,950.33	2,180.94
CH_4	0.003 kg/MMBtu	4	2.2 lb/kg	0.0066 lb/MMBtu	0.024	0.57	0.10
N_2O	0.0006 kg/MMBtu	4	2.2 lb/kg	0.0013 lb/MMBtu	0.0048	0.11	0.021
CO_2e	63.12 kg/MMBtu	5	2.2 lb/kg	138.87 lb/MMBtu	499.94	11,998.57	2,189.74

Emission Factor References:

1. AP-42, Table 1.5-1 (7/08). The emission factor for methane has been subtracted from the TOC emission factor to represent VOC emissions since TOC includes VOCs plus "exempt" compounds such as methane and ethane.
2. Per the Gas Processors Association, the sulfur content in commercial propane is 254 ppmv as S. Using the ideal gas law conversion factor of 359.05 scf/lb-mol at 32°F and 1 atm and a molecular weight of 32.065 lb/lb-mol for sulfur, the sulfur content for propane is 15.9 grains/100 ft^3.
3. AP-42, Tables 1.4-3 and 1.4-4 (7/98). The emission factors for natural gas combustion are used since there are no HAP emission factors for propane combustion. The three highest HAPs hexane, formaldehyde, and toluene are listed in the table.
4. 40 CFR 98, Subpart C, Tables C-1 and C-2. The emission factors for CH_4 and N_2O are based on the "Petroleum Products" category, which is not propane-specific.
5. 40 CFR 98, Subpart A, Table A-1. Global Warming Potentials are 1 for CO_2, 25 for CH_4, and 298 for N_2O. Emissions are reported in short tons. To convert to metric tons, divide the short tons by 1.1.

Footnotes:

[a] The higher heating values for propane and natural gas are used to convert the corresponding emission factors to lb/MMBtu.

[b] Includes HAPs not listed in the table.

SD-1 [Caterpillar C9 300hp]

Unit Number:	SD-1		
Source Description:	Diesel Powered Engine		

Engine Info

Manufacturer:	Caterpillar		
Model:	C9		
Aspiration:	Turbocharged/ATAAC		
Engine speed:	2,200	rpm	Mfg data
Sea level hp:	300	hp	Mfg data
	3.0	%	Per 1,000 ft above 4,000 ft
Elevation	5,801	ft	Google Earth
Derated hp:	283.8	hp	Calculated
Conversion Factor	1.34	hp/kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000	lb/ton	
Hours of Operation	8,760	hr/yr	
Fuel Heating Value:	137,000	Btu/gal	AP-42
Fuel Usage Rate:	14.5	gal/hr	Calculated based on 7,000 Btu/hp-hr
Fuel Usage Rate:	127,022	gal/yr	

Emission Calculations

NOx[1]	CO	PM[2]	SO_2[3]		
2.83	2.61	0.15		g/hp-hr	EPA Tier 3 Emission Standards
			0.0021	lb/hp-hr	AP-42 Table 3.3-1
1.77	**1.63**	**0.09**	**0.58**	lb/hr	Hourly emission rate
7.77	**7.15**	**0.41**	**2.55**	tpy	Annual emission rate

VOC[4]	Total HAPs[5]	Toluene	Xylenes	Formaldehyde		
0.15					g/hp-hr	EPA Tier 3 Emission Standards
	3.42E-03	4.09E-05	2.85E-04	1.18E-03	lb/MMBtu	AP-42
0.093	**0.0068**	**8.12E-05**	**5.66E-04**	**2.34E-03**	lb/hr	Hourly emission rate
0.41	**0.030**	**3.56E-04**	**2.48E-03**	**1.03E-02**	tpy	Annual emission rate

CO_2	CH_4	N_2O	CO_2e		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
295.99	0.012	0.0024	297.01	lb/hr	
1,296.45	**0.053**	**0.0105**	**1,300.90**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factor for NOx is assumed to be 95% of the EPA Tier 3 emission factor for NOx + NMHC.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1.

[4] Emission factor for VOC is assumed to be 5% of the EPA Tier 3 emission factor for NOx + NMHC.

[5] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

SD-2 [Caterpillar C9 300hp]

Unit Number:	SD-2
Source Description:	Diesel Powered Engine

Engine Info

Manufacturer:	Caterpillar		
Model:	C9		
Aspiration:	Turbocharged/ATAAC		
Engine speed:	2,200	rpm	Mfg data
Sea level hp:	300	hp	Mfg data
	3.0	%	Per 1,000 ft above 4,000 ft
Elevation	5,801	ft	Google Earth
Derated hp:	283.8	hp	Calculated
Conversion Factor	1.34	hp/kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000	lb/ton	
Hours of Operation	8,760	hr/yr	
Fuel Heating Value:	137,000	Btu/gal	AP-42
Fuel Usage Rate:	14.5	gal/hr	Calculated based on 7,000 Btu/hp-hr
Fuel Usage Rate:	127,022	gal/yr	

Emission Calculations

NOx[1]	CO	PM[2]	SO_2[3]		
2.83	2.61	0.15		g/hp-hr	EPA Tier 3 Emission Standards
			0.0021	lb/hp-hr	AP-42 Table 3.3-1
1.77	**1.63**	**0.093**	**0.58**	lb/hr	Hourly emission rate
7.77	**7.15**	**0.41**	**2.55**	tpy	Annual emission rate

VOC[4]	Total HAPs[5]	Toluene	Xylenes	Formaldehyde		
0.15					g/hp-hr	EPA Tier 3 Emission Standards
	3.42E-03	4.09E-05	2.85E-04	1.18E-03	lb/MMBtu	AP-42
0.093	**0.0068**	**8.12E-05**	**5.66E-04**	**2.34E-03**	lb/hr	Hourly emission rate
0.41	**0.030**	**3.56E-04**	**2.48E-03**	**1.03E-02**	tpy	Annual emission rate

CO_2	**CH_4**	**N_2O**	**CO_2e**		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
295.99	0.012	0.0024	297.01	lb/hr	
1,296.45	**0.053**	**0.0105**	**1,300.90**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factor for NOx is assumed to be 95% of the EPA Tier 3 emission factor for NOx + NMHC.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1.

[4] Emission factor for VOC is assumed to be 5% of the EPA Tier 3 emission factor for NOx + NMHC.

[5] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

Freeport-McMoRan Tyrone Inc.
ENV-101: Stormwater Pump Engine Emissions

Criteria Pollutant Emission Factors:

NOx:	Source: 2014 Title V Permit Renewal Application	
	NOx =	**0.0310 (lb/hp-hr)**
CO:	Source: 2014 Title V Permit Renewal Application	
	CO =	**0.0067 (lb/hp-hr)**
***PM:**	Source: 2014 Title V Permit Renewal Application	
	PM =	**0.0022 (lb/hp-hr)**
HC:	Source: 2014 Title V Permit Renewal Application	
	HC =	**0.0025 (lb/hp-hr)**
SO_2:	Source: 2014 Title V Permit Renewal Application	
	SO_2 =	**0.0021 (lb/hp-hr)**

* Tyrone uses the same emission factor for PM, PM_{10}, and $PM_{2.5}$

HAP Emission Factors:

Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-2.

Pollutant	Emission Factors	To convert from lb/MMBTU to lb/hp-hr: (Emission Factor/1E06 BTU) * (7,000 BTU/ hp-hr)
Benzene	9.33E-04 lb/MMBTU	6.53E-06 lb/hp-hr
Toluene	4.09E-04 lb/MMBTU	2.86E-06 lb/hp-hr
Xylenes	2.85E-04 lb/MMBTU	2.00E-06 lb/hp-hr
1,3-Butadiene	3.91E-05 lb/MMBTU	2.74E-07 lb/hp-hr
Formaldehyde	1.18E-03 lb/MMBTU	8.26E-06 lb/hp-hr
Acetaldehyde	7.67E-04 lb/MMBTU	5.37E-06 lb/hp-hr
Acrolein	9.25E-05 lb/MMBTU	6.48E-07 lb/hp-hr
Naphthalene	8.48E-05 lb/MMBTU	5.94E-07 lb/hp-hr
Total Polycyclic Aromatic Hydrocarbons (PAHs)	1.68E-04 lb/MMBTU	1.18E-06 lb/hp-hr
Total Hazardous Air Pollutants (HAPs)	3.96E-03 lb/MMBTU	2.77E-05 lb/hp-hr

Greenhouse Gas Emission Factors:

CO_2	73.96	kg/MMBtu	40 CFR 98 Table C-1
CH_4	0.003	kg/MMBtu	40 CFR 98 Table C-2
N_2O	0.0006	kg/MMBtu	40 CFR 98 Table C-2

Fuel	Diesel		
Equipment	Stationary Stormwater Pump Engine		
Number of Units	1		
Hours of Operation [hr/year]	8,760		
Fuel Heat Value (Btu/gal) (AP-42)	137,000		
Fuel Usage Rate (gal/hr)	6		
Fuel Usage Rate (gal/yr)	52,560		
Heat Rate (MMBtu/hr)	0.82		
Capacity [hp]	125		
	Diesel Combustion		
Criteria Pollutants	**Emission Factor [lb/hr]**	**Emission Rate [lb/yr]**	**Emission Rate [ton/yr]**
Nitrogen Oxides (NO_x)	3.875	33,945	16.973
Carbon Monoxide (CO)	0.838	7,337	3.6683
Particulate Matter (PM)	0.275	2,409	1.205
Hydrocarbons (HC)	0.313	2,738	1.369
Sulfur Dioxide (SO_2)	0.256	2,245	1.122
HAPs			
Benzene	8.16E-04	7.15	3.58E-03
Toluene	3.58E-04	3.13	1.57E-03
Xylenes	2.49E-04	2.18	1.09E-03
1,3-Butadiene	3.42E-05	0.30	1.50E-04
Formaldehyde	1.03E-03	9.04	4.52E-03
Acetaldehyde	6.71E-04	5.88	2.94E-03
Acrolein	8.09E-05	0.71	3.55E-04
Naphthalene	7.42E-05	0.65	3.25E-04
Total Polycyclic Aromatic Hydrocarbons (PAHs)	1.47E-04	1.29	6.44E-04
Total Hazardous Air Pollutants (HAPs)	3.46E-03	30.34	1.52E-02
Greenhouse Gases			
CO_2 (metric tpy)	122.48	1,072,905	536.45
CH_4 (metric tpy)	0.0050	43.5	0.022
N_2O (metric tpy)	0.00099	8.7	0.0044
CO_2e [1] (metric tpy)	--	--	**538.29**

Notes:

1. Based on Global Warming Potentials from 40 CFR 98, Table A-1 and a default HHV of 0.138 MMBtu/gal

Freeport-McMoRan Tyrone Inc.
ENV-111: Stormwater Pump Engine Emissions

Criteria Pollutant Emission Factors:

NOx:	Source: 2014 Title V Permit Renewal Application	
	NOx =	**0.0310 (lb/hp-hr)**
CO:	Source: 2014 Title V Permit Renewal Application	
	CO =	**0.0067 (lb/hp-hr)**
***PM:**	Source: 2014 Title V Permit Renewal Application	
	PM =	**0.0022 (lb/hp-hr)**
HC:	Source: 2014 Title V Permit Renewal Application	
	HC =	**0.0025 (lb/hp-hr)**
SO_2:	Source: 2014 Title V Permit Renewal Application	
	SO_2 =	**0.0021 (lb/hp-hr)**

* Tyrone uses the same emission factor for PM, PM_{10}, and $PM_{2.5}$

HAP Emission Factors:

Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-2.

Pollutant	Emission Factors	To convert from lb/MMBTU to lb/hp-hr: (Emission Factor/1E06 BTU) * (7,000 BTU/ hp-hr)
Benzene	9.33E-04 lb/MMBTU	6.53E-06 lb/hp-hr
Toluene	4.09E-04 lb/MMBTU	2.86E-06 lb/hp-hr
Xylenes	2.85E-04 lb/MMBTU	2.00E-06 lb/hp-hr
1,3-Butadiene	3.91E-05 lb/MMBTU	2.74E-07 lb/hp-hr
Formaldehyde	1.18E-03 lb/MMBTU	8.26E-06 lb/hp-hr
Acetaldehyde	7.67E-04 lb/MMBTU	5.37E-06 lb/hp-hr
Acrolein	9.25E-05 lb/MMBTU	6.48E-07 lb/hp-hr
Naphthalene	8.48E-05 lb/MMBTU	5.94E-07 lb/hp-hr
Total Polycyclic Aromatic Hydrocarbons (PAHs)	1.68E-04 lb/MMBTU	1.18E-06 lb/hp-hr
Total Hazardous Air Pollutants (HAPs)	3.96E-03 lb/MMBTU	2.77E-05 lb/hp-hr

Greenhouse Gas Emission Factors:

CO_2	73.96	kg/MMBtu	40 CFR 98 Table C-1
CH_4	0.003	kg/MMBtu	40 CFR 98 Table C-2
N_2O	0.0006	kg/MMBtu	40 CFR 98 Table C-2

Fuel	Diesel		
Equipment	Stationary Stormwater Pump Engine		
Number of Units	1		
Hours of Operation [hr/year][1]	8,760		
Fuel Heat Value (Btu/gal) (AP-42)	137,000		
Fuel Usage Rate (gal/hr)	6		
Fuel Usage Rate (gal/yr)	52,560		
Heat Rate (MMBtu/hr)	0.82		
Capacity [hp]	125		
	Diesel Combustion		
Criteria Pollutants	**Emission Factor [lb/hr]**	**Emission Rate [lb/yr]**	**Emission Rate [ton/yr]**
Nitrogen Oxides (NO_x)	3.875	33,945	16.973
Carbon Monoxide (CO)	0.838	7,337	3.668
Particulate Matter (PM)	0.275	2,409	1.205
Hydrocarbons (HC)	0.313	2,738	1.369
Sulfur Dioxide (SO_2)	0.256	2,245	1.122
HAPs			
Benzene	8.16E-04	7.15	3.58E-03
Toluene	3.58E-04	3.13	1.57E-03
Xylenes	2.49E-04	2.18	1.09E-03
1,3-Butadiene	3.42E-05	0.30	1.50E-04
Formaldehyde	1.03E-03	9.04	4.52E-03
Acetaldehyde	6.71E-04	5.88	2.94E-03
Acrolein	8.09E-05	0.71	3.55E-04
Naphthalene	7.42E-05	0.65	3.25E-04
Total Polycyclic Aromatic Hydrocarbons (PAHs)	1.47E-04	1.29	6.44E-04
Total Hazardous Air Pollutants (HAPs)	3.46E-03	30.34	1.52E-02
Greenhouse Gases			
CO_2 (metric tpy)	122.48	1,072,905	536.45
CH_4 (metric tpy)	0.0050	43.5	0.022
N_2O (metric tpy)	0.00099	8.7	0.0044
CO_2e [1] (metric tpy)	--	--	**538.29**

Notes:

1. Based on Global Warming Potentials from 40 CFR 98, Table A-1 and a default HHV of 0.138 MMBtu/gal

ENV-117 [John Deere 4045TF275 115hp]

Unit Number:	ENV-117
Source Description:	Diesel Powered Pump

Engine Info

Manufacturer:	John Deere		
Model:	4045TF275		
Sea level hp:	115	hp	Engine Nameplate
	3	%	Per 1,000 ft above 4,000 ft
Elevation	5,801	ft	
Derated hp:	109.1	hp	
Derated kW:	81.35	kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000	lb/ton	
Conversion Factor	1.34	hp/kW	
Hours of Operation	8,760	hr/yr	
Diesel Heating Value	137,000	Btu/gal	From AP-42
Fuel Usage Rate:	5.6	gal/hr	Calculated based on 7,000 Btu/hp-hr
Fuel Usage Rate:	48,831	gal/yr	

Emission Calculations

NOx[1]	CO	PM[2]	SO_2[3]		
4.18	0.89	0.22		g/hp-hr	FEL Certification Test for EPA Family No. 5JDXL06.8082 (nameplate)
			0.00205	lb/hp-hr	AP-42 Table 3.3-1
1.01	**0.22**	**0.052**	**0.22**	lb/hr	Hourly emission rate
4.40	**0.94**	**0.23**	**0.98**	tpy	Annual emission rate

VOC[4]	Total HAPs[5]	Toluene	Xylenes	Formaldehyde		
0.22					g/hp-hr	FEL Certification Test for EPA Family No. 5JDXL06.8082 (nameplate)
	3.42E-03	4.09E-05	2.85E-04	1.18E-03	lb/MMBtu	AP-42
0.053	**0.0026**	**3.12E-05**	**2.18E-04**	**9.01E-04**	lb/hr	Hourly emission rate
0.23	**0.011**	**1.37E-04**	**9.53E-04**	**0.0039**	tpy	Annual emission rate

CO_2	**CH_4**	**N_2O**	**CO_2e**		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
113.79	0.0046	0.0009	114.18	lb/hr	
498.39	**2.02E-02**	**4.04E-03**	**500.10**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factor for NOx is based on 95% of the FEL Certification Test for EPA Family No. 5JDXL06.8082 emission factor for NOx + NMHC.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1.

[4] Emission factor for VOC is based on 5% of the FEL Certification Test for EPA Family No. 5JDXL06.8082 emission factor for NOx + NMHC.

[5] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

Freeport-McMoRan Tyrone Inc.
ENV-122: Stormwater Pump Engine Emissions

Criteria Pollutant Emission Factors:

NOx:	Source: Tier 2 Emission Standards; 95% of NOx+NMHC	
	NOx =	**0.010 (lb/hp-hr)**
CO:	Source: Tier 2 Emission Standards	
	CO =	**0.0082 (lb/hp-hr)**
***PM:**	Source: Tier 2 Emission Standards	
	PM =	**0.00049 (lb/hp-hr)**
VOC:	Source: Tier 2 Emission Standards; 5% of NOx+NMHC	
	VOC =	**0.00054 (lb/hp-hr)**
SO_2:	Source: 2014 Title V Permit Renewal Application	
	SO_2 =	**0.0021 (lb/hp-hr)**

* Tyrone uses the same emission factor for PM, PM_{10}, and $PM_{2.5}$

HAP Emission Factors:

Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-2.

Pollutant	Emission Factors	To convert from lb/MMBTU to lb/hp-hr: (Emission Factor/1E06 BTU) * (7,000 BTU/ hp-hr)
Benzene	9.33E-04 lb/MMBTU	6.53E-06 lb/hp-hr
Toluene	4.09E-04 lb/MMBTU	2.86E-06 lb/hp-hr
Xylenes	2.85E-04 lb/MMBTU	2.00E-06 lb/hp-hr
1,3-Butadiene	3.91E-05 lb/MMBTU	2.74E-07 lb/hp-hr
Formaldehyde	1.18E-03 lb/MMBTU	8.26E-06 lb/hp-hr
Acetaldehyde	7.67E-04 lb/MMBTU	5.37E-06 lb/hp-hr
Acrolein	9.25E-05 lb/MMBTU	6.48E-07 lb/hp-hr
Naphthalene	8.48E-05 lb/MMBTU	5.94E-07 lb/hp-hr
Total Polycyclic Aromatic Hydrocarbons (PAHs)	1.68E-04 lb/MMBTU	1.18E-06 lb/hp-hr
Total Hazardous Air Pollutants (HAPs)	3.96E-03 lb/MMBTU	2.77E-05 lb/hp-hr

Greenhouse Gas Emission Factors:

CO_2	73.96	kg/MMBtu	40 CFR 98 Table C-1
CH_4	0.003	kg/MMBtu	40 CFR 98 Table C-2
N_2O	0.0006	kg/MMBtu	40 CFR 98 Table C-2

Fuel	Diesel		
Equipment	Stationary Stormwater Pump Engine (Cat 3054C)		
Number of Units	1		
Hours of Operation [hr/year]	8,760		
Fuel Heat Value (Btu/gal) (AP-42)	137,000		
Fuel Usage Rate (gal/hr)	6		
Fuel Usage Rate (gal/yr)	52,560		
Heat Rate (MMBtu/hr)	0.82		
Capacity [hp]	125		
	Diesel Combustion		
Criteria Pollutants	**Emission Factor [lb/hr]**	**Emission Rate [lb/yr]**	**Emission Rate [ton/yr]**
Nitrogen Oxides (NO_x)	1.29	11,295	5.65
Carbon Monoxide (CO)	1.03	9,008	4.50
Particulate Matter (PM)	0.062	540	0.27
Hydrocarbons (HC)	0.068	594	0.30
Sulfur Dioxide (SO_2)	0.26	2,245	1.12
HAPs			
Benzene	8.16E-04	7.15	3.58E-03
Toluene	3.58E-04	3.13	1.57E-03
Xylenes	2.49E-04	2.18	1.09E-03
1,3-Butadiene	3.42E-05	0.30	1.50E-04
Formaldehyde	1.03E-03	9.04	4.52E-03
Acetaldehyde	6.71E-04	5.88	2.94E-03
Acrolein	8.09E-05	0.71	3.55E-04
Naphthalene	7.42E-05	0.65	3.25E-04
Total Polycyclic Aromatic Hydrocarbons (PAHs)	1.47E-04	1.29	6.44E-04
Total Hazardous Air Pollutants (HAPs)	3.46E-03	30.34	1.52E-02
Greenhouse Gases			
CO_2 (metric tpy)	122.48	1,072,905	536.45
CH_4 (metric tpy)	0.0050	43.5	0.022
N_2O (metric tpy)	0.00099	8.7	0.0044
CO_2e [1] (metric tpy)	--	--	**538.29**

Notes:

1. Based on Global Warming Potentials from 40 CFR 98, Table A-1 and a default HHV of 0.138 MMBtu/gal

ENV-123 [Caterpillar 3126B 225hp]

Unit Number:	ENV-123	
Source Description:	Diesel Powered Pump	

Engine Info

Manufacturer:	Caterpillar		
Model:	3126B		
Sea level hp:	225	hp	Mfg data
	3	%	Per 1,000 ft above 4,000 ft
Elevation	5,801	ft	
Derated hp:	212.8	hp	
Derated kW:	158.72	kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2000	lb/ton	
Conversion Factor	1.34	hp/kW	
Hours of Operation	8,760	hr/yr	
Brake Specific Fuel Consumption	7,000	Btu/hp-hr	AP-42 Section 3.3
Diesel Heating Value	137,000	Btu/gal	From AP-42
Fuel Usage Rate:	10.9	gal/hr	Calculated
Fuel Usage Rate:	95,267	gal/yr	Calculated

Emission Calculations

NOx[1]	CO	PM[2]	SO_2[3]		
4.68	2.61	0.15		g/hp-hr	EPA Tier 2 Emissions Standards
			0.00205	lb/hp-hr	AP-42 Table 3.3-1
2.19	**1.22**	**0.0700**	**0.44**	lb/hr	Hourly emission rate
9.61	**5.36**	**0.307**	**1.91**	tpy	Annual emission rate

VOC[4]	Total HAPs[5]	Toluene	Xylenes	Formaldehyde		
0.25					g/hp-hr	EPA Tier 2 Emissions Standards
	3.42E-03	4.09E-05	2.85E-04	1.18E-03	lb/MMBtu	AP-42
0.115	**0.0051**	**6.09E-05**	**4.25E-04**	**1.76E-03**	lb/hr	Hourly emission rate
0.51	**0.022**	**2.67E-04**	**1.86E-03**	**7.70E-03**	tpy	Annual emission rate

CO_2	**CH_4**	**N_2O**	**CO_2e**		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
222.00	0.009	0.0018	222.76	lb/hr	
972.34	**0.039**	**0.0079**	**975.68**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factor for NOx is assumed to be 95% of the EPA Tier 2 emission factor for NOx + NMHC.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1

[4] Emission factor for VOC is assumed to be 5% of the EPA Tier 2 emission factor for NOx + NMHC.

[5] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

OP-2 [Perkins 403C-15 32.5hp]

Unit Number:	OP-2		
Source Description:	Diesel Powered Pump		

Engine Info

Manufacturer:	Perkins		
Model:	403C-15		
Engine speed:	3,000	rpm	Mfg data
Sea level hp:	32.5	hp	Mfg data
	3.0	%	Per 1,000 ft above 4,000 ft
Elevation	5,801	ft	Google Earth
Derated hp:	30.74	hp	Calculated
Conversion Factor	1.34	hp/kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000	lb/ton	
Hours of Operation	8,760	hr/yr	
Fuel Rate	3.70	L/hr	Manufacturer
Fuel Rate	0.98	gal/hr	
Fuel Usage Rate:	8,562	gal/yr	Calculated
Fuel Heating Value:	137,000	Btu/gal	AP-42

Emission Calculations

NOx[1]	CO	PM[2]	SO_2[3]		
5.3	4.10	0.45		g/hp-hr	EPA Tier 2 Emission Standards
			0.00205	lb/hp-hr	AP-42 Table 3.3-1
0.36	**0.28**	**0.030**	**0.0630**	lb/hr	Hourly emission rate
1.58	**1.22**	**0.13**	**0.28**	tpy	Annual emission rate

VOC[4]	Total HAPs[5]	Toluene	Xylenes	Formaldehyde		
0.28					g/hp-hr	EPA Tier 2 Emission Standards
	3.42E-03	4.09E-05	2.85E-04	1.18E-03	lb/MMBtu	AP-42
0.019	**0.00074**	**8.80E-06**	**6.13E-05**	**2.54E-04**	lb/hr	Hourly emission rate
0.083	**3.23E-03**	**3.86E-05**	**2.69E-04**	**1.11E-03**	tpy	Annual emission rate

CO_2	**CH_4**	**N_2O**	**CO_2e**		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
19.95	8.09E-04	1.62E-04		lb/hr	
87.39	**3.54E-03**	**7.09E-04**	**87.7**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factor for NOx is assumed to be 95% of the EPA Tier 2 emission factor for NOx + NMHC.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1.

[4] Emission factor for VOC is assumed to be 5% of the EPA Tier 2 emission factor for NOx + NMHC.

[5] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

Freeport-McMoRan Tyrone Inc.

OP-4 [Caterpillar C6.6 225hp]

Unit Number:	OP-4		
Source Description:	Diesel Powered Pump		

Engine Info

Manufacturer:	Caterpillar		
Model:	C6.6		
Sea level hp:	225	hp	Mfg data
	3	%	Per 1,000 ft above 4,000 ft
Elevation	5801	ft	
Derated hp:	212.8	hp	
Derated kW:	158.7	kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000	lb/ton	
Conversion Factor	1.34	hp/kW	
Hours of Operation	8,760	hr/yr	
Brake Specific Fuel Consumption	7,000	Btu/hp-hr	AP-42 Section 3.3
Diesel Heating Value	137,000	Btu/gal	From AP-42
Fuel Usage	10.9	gal/hr	Calculated
Fuel Usage	95,267	gal/yr	Calculated

Emission Calculations

NOx[1]	CO	PM[2]	SO_2[3]		
2.83	2.61	0.15		g/hp-hr	EPA Tier 3 Emission Standards
			0.00205	lb/hp-hr	AP-42 Table 3.3-1
1.33	**1.22**	**0.070**	**0.44**	lb/hr	Hourly emission rate
5.82	**5.36**	**0.31**	**1.91**	tpy	Annual emission rate

VOC[4]	Total HAPs	Toluene	Xylenes	Formaldehyde		
0.15					g/hp-hr	EPA Tier 3 Emission Standards
	3.42E-03	4.09E-05	2.85E-04	1.18E-03	lb/MMBtu	AP-42
0.070	**0.0051**	**6.09E-05**	**4.25E-04**	**1.76E-03**	lb/hr	Hourly emission rate
0.31	**0.022**	**2.67E-04**	**1.86E-03**	**7.70E-03**	tpy	Annual emission rate

CO_2	**CH_4**	**N_2O**	**CO_2e**		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
222.00	0.0090	0.0018	222.76	lb/hr	
972.34	**0.039**	**0.0079**	**975.68**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factor for NOx is assumed to be 95% of the EPA Tier 3 emission factor for NOx + NMHC.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1.

[4] Emission factor for VOC is assumed to be 5% of the EPA Tier 3 emission factor for NOx + NMHC.

[5] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

OP-7 [Caterpillar C7 225hp]

Unit Number:	OP-7		
Source Description:	Diesel Powered Pump		

Engine Info

Manufacturer:	Caterpillar		
Model:	C7		
Sea level hp:	225	hp	Mfg data
	3	%	Per 1,000 ft above 4,000 ft
Elevation	5801	ft	
Derated hp:	212.8	hp	
Derated kW:	158.7	kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000	lb/ton	
Conversion Factor	1.34	hp/kW	
Hours of Operation	8,760	hr/yr	
Brake Specific Fuel Consumption	7,000	Btu/hp-hr	AP-42 Section 3.3
Diesel Heating Value	137,000	Btu/gal	From AP-42
Fuel Usage	10.88	gal/hr	Calculated
Fuel Usage	95,267	gal/yr	Calculated

Emission Calculations

NOx[1]	CO	PM[2]	SO_2[3]		
2.83	2.61	0.15		g/hp-hr	EPA Tier 3 Emission Standards
			0.00205	lb/hp-hr	AP-42 Table 3.3-1
1.33	**1.22**	**0.0700**	**0.44**	lb/hr	Hourly emission rate
5.82	**5.36**	**0.31**	**1.91**	tpy	Annual emission rate

VOC[4]	Total HAPs[5]	Toluene	Xylenes	Formaldehyde		
0.15					g/hp-hr	EPA Tier 3 Emission Standards
	3.42E-03	4.09E-05	2.85E-04	1.18E-03	lb/MMBtu	AP-42
0.070	**0.0051**	**6.09E-05**	**4.25E-04**	**1.76E-03**	lb/hr	Hourly emission rate
0.31	**0.022**	**2.67E-04**	**1.86E-03**	**7.70E-03**	tpy	Annual emission rate

CO_2	**CH_4**	**N_2O**	**CO_2e**		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
222.00	0.0090	0.0018	222.76	lb/hr	
972.34	**0.039**	**0.0079**	**975.68**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factor for NOx is assumed to be 95% of the EPA Tier 3 emission factor for NOx + NMHC.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1.

[4] Emission factor for VOC is assumed to be 5% of the EPA Tier 3 emission factor for NOx + NMHC.

[5] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

OP-8 [Caterpillar C7 225hp]

Unit Number:	OP-8		
Source Description:	Diesel Engine		

Engine Info

Manufacturer:	Caterpillar		
Model:	C7		
Aspiration:	Turbocharged/ATAAC		
Engine speed:	2,200	rpm	Manufacturer data
Sea level hp:	225	hp	Manufacturer data
	3.0	%	Per 1,000 ft above 4,000 ft
Elevation	5,801	ft	Google Earth
Derated hp:	212.84	hp	Calculated
Conversion Factor	1.34	hp/kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000	lb/ton	
Hours of Operation	8,760	hr/yr	
Fuel Usage Rate	47.00	L/hr	Manufacturer data
Fuel Usage Rate	12.42	gal/hr	
Fuel Usage Rate	108,765	gal/yr	
Fuel Heating Value:	137,000	Btu/gal	AP-42

Emission Calculations

NOx[1]	CO	PM[2]	SO_2[3]		
2.83	2.61	0.15		g/hp-hr	EPA Tier 3 Emission Standards
			0.0021	lb/hp-hr	AP-42 Table 3.3-1
1.33	**1.22**	**0.070**	**0.4363**	lb/hr	Hourly emission rate
5.82	**5.36**	**0.31**	**1.91**	tpy	Annual emission rate

VOC[4]	Total HAPs[5]	Toluene	Xylenes	Formaldehyde		
0.15					g/hp-hr	EPA Tier 3 Emission Standards
	3.42E-03	4.09E-05	2.85E-04	1.18E-03	lb/MMBtu	AP-42
0.074	**0.0051**	**6.09E-05**	**4.25E-04**	**1.76E-03**	lb/hr	Hourly emission rate
0.32	**0.022**	**2.67E-04**	**1.86E-03**	**7.70E-03**	tpy	Annual emission rate

CO_2	**CH_4**	**N_2O**	**CO_2e**		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
253.45	0.010	0.0021	254.3	lb/hr	
1,110.11	**0.045**	**0.0090**	**1,113.9**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factor for NOx is assumed to be 95% of the EPA Tier 3 emission factor for NOx + NMHC.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1.

[4] Emission factor for VOC is assumed to be 5% of the EPA Tier 3 emission factor for NOx + NMHC.

[5] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

ENV-120 [Caterpillar C6.6 225hp]

Unit Number:	ENV-120
Source Description:	Diesel Engine

Engine Info

Manufacturer:	Caterpillar		
Model:	C6.6		
Engine speed:	2,200	rpm	Mfg data
Sea level hp:	225	hp	Mfg data
	3.0	%	Per 1,000 ft above 4,000 ft
Elevation	5,801	ft	
Derated hp:	212.8	hp	
Conversion Factor	1.34	hp/kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000	lb/ton	
Hours of Operation	8,760	hr/yr	
Fuel Usage	10.9	gal/hr	Calculated
Fuel Usage	95,267	gal/yr	Calculated
Fuel Heating Value:	137,000	Btu/gal	AP-42

Emission Calculations

NO_x[1]	CO	PM[2]	SO_2[3]		
2.83	2.61	0.15		g/hp-hr	EPA Tier 3 Emission Standards
			0.00205	lb/hp-hr	AP-42 Table 3.3-1
1.33	**1.22**	**0.070**	**0.436**	lb/hr	Hourly emission rate
5.82	**5.36**	**0.31**	**1.91**	tpy	Annual emission rate

VOC[4]	Total HAPs[5]	Toluene	Xylenes	Formaldehyde		
0.15					g/hp-hr	EPA Tier 3 Emission Standards
	3.42E-03	4.09E-05	2.85E-04	1.18E-03	lb/MMBtu	AP-42
0.070	**0.0051**	**6.09E-05**	**4.25E-04**	**1.76E-03**	lb/hr	Hourly emission rate
0.31	**0.022**	**2.67E-04**	**1.86E-03**	**7.70E-03**	tpy	Annual emission rate

CO_2	**CH_4**	**N_2O**	**CO_2e**		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
222.00	0.009	0.0018	222.8	lb/hr	
972.34	**0.039**	**0.0079**	**975.7**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factor for NOx is assumed to be 95% of the EPA Tier 3 emission factor for NOx + NMHC.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1.

[4] Emission factor for VOC is assumed to be 5% of the EPA Tier 3 emission factor for NOx + NMHC.

[5] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

Freeport-McMoRan Tyrone Inc.

EMP-1 [Caterpillar 3126 190hp]

Unit Number:	EMP-1		
Source Description:	Diesel Powered Pump		

Engine Info

Manufacturer:	Caterpillar		
Model:	3126		
Sea level hp:	190	hp	Mfg data
	3	%	Per 1,000 ft above 4,000 ft
Elevation	5801	ft	
Derated hp:	179.7	hp	
Derated kW:	134.0	kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000	lb/ton	
Conversion Factor	1.34	hp/kW	
Hours of Operation	8,760	hr/yr	
Brake Specific Fuel Consumption	7,000	Btu/hp-hr	AP-42 Section 3.3
Diesel Heating Value	137,000	Btu/gal	From AP-42
Fuel Usage	9.2	gal/hr	Calculated
Fuel Usage	80,447	gal/yr	Calculated

Emission Calculations

NOx[1]	CO[1]	PM[1,2]	SO_2[3]		
6.9	8.5	0.40		g/hp-hr	EPA Tier 1 Emission Standards
			0.00205	lb/hp-hr	AP-42 Table 3.3-1
2.72	**3.37**	**0.160**	**0.37**	lb/hr	Hourly emission rate
11.91	**14.75**	**0.70**	**1.61**	tpy	Annual emission rate

VOC[1]	Total HAPs[4]	Toluene	Xylenes	Formaldehyde		
1.0					g/hp-hr	EPA Tier 1 Emission Standards
					lb/hp-hr	AP-42 Table 3.3-1
	0.00342	4.09E-05	2.85E-04	0.00118	lb/MMBtu	AP-42 Table 3.3-2
0.38	**0.0043**	**5.15E-05**	**3.59E-04**	**1.48E-03**	lb/hr	Hourly emission rate
1.68	**0.019**	**2.25E-04**	**1.57E-03**	**6.50E-03**	tpy	Annual emission rate

CO_2	**CH_4**	**N_2O**	**CO_2e**		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
187.46	0.0076	0.0015	188.11	lb/hr	
821.09	**0.033**	**0.0067**	**823.90**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factors for NO_X, CO, PM, and VOC are based on Tier 1 Emission Standards.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1.

[4] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

Freeport-McMoRan Tyrone Inc.

EMP-2 [Caterpillar 3126B 200hp]

Unit Number:	EMP-2
Source Description:	Diesel Powered Pump

Engine Info

Manufacturer:	Caterpillar		
Model:	3126B		
Sea level hp:	200	hp	Mfg data
	3	%	Per 1,000 ft above 4,000 ft
Elevation	5801	ft	
Derated hp:	189.2	hp	
Derated kW:	141.1	kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000	lb/ton	
Conversion Factor	1.34	hp/kW	
Hours of Operation	8,760	hr/yr	
Brake Specific Fuel Consumption	7,000	Btu/hp-hr	AP-42 Section 3.3
Diesel Heating Value	137,000	Btu/gal	From AP-42
Fuel Usage	9.7	gal/hr	Calculated
Fuel Usage	84,682	gal/yr	Calculated

Emission Calculations

NOx[1]	CO	PM[2]	SO_2[3]		
4.68	2.61	0.15		g/hp-hr	EPA Tier 2 Emissions Standards
			0.00205	lb/hp-hr	AP-42 Table 3.3-1
1.95	**1.09**	**0.062**	**0.39**	lb/hr	Hourly emission rate
8.54	**4.77**	**0.27**	**1.70**	tpy	Annual emission rate

VOC[4]	Total HAPs[5]	Toluene	Xylenes	Formaldehyde		
0.25					g/hp-hr	EPA Tier 2 Emissions Standards
	3.42E-03	4.09E-05	2.85E-04	1.18E-03	lb/MMBtu	AP-42
0.103	**0.0045**	**5.42E-05**	**3.77E-04**	**1.56E-03**	lb/hr	Hourly emission rate
0.45	**0.020**	**2.37E-04**	**1.65E-03**	**6.84E-03**	tpy	Annual emission rate

CO_2	CH_4	N_2O	CO_2e		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98, Tables C-1 and C-2
163.1	0.0066	0.00132		lb/MMBtu	
1	25	298		GWP	40 CFR 98, Table A-1
197.33	0.008	0.0016	198.0	lb/hr	
864.30	**0.035**	**0.007**	**867.3**	**tpy (metric)**	40 CFR 98, Equations C-1 and C-8, Table C-1 (default HHV of 0.138 MMBtu/gal)

Footnotes:

[1] Emission factor for NOx is assumed to be 95% of the EPA Tier 2 emission factor for NOx + NMHC.

[2] It is assumed that TSP = PM_{10} = $PM_{2.5}$.

[3] Sulfur content is taken from AP-42 Table 3.3-1.

[4] Emission factor for VOC is assumed to be 5% of the EPA Tier 2 emission factor for NOx + NMHC.

[5] Total HAPs are based on AP-42 Table 3.3.2 and an average brake-specific fuel consumption rate of 7,000 Btu/hp-hr.

Freeport-McMoRan Tyrone Inc.

Indian Peak Generator

Unit No(s):	IPG			
Description:	Indian Peak Generator			

Engine Data

Horsepower:	18.8	hp	Manufacturer Data	(14kW)
Fuel usage:	279	ft3/hr	MFG Data	
Fuel heat value:	2500	Btu/scf	Nominal for propane	
Heating rate:	0.70	MMBtu/hr		
Fuel usage:	2.79E-04	MMscf/hr		
	2.4	MMscf/yr		
Operating hours:	8760.0	hours/year		

Emission Rates

$HC + NO_X$[1]	NO_x[1]	CO[1]	HC (VOC)[1]	SO_2[2]	PM[3]	Total HAPs[4]	Toluene[4]	Xylenes[4]		
7.5	7.125	610	0.375						g/kW-hr	NSPS JJJJ limit
					0.010				lb/MMBtu	AP-42 Table 3.2-2
0.23	**0.22**	**18.83**	**0.012**	**0.0028**	**6.97E-03**	**9.91E-03**	**4.57E-05**	**2.28E-05**	**lb/hr**	
1.01	**0.96**	**82.46**	**0.051**	**0.012**	**0.031**	**0.043**	**2.00E-04**	**1.00E-04**	**tpy (8760 hours)**	

Greenhouse Gas Emissions

CO_2	CH_4	N_2O	CO_2e		
53.06	0.0010	0.00010		kg/MMBtu	40 CFR 98 Subpart C
357.37	**6.74E-03**	**6.74E-04**	**357.74**	**tpy**	
1	25	298		GWP	

Notes

[1] NOx, CO, and VOC emissions based on NSPS JJJJ limits for nonhandheld Class II engines.
NMHC and NO_X combined emission factor was broken down assuming 5% NMHC and 95% NO_X per CARB policy dated June 28, 2004.

[2] SO_2 emissions are based on the average national sulfur content of LPG which is 0.012% by mass (approximately 2.6 g of SO2/GJ of heat input) per Appendix K-2 of undated document at US Department of Energy website:
http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/k-2.pdf

[3] PM emission were calculated using AP-42 Table 3.2-2. It is assumed that TSP = PM_{10} = $PM_{2.5}$

[4] HAPs calculated using GRI HAPCalc 3.01

Nordberg Engine and CE-1 Emission Factors

A. Dual Fuel Engine - Natural Gas with Diesel

CO: Source: NSR Permit No. 2448A-R1, Condition 2.d)
Average Value = **2.857E+01 [lb/hr]**

NOx: Source: 2005 Cubix Emission Tests
Average Value = **3.434E+01 [lb/hr]**

Note: AP-42 Chapter 3.4, Large Stationary Diesel and All Stationary Dual-Fuel Engines, does not have emission factors for particulates. Therefore, particulate emission factors from AP-42 Chapter 3.2, Natural Gas-Fired Reciprocating Engines, were selected to estimate particulate emissions for dual fuel engine combustion of natural gas.

Natural gas-fired engine Brake Specific Fuel Consumption of 7500 Btu/hp-hr is from US Department of the Interior document

$PM_{2.5}$: Source: AP-42 Chapter 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-3
$PM_{2.5}$ = 9.50E-03 lb/MMBtu
9.50E-03 lb/MMBtu * 7500 Btu/hp-hr * 1MMBtu/1E06Btu = **7.13E-05 [lb/hp-hr]**

PM_{10} : Source: AP-42 Chapter 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-3
PM_{10} = 9.50E-03 lb/MMBtu
9.50E-03 lb/MMBtu * 7500 Btu/hp-hr * 1MMBtu/1E06Btu = **7.13E-05 [lb/hp-hr]**

TSP: Source: AP-42 Chapter 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-3
TSP = 9.91E-03 lb/MMBtu
9.91E-03 lb/MMBtu * 7500 Btu/hp-hr * 1MMBtu/1E06Btu = **7.43E-05 [lb/hp-hr]**

SO_2 : Source: AP-42, Chapter 3.4 Large Stationary Diesel and All Stationary Dual-Fuel Engines, Table 3.4-1
$SO_2 = 4.06E-4*S_1 + 9.57E-3*S_2$ [lb/hp-hr] where: S_1 = % sulfur in fuel oil
S_2 = % sulfur in natural gas

For Tyrone:	% sulfur in fuel oil	0.05	% (500 ppm low sulfur diesel fuel)
	% sulfur in natural gas	0.00104	% (10.4 ppm S in natural gas)

SO_2 = **3.0253E-05 (lb/hp-hr)**

VOC: Source: 1997 Cubix Emission Tests
Average Value = **1.040 (lb/hr)**

HAPs: Source: AP-42, Chapter 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-2

Pollutant	Emission Factor	To convert from lb/MMBTU to lb/hp-hr: (Emission Factor/1E06 BTU) * (7500 BTU/ hp-hr) =
Formaldehyde	5.28E-02 lb/MMBTU	**3.96E-04 lb/hp-hr**

B. Non-Dual Fuel Engine - Diesel Combustion

CO: Source: 2005 Cubix Emission Tests
Average Value = **1.036E+01 (lb/hr)**

NOx: Source: 2004 Cubix Emission Tests
Average Value = **4.997E+01 (lb/hr)**

$PM_{2.5}$: Source: AP-42 Chapter 3.4 Large Stationary Diesel and All Stationary Dual-Fuel Engines, Table 3.4-2
$PM_{2.5}$ = 0.0479 (lb/MMBTU)

To convert from lb/MMBTU to lb/hp-hr:
(0.0479 lb/1E06 BTU) * (7000 BTU/ hp-hr) = **3.353E-04 (lb/hp-hr)**

Diesel Brake Specific Fuel Consumption of 7000 Btu/hp-hr is from Note e of Table 3.4-1.

PM_{10}: Source: AP-42 Chapter 3.4 Large Stationary Diesel and All Stationary Dual-Fuel Engines, Table 3.4-2
PM_{10} = 0.0573 (lb/MMBTU)

(0.0573 lb/1E06 BTU) * (7000 BTU/ hp-hr) = **4.01E-04 (lb/hp-hr)**

TSP: Source: AP-42 Chapter 3.4 Large Stationary Diesel and All Stationary Dual-Fuel Engines, Table 3.4-2
TSP = 0.0697 (lb/MMBTU)

To convert from lb/MMBTU to lb/hp-hr:
(0.0697 lb/1E06 BTU) * (7000 BTU/ hp-hr) = **4.88E-04 (lb/hp-hr)**

SO_2: Source: AP-42 Chapter 3.4 Large Stationary Diesel and All Stationary Dual-Fuel Engines, Table 3.4-1
SO_2 = 8.09E-03*S_1 [lb/hp-hr] where S_1 = % sulfur in fuel oil

For Tyrone % sulfur in fuel oil = 0.05 % (500 ppm low sulfur diesel fuel)
Emission factor for SO_2 = **4.045E-04 (lb/hp-hr)**

VOC: 1997 Cubix Emission Tests
Average Value = **2.9 (lb/hr)**

HAPs: Source: AP-42, Chapter 3.4 Large Stationary Diesel and All Stationary Dual-Fuel Engines, Tables 3.4-3 and 3.4-4

Pollutant	Emission Factors	To convert from lb/MMBTU to lb/hp-hr: (Emission Factor/1E06 BTU) * (7000 BTU/ hp-hr) =
Benzene	7.76E-04 lb/MMBTU	**5.43E-06 lb/hp-hr**
Toluene	2.81E-04 lb/MMBTU	**1.97E-06 lb/hp-hr**
Xylenes	1.93E-04 lb/MMBTU	**1.35E-06 lb/hp-hr**
Formaldehyde	7.89E-05 lb/MMBTU	**5.52E-07 lb/hp-hr**
Acetaldehyde	2.52E-05 lb/MMBTU	**1.76E-07 lb/hp-hr**
Acrolein	7.88E-06 lb/MMBTU	**5.52E-08 lb/hp-hr**
Naphthalene	1.30E-04 lb/MMBTU	**9.10E-07 lb/hp-hr**
Total Polycyclic Aromatic	2.12E-04 lb/MMBTU	**1.48E-06 lb/hp-hr**
Total Hazardous Air Pollutants	1.70E-03 lb/MMBTU	**1.19E-05 lb/hp-hr**

C. Cold Start Compressor Engine and 7A Screening Plant Engine - Diesel Combustion

CO: Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1
CO = **6.68E-03 (lb/hp-hr)**

NOx: Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1
NOx = **0.031 (lb/hp-hr)**

$PM_{2.5}$: Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1
$PM_{2.5}$ = **2.20E-03 (lb/hp-hr)**
Note: no published value for $PM_{2.5}$, assumed equal to PM_{10}

PM_{10}: Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1
PM_{10} = **2.20E-03 (lb/hp-hr)**

TSP : Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1
PT = No Data

SO_2: Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1
SO_2 = **2.05E-03 (lb/hp-hr)**

VOC: Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1
VOC = **2.51E-03 (lb/hp-hr)** (VOC as total TOC)

D. Cold Start Compressor Engine and 1A, 7A Screening Plant Engines - Diesel Combustion
HAPs: Source: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-2.

Pollutant	Emission Factors	To convert from lb/MMBTU to lb/hp-hr: (Emission Factor/1E06 BTU) * (7,000 BTU/ hp-hr) =
Benzene	9.33E-04 lb/MMBTU	**6.53E-06 lb/hp-hr**
Toluene	4.09E-04 lb/MMBTU	**2.86E-06 lb/hp-hr**
Xylenes	2.85E-04 lb/MMBTU	**2.00E-06 lb/hp-hr**
1,3-Butadiene	3.91E-05 lb/MMBTU	**2.74E-07 lb/hp-hr**
Formaldehyde	1.18E-03 lb/MMBTU	**8.26E-06 lb/hp-hr**
Acetaldehyde	7.67E-04 lb/MMBTU	**5.37E-06 lb/hp-hr**
Acrolein	9.25E-05 lb/MMBTU	**6.48E-07 lb/hp-hr**
Naphthalene	8.48E-05 lb/MMBTU	**5.94E-07 lb/hp-hr**
Total Polycyclic Aromatic	1.68E-04 lb/MMBTU	**1.18E-06 lb/hp-hr**
Total Hazardous Air Pollutants	3.96E-03 lb/MMBTU	**2.77E-05 lb/hp-hr**

Note: Brake Specific Fuel Consumption of 7,000 Btu/hp-hr is from Note E of Table 3.4-1.

Freeport-McMoRan Tyrone Inc.

Nordberg Engines and CE-1 Emission Calculations

Power Plant Emissions - PPG-3 Diesel

Fuel	Dual-Fuel				Diesel				Diesel				**Permitted Operating Hours**			
Equipment	Nordberg FSG-1316-HSC Engines (Units PPG-1, 3, 4, 7, 8, 11, 12, 13, and 14)				Nordberg FSG-1316-HSC Engines (Units PPG-1, 3, 4, 7, 8, 11, 12, 13, 14, and 15)				Ford-New Holland Compressor (Unit CE-1)				3,000	Nordberg Engine Permitted Hours		
Number of Units	1				1				1				500	CE-1 Permitted Hours		
Hours of Operation [hr/year]	255				255				500							
Fuel Usage	7,500	Btu/hp-hr	US Dept. of Interior		7,000	Btu/hp-hr										
Capacity [hp]	3,090				3,090				100				**Total PPG Emissions (Does not include compressor engine)**			
	Dual-Fuel Combustion (PPGs)				**Diesel Combustion (PPGs)**				**Diesel Combustion (CE-1)**							
Criteria Pollutants	**Emission Factor[1]**	**Units**	**Emission Rate [lb/yr]**	**Emission Rate [ton/yr]**	**Emission Factor**	**Units**	**Emission Rate [lb/yr]**	**Emission Rate [ton/yr]**	**Emission Factor [lb/hp-hr]**	**Emission Rate [lb/yr]**	**Emission Rate [ton/yr]**	**Emission Rate [lb/hr]**	**Annual Dual-Fuel Emission Rate [ton/yr][2]**	**Hourly Dual-Fuel Emission Rate [lb/hr][3, 4]**	**Hourly Diesel Emission Rate [lb/hr][5]**	**Annual Maximum Emission Rate (tpy)**
Nitrogen Oxides (NO_x)	34.34	[lb/hr]	8,756.7	**4.38**	49.97	[lb/hr]	12,742.4	**6.37**	0.031	1,550.0	**0.78**	3.10	4.38	34.34	**49.97**	6.37
Carbon Monoxide (CO)	28.57	[lb/hr]	7,285.4	**3.64**	10.36	[lb/hr]	2,641.8	**1.32**	6.68E-03	334.0	**0.17**	0.67	3.64	**28.57**	10.36	3.64
Particulate Matter ($PM_{2.5}$)	7.13E-05	[lb/hp-hr]	56.1	**0.028**	3.35E-04	[lb/hp-hr]	264.2	**0.13**	2.20E-03	110.0	**0.055**	0.22	0.03	0.22	**1.04**	0.13
Particulate Matter (PM_{10})	7.13E-05	[lb/hp-hr]	56.1	**0.028**	4.01E-04	[lb/hp-hr]	316.0	**0.16**	2.20E-03	110.0	**0.055**	0.22	0.03	0.22	**1.24**	0.16
Total Suspended Particulates (TSP)	7.43E-05	[lb/hp-hr]	58.6	**0.029**	4.88E-04	[lb/hp-hr]	384.4	**0.19**	2.20E-03	110.0	**0.055**	0.22	0.03	0.23	**1.51**	0.19
Sulfur Dioxide (SO_2)	3.03E-05	[lb/hp-hr]	23.8	**0.012**	4.05E-04	[lb/hp-hr]	318.7	**0.16**	2.05E-03	102.5	**0.051**	0.21	0.01	0.09	**1.25**	0.16
Volatile Organic Compounds (VOC)	1.04	[lb/hr]	265.2	**0.13**	2.9	[lb/hr]	739.5	**0.37**	2.51E-03	125.5	**0.063**	0.25	0.13	1.04	**2.90**	0.37
Hazardous Air Pollutants (HAPs)[6]																
Benzene	-	-	-	-	5.43E-06	[lb/hp-hr]	4.28	**2.14E-03**	6.53E-06	0.33	**1.63E-04**	6.53E-04	-	-	**1.68E-02**	2.14E-03
Toluene	-	-	-	-	1.97E-06	[lb/hp-hr]	1.55	**7.75E-04**	2.86E-06	0.14	**7.16E-05**	2.86E-04	-	-	**6.08E-03**	7.75E-04
Xylenes	-	-	-	-	1.35E-06	[lb/hp-hr]	1.06	**5.32E-04**	2.00E-06	0.10	**4.99E-05**	2.00E-04	-	-	**4.17E-03**	5.32E-04
1,3-Butadiene	-	-	-	-	-	-	-	-	2.74E-07	0.014	**6.84E-06**	2.74E-05	-	-	-	--
Formaldehyde	3.96E-04	[lb/hp-hr]	312.0	**0.16**	5.52E-07	[lb/hp-hr]	0.44	**2.18E-04**	8.26E-06	0.41	**2.07E-04**	8.26E-04	0.16	**1.22**	1.71E-03	1.56E-01
Acetaldehyde	-	-		-	1.76E-07	[lb/hp-hr]	0.14	**6.95E-05**	5.37E-06	0.27	**1.34E-04**	5.37E-04	-	-	**5.45E-04**	6.95E-05
Acrolein	-	-	-	-	5.52E-08	[lb/hp-hr]	0.043	**2.17E-05**	6.48E-07	0.032	**1.62E-05**	6.48E-05	-	-	**1.70E-04**	2.17E-05
Naphthalene	-	-	-	-	9.10E-07	[lb/hp-hr]	0.72	**3.59E-04**	5.94E-07	0.030	**1.48E-05**	5.94E-05	-	-	**2.81E-03**	3.59E-04
Total PAHs	-	-	-	-	1.48E-06	[lb/hp-hr]	1.17	**5.85E-04**	1.18E-06	0.059	**2.94E-05**	1.18E-04	-	-	**4.59E-03**	5.85E-04
Total HAPs	-	-	-	-	1.19E-05	[lb/hp-hr]	9.40	**4.70E-03**	2.77E-05	1.39	**6.93E-04**	2.77E-03	-	-	**3.69E-02**	4.70E-03

Footnotes:

[1] See 'Engine Emission Factors' tab for specific emission factor references.

[2] The annual dual-fuel emission rate is the sum of dual-fuel operation for 2,400 hr/yr and diesel operation for 600 hr/yr. The 2,400 hr/yr of dual-fuel operaion is 80% of the total 3,000 allowable hours and the 600 hr/yr of diesel operation is 20% of the total 3,000 allowable hours.

[3] Hourly dual-fuel emission rates are based on applying the hourly dual-fuel emission factor to all 10 Nordbergs operating simultaneously. The actual average daily hourly rate would be less than this value.

[4] Hourly dual-fuel HAPs emission rates for HAPs without a lb/hp-hr emission factor are based on the annual emission rate divided by 3,000 hr/yr.

[5] The hourly diesel emission rate is based on applying the hourly diesel emission factor to all 10 Nordbergs operating simultaneously. The actual average daily hourly rate would be less than this value.

[6] Among the HAP emission factors available in AP-42, Chapter 3.2, Natural Gas-Fired Reciprocating Engines, the emission factor for formaldehyde is the highest and is used here to represent HAP emissions. AP-42 emission factors for other HAPs generated from natural gas combustion in reciprocating engines are orders of magnitude less than formaldehyde and result in negligible emissions even when combined with formaldehyde emissions.

Freeport-McMoRan Tyrone Inc.

Nordberg Engines and CE-1 Greenhouse Gas Calculations

Unit Numbers:	PPG-1, 3, 4, 7, 8, 11-15; CE-1
Source description:	Dual fire engines; Diesel cold-start engine

Nordberg Engines Units PPG-1, 3, 4, 7, 8, 11-15

Hours of Operation	3000	Maximum annual hours of operation for all engines
Horsepower	3090	hp
Fuel Usage	7,500	Btu/hp-hr For dual fire scenario, from US Department of Interior
Heat Rate	23.2	MMBtu/hr
Number of engines	10	

Total Emissions

Diesel

CO_2	CH_4	N_2O	CO_2e		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98 Subpart C
163.1	0.0066	0.00132		lb/MMBtu	
5668.15	**0.23**	**0.046**	**5687.60**	**tpy**	

Dual-Fired

CO_2	CH_4	N_2O	CO_2e		
53.06	0.001	0.0001		kg/MMBtu	40 CFR 98 Subpart C
117.0	0.0022	0.00022		lb/MMBtu	
4066.42	0.077	0.0077	4070.62	tpy	

Maximum

CO_2	CH_4	N_2O	CO_2e	
5668.15	**0.23**	**0.05**	**5687.60**	**tpy**

Diesel Cold-Start Engine Unit CE-1

Hours of Operation	500	Maximum annual hours of operation
Horsepower	1000	hp
Fuel Usage	158	gal/hr
Fuel Heating Value	137000	Btu/gal
Heat Rate	21.6	MMBtu/hr

CO_2	CH_4	N_2O	CO_2e		
73.96	0.003	0.0006		kg/MMBtu	40 CFR 98 Subpart C
163.1	0.0066	0.0013		lb/MMBtu	
882.37	**0.036**	**0.0072**	**885.39**	**tpy**	

	CO_2	CH_4	N_2O	
GWP	1	25	298	Table A-1 of 40 CFR 98 Subpart A

Section 7

Information Used To Determine Emissions

Information Used to Determine Emissions shall include the following:

- ☐ If manufacturer data are used, include specifications for emissions units and control equipment, including control efficiencies specifications and sufficient engineering data for verification of control equipment operation, including design drawings, test reports, and design parameters that affect normal operation.
- ☐ If test data are used, include a copy of the complete test report. If the test data are for an emissions unit other than the one being permitted, the emission units must be identical. Test data may not be used if any difference in operating conditions of the unit being permitted and the unit represented in the test report significantly effect emission rates.
- ☑ If the most current copy of AP-42 is used, reference the section and date located at the bottom of the page. Include a copy of the page containing the emissions factors, and clearly mark the factors used in the calculations.
- ☐ If an older version of AP-42 is used, include a complete copy of the section.
- ☑ If an EPA document or other material is referenced, include a complete copy.
- ☐ Fuel specifications sheet.
- ☐ If computer models are used to estimate emissions, include an input summary (if available) and a detailed report, and a disk containing the input file(s) used to run the model. For tank-flashing emissions, include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., permit or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis.

This section describes the information used to determine emissions for the new operating scenarios that are included in this permit application. Calculations for all other emission sources have remained the same since permit application M6 was submitted and are not being included in this submittal.

Mine Blasting (Fugitive)

- "NOx Emissions from Blasting Operations in Open-Cut Coal Mining" by Moetaz I. Attalla, Stuart J. Day, Tony Lange, William Lilley, and Scott Morgan (2008).
- "Factors Affecting Anfo Fumes Production" by James H. Rowland III and Richard Mainiero (2001)
- AP-42 Table 11.9-1
- 40 CFR 98 Subpart A, Table A-1
- 40 CFR 98 Subpart C, Tables C-1 and C-2

Mine Handling (Fugitive)

- AP-42 Chapter 11.19.2

Mine Hauling (Fugitive)

- AP-42 Chapter 13.2.2
- NMED Memo: “Department Accepted Values for: Aggregate Handling, Storage Pile, and Haul Road Emissions”
- Western Regional Air Partnership (WRAP) Fugitive Dust Handbook, September 7, 2006

Section 7

Information Used to Determine Emissions

Mine Blasting (Fugitives)

- "NOx Emissions from Blasting Operations in Open-Cut Coal Mining" by Moetaz I. Attalla, Stuart J. Day, Tony Lange, William Lilley, and Scott Morgan (2008).
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- AP-42 Table 11.9-1
- 40 CFR 98 Subpart A, Table A-1
- 40 CFR 98 Subpart C, Tables C-1 and C-2

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NO_x emissions from blasting operations in open-cut coal mining

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ABSTRACT

The Australian coal mining industry, as with other industries is coming under greater constraints with respect to their environmental impacts. Emissions of acid gases such as NO_x and SO_x to the atmosphere have been regulated for many years because of their adverse health effects. Although NO_x from blasting in open-cut coal mining may represent only a very small proportion of mining operations' total NO_x emissions, the rapid release and high concentration associated with such activities may pose a health risk. This paper presents the results of a new approach to measure these gas emissions by scanning the resulting plume from an open-cut mine blast with a miniaturised ultraviolet spectrometer. The work presented here was undertaken in the Hunter Valley, New South Wales, Australia during 2006. Overall this technique was found to be simpler, safer and more successful than other approaches that in the past have proved to be ineffective in monitoring these short lived plumes. The average emission flux of NO_x from the blasts studied was about 0.9 kt t^{-1} of explosive. Numerical modelling indicated that NO_x concentrations resulting from the blast would be indistinguishable from background levels at distances greater than about 5 km from the source.

1. Introduction

Open-cut coal mining is widespread in the upper Hunter Valley in New South Wales (NSW) with several large mines operating within close proximity to the towns of Muswellbrook and Singleton. Consequently, there is community concern about the potential environmental impacts of mining on nearby populations.

Blasting, in particular, has the potential to affect areas outside the mine boundary and accordingly, vibration and dust emission limits are set in each mine's environmental licence. However, gaseous emissions of environmental concern, such as nitrogen dioxide (NO_2) may also be released during blasting operations. Currently, there are very little quantitative data relating to the magnitude of these emissions and it is not yet possible to determine if they contribute significantly to ambient levels in the main population centres.

The explosive ammonium nitrate/fuel oil (ANFO) is used almost universally throughout the open-cut coal mining industry. Under ideal conditions, the only gaseous products from the explosion are carbon dioxide (CO_2), water (H_2O) and nitrogen (N_2).

$$3NH_4NO_3 + CH_2 \rightarrow 3N_2 + CO_2 + 7H_2O \quad (1)$$

However, even quite small changes in the stoichiometry (either in the bulk material or caused by localised conditions such as moisture in the blast hole, mineral matter or other factors) can lead to the formation of substantial amounts of the toxic gases carbon monoxide (CO) and nitric oxide (NO) as shown.

$$2NH_4NO_3 + CH_2 \rightarrow 2N_2 + CO + 5H_2O \quad (2)$$

$$5NH_4NO_3 + CH_2 \rightarrow 4N_2 + 2NO + CO_2 + 7H_2O \quad (3)$$

In addition, some of the NO formed may oxidise in the presence of oxygen (O_2) to produce NO_2.

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$$2NO + O_2 \rightarrow 2NO_2 \quad (4)$$

Often in practice, large quantities of NO_2 are released from blasts which are observed as intense orange plumes.

Although these gases are not considered in their environmental licences, each mine is required to estimate annual emissions of CO, NO_x and SO_2 for the National Pollutant Inventory (NPI), compiled each year by the Australian government. These estimates are made by multiplying the amount of explosive consumed by an emission factor which is currently 8 kg t^{-1} for NO_x, 34 kg t^{-1} for CO and 1 kg t^{-1} for SO_2 (National Pollutant Inventory, 1999). These emission factors, however, are based on limited overseas data and are subject to high uncertainty.

Most of the studies which have examined NO_x formation from blasting have used blast chambers. The results from these studies do not necessarily correlate with what is observed during actual blasts. Few studies have attempted to measure NO_x emissions under actual field conditions, presumably because of the practical difficulties involved. Plumes from blasting lack confinement, can be very large in size and are affected by prevailing weather conditions. There is also a large quantity of dust associated with the blast and these factors combine to make physical sampling of the plume very difficult. There are also the obvious safety implications which restrict access to blast sites. Consequently, quantitative measurements of plume characteristics are generally unavailable. Nevertheless, it is important for mine operators, particularly when their operations are close to residential areas, to have some method for assessing NO_x formation and more importantly, predicting the severity of the NO_x plume. At present predictions of NO_x formation are subjective and are based on the blast engineer's knowledge of the area to be blasted (e.g. rock type, area of the mine, presence of water in the holes, etc.) and the ratings obtained from blasts performed under similar conditions. Quantitative flux estimations of NO_x released from a blast require measurement of concentration through the plume in both the horizontal and vertical axes.

Some of the options available to make these measurements are given in the following sections.

1.1. Physical sampling

Sampling of blasting fumes involves taking a sample of gas from the plume for subsequent analysis, which could be either on site or in an off site laboratory. Although physical sampling could in principle provide sufficient information to characterise a plume, there are a number of serious logistical problems with this approach:

- The size of the plume means that a large number of sample points would be required to sample across the width and height of the plume.
- The force of the explosion and the resulting debris would restrict the proximity of any sampling packages to the initial gas release.
- The potential toxicity of the plume; personnel cannot move through it to take samples, hence sampling stations must be fixed prior to the blast. This means that the path of the plume must be anticipated before the blast.

1.2. Continuous analysis

Another option is to use portable analysers to measure NO_x concentrations in real time. There are, however, disadvantages with this approach since a sample of the plume must be presented to the instrument for analysis. Usually a pump draws air through a small diameter tube into the instrument, but to achieve the necessary spatial characterisation of the plume, sample tubes would need to be positioned at various points throughout the plume. Thus many of the problems identified for the physical sampling would also apply to the use of continuous analysers.

1.3. Optical methods

There are several optical methods of analysis currently available that may be applicable to field measurements of NO_x. These include open-path Fourier Transform Infra-Red Spectroscopy (FT-IR), Correlation Spectroscopy (COSPEC) and Differential Optical Absorption Spectroscopy (DOAS). FT-IR has often been used in air pollution studies (e.g. Levine and Russwurm, 1994). It has also been used in mine situations to measure fugitive methane emissions. Kirchgessner et al. (1993) used open-path FT-IR (op-FT-IR) to estimate methane emissions from open-cut coal mines in the United States. The technique relies on passing a collimated infrared beam through ambient air over a path length of up to several hundred metres. In the Kirchgessner et al. (1993) study, the concentration of methane across the plume was measured then wind speed data and a Gaussian plume dispersion model were used to estimate the methane emission rate from the mine. These authors subsequently developed a modification of their method which improved its accuracy (Piccot et al., 1994, 1996). The improved method was essentially the same as described above except that methane concentrations were measured at several elevations to better characterise the plume.

In principle, open-path FT-IR could be used to measure NO_x in blast plumes since it is sensitive to NO, NO_2, and CO along with other gases. Infrared radiation is also strongly absorbed in many parts of the spectrum by both CO_2 and water which are very likely to be present in high concentrations in blast plumes and this may tend to obscure the NO_x signal. High resolution instruments may resolve at least some of the NO_x absorption lines, however, a more serious drawback with op-FT-IR is that the infrared beam would be substantially attenuated by the dust thrown up by the blast. In the period immediately after the blast when the dust level is very high it is likely that the IR beam would be completely blocked thus making measurements impossible.

Another well established optical method is Correlation Spectroscopy (COSPEC). The system was first described by Moffat and Milan (1971) and was designed to measure point source emissions of SO_2 and NO_2 from industrial plants but found a niche application in the measurement of SO_2 fluxes from volcanoes (Galle et al., 2002). The COSPEC system utilises a "mask correlation" spectrometer and was designed to measure vertical or slant columns using sky-scattered sunlight. By traversing beneath plumes with the mobile instrument, the concentration of the column is calculated and, once multiplied by the plume velocity, produces a source emission rate. These instruments are limited to detecting only those species where masks are available. They also suffer from interferences from other atmospheric gases and light scattering from clouds or aerosols that can produce errors in column densities (Chalmers Radio and Space Science, website).

The DOAS technique is a relatively new technique that is gaining widespread acceptance as an air pollution monitoring method. Like the open-path FT-IR method, the DOAS can simultaneously measure concentrations of a number of species over path lengths which typically range from hundreds of metres to kilometres.

A DOAS, configured as an 'active system', Fig. 1, has three main parts – a light emitter, a light receiver and a spectrometer. The emitter sends a beam of light to the receiver (in some cases the emitter and receiver are contained in the same unit and the light beam is reflected off a remotely located passive reflector). The light beam contains a range of wavelengths, from ultraviolet to visible, although instruments are now available with an infrared source, which extends the range of compounds that can be detected. Different pollutant molecules absorb light at different wavelengths along the path between the emitter and receiver. The receiver is connected to the spectrometer which measures the intensity of the different wavelengths over the entire light path and through the data system converts this signal into concentrations for each of the species being monitored.

DOAS instruments are routinely used to measure SO_2, NO_2 and O_3.

More recently, advances in miniaturising UV–vis spectrometers has lead to the development of much more compact DOAS units, configured as a passive system (Fig. 1), which have come to be known as "mini-DOAS". The mini-DOAS system has so far been used mainly in the study of SO_2 fluxes in volcanic emissions (McGonigle et al., 2003).

2. Methodology

2.1. Field measurements

A portable DOAS (mini-DOAS) manufactured by Resonance Ltd was used in this study. The instrument covers a spectral range of 280–420 nm and can measure sub-part per million levels of NO_2 and SO_2. The unit, which comprises a telescope, scanning mirrors, calibration cells and a miniature CCD array spectrometer (Ocean Optics USB2000 spectrometer), is housed in a small package which is mounted on a tripod. Calibration of the instrument was carried out using the internal calibration cell. The concentration of the cell was equivalent 50 ppm m. No SO_x measurements were undertaken.

Data collection and processing were performed by Ocean Optics OOIBase32 software loaded in a laptop computer. This results in a more compact system that is easier to deploy at mine sites and provides greater flexibility in positioning the instrument in relation to the blast plume.

Prior to each monitored blast, a dark spectrum was collected by blocking light from entering the spectrometer and a scan was performed. To produce a reference spectrum, a further scan was performed in a clear sky background which contained background absorption from NO_2. The reference spectrum was required in order to determine the increase in concentration of NO_2 above ambient levels in the blast plumes.

The plume resulting from each blast was tracked with the spectrometer until the NO_2 concentration was indistinguishable from the surrounding sky. During each field measurement, the mini-DOAS and a video camera were positioned a safe operating distance from the blast at all times.

NO_2 concentrations in the plume were calculated by subtracting the dark spectrum from the measured spectrum and the reference spectrum using the supplied software.

The results obtained from the mini-DOAS are a path-averaged NO_2 concentration profile measured in units of parts per million metre (ppm m). The mini-DOAS results must be divided by the path length through the plume to yield a concentration. To estimate the amount of NO_2 released from each blast it was necessary to multiply the concentration by the volume of the plume. Hence it was necessary to estimate the dimensions of each plume.

All of the blasts monitored were video-taped using at least one, and sometimes two, video recorders. The distances between the cameras and the blast were measured by locating their positions with a handheld GPS receiver.

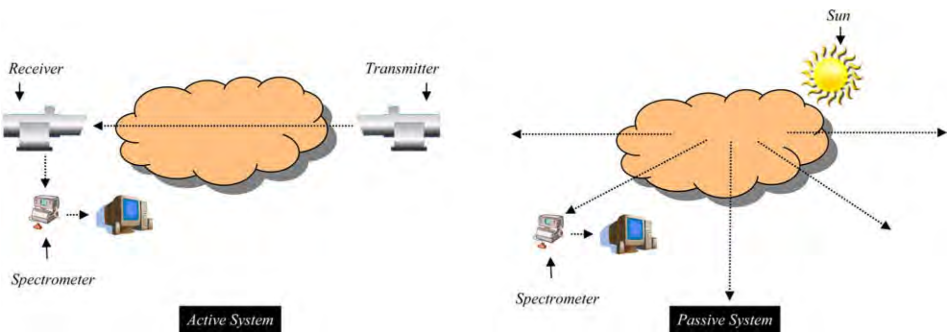

Fig. 1. Schematic diagram of DOAS systems operating in both active and passive modes.

Wind speed and directional data used to plot the directional path of the plume were obtained from a series of meteorological stations located around the mining lease. Simple trigonometry was employed to determine the distance from the video camera to the plume at the corresponding time intervals.

A rudimentary method of photogrammetry was then used to estimate the size of the plume based on still images extracted from the videos. Ratios of the plume to picture size in both the vertical and horizontal planes were made.

Once the plume to camera distance and the constraining angle for the plume is known, a crude three-dimensional estimate of the plume dimension was calculated using basic trigonometric functions. An example of the dimensions determined for a plume using this method is shown in Fig. 2.

Ground level measurements were carried out using a Greenline 8000 portable gas analyser. This instrument is capable of continuous, simultaneous analysis of O_2, CO_2, CO, SO_2, NO and NO_2. It is battery powered and can operate unattended for up to about 2 h. The instrument was calibrated against a standard gas mixture before each use. Data were logged on a laptop computer connected to the instrument.

For each experiment, the instrument was set up downwind of the blast in a location where the plume was expected to pass, but far enough away to avoid flying debris. The inlet probe was fixed at about 2 m above ground level.

It must be noted that selecting an appropriate location for the instrument was often difficult. In many cases, the wind conditions were quite variable, especially within the pit so it was not always possible to correctly anticipate the path of the blast plume. As well, the layout of the mine pit and safety considerations imposed constraints on where the instrument could be placed. Because of these problems, the plumes from many of the blasts did not pass over the analyser and data was not recorded.

2.2. Modelling

A simple modelling exercise was undertaken for this study to determine if the release of NO_2 from a blast could be of detriment to persons exposed to the plume within 5 km of the release. The results of this study are indicative and based on the assumption that the model used is appropriate. Modelling generally relies on local observational data to confirm the performance of the model. The difficulty in measuring emissions from mining blasts has meant that in this case the model is used as an indicator relying on the verifications used in the development of the chosen model. For this reason we have modelled concentrations directly downwind of theoretical blasts with AFTOX (Kunkel, 1991), a USEPA approved dispersion model (http://www.epa.gov/scram001/dispersion_alt.htm#aftox). The original DOS based QuickBasic code was transformed into Excel macros to enable many scenarios to be run.

AFTOX is a Gaussian Puff model developed for the United States Air Force to assess real time toxic chemical releases. The model uses information from US Air Weather Service (AWS) stations to calculate dispersion based on measured atmospheric conditions. As for all Gaussian models, the spread of pollutants is governed by dispersion coefficients in the horizontal (σ_y) and vertical (σ_z) directions. These coefficients depend on the atmospheric stability derived from the AWS data. In this study, the scenarios were modelled by predefining the wind speed and atmospheric stability classes. The wind speeds modelled ranged from very low ($0.5\ m\ s^{-1}$) to moderate ($10\ m\ s^{-1}$). Stability was modelled in six steps representing the standard Pasquill-Gifford stability classes, i.e. A–F, where A, B and C represent unstable conditions (where A is the most unstable), D is neutral and E and F are stable conditions. These stability classes are used to categorise the rate at which a plume will disperse. Unstable conditions might be found on a sunny day with light winds leading to rapid plume dispersion while the stable conditions may occur in clear skies with light winds and perhaps a temperature inversion present. Plume spread is slow in these circumstances.

AFTOX is operated by assuming an emission release from a single location. The emissions can be either continuous or instantaneous. In this study AFTOX was used to describe an area source by representing it as a large number of individual points. The area of the emission (i.e. the area over which the explosives were distributed) was

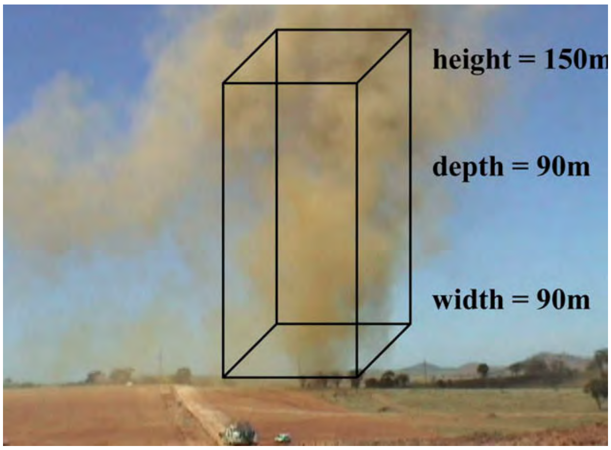

Fig. 2. Blast plume with estimated dimensions.

assumed to be 100 m × 200 m based upon sizes commonly observed during the field measurements. The area was subdivided into 10 m × 10 m units. Each square was represented by a point source with its source at the centre. In total, the area was modelled as 231 separate point sources (see Fig. 3). The total flux of emissions for the source was set at 100 kg. To estimate the maximum concentration and pollutant exposure values, the values should be multiplied by an appropriate scaling factor.

One hundred and twenty scenarios were modelled in which the 100 kg of emissions were spread randomly throughout the source area. A multi-stage process was employed for this task. In the first step, the total maximum number of points emitting was determined. This was defined by a random number between 20% and 80% of the maximum number of sources (in this case 231). The range chosen was an estimate from the portion of blasts that appeared to fume in conditions witnessed during this study. The total emission was then divided by this number. Each portion of the total emission was then placed randomly within the emission area. This process allowed certain points to receive multiple portions of the total emissions enabling the formation of hot spots. An example of one emission grid (Scenario 1 of 120) is displayed in Fig. 4.

Concentrations were determined for each of the 120 emission scenarios at distances of 200 m, 300 m, 400 m, 500 m, 750 m, 1 km, 1.25 km, 1.5 km, 2 km, 2.5 km, 3 km, 4 km and 5 km from the origin of the source. A concentration was determined for a number of discrete times that encompassed the complete plume travelling past the receptor. Further the concentrations were determined at 21 locations 10 m apart in a plane parallel and directly downwind of the source area (see Fig. 3). An average concentration from each of the receptors was determined; in this case with N equal to 21.

$$C^{*} = \frac{1}{N}\sum_{i=1}^{N} C_i \tag{5}$$

The average for each scenario was then used to create an ensemble average and standard deviation for the entire run (i.e. $N = 120$).

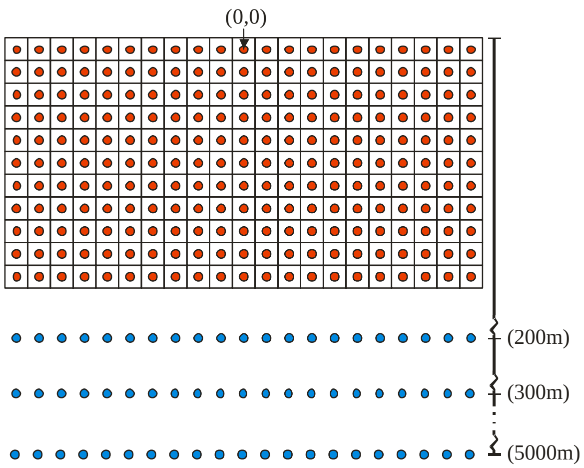

Fig. 3. Emission grid and receptor array setup.

$$\overline{C} = \frac{1}{N}\sum_{j=1}^{N} C_j^{*} \tag{6}$$

$$\sigma_{\overline{C}} = \frac{1}{N}\sum_{j=1}^{N}\left(C_j^{*} - \overline{C}\right)^2 \tag{7}$$

$$C_{\max} = \max_{k=1}^{N}[\overline{C}_k] \tag{8}$$

A dosage expressed in ppm s was determined from the times when the ensemble average plume travelled past the receptors located at each distance downwind of the source. Again N represents each discrete time step (dt) where $C' \neq 0$.

$$C_{\text{dose}} = \sum_{k=1}^{N}(\overline{C}_k)\mathrm{d}t \tag{9}$$

The relative variation for the dosage is provided by similarly treating the ensemble standard deviation.

$$\sigma_{\text{dose}} = \sum_{k=1}^{N}(\sigma_{\overline{C}k})\mathrm{d}t \tag{10}$$

3. Results and discussion

3.1. Field measurements

Plume measurements were made using the mini-DOAS spectrometer at two open-cut mine sites located in the Hunter Valley. The combination of the spectral analysis and the plume estimation technique allowed for NO_2 concentration and mass flux estimates to be made remotely, totally eliminating the requirement of physical sampling.

An example of the spectral output produced by the mini-DOAS is shown in Fig. 5. The spectral output consists of the NO_2 concentration (ppm m) as a function of time. The figure also contains a series of photographs depicting the formation of a blast plume at time intervals of 70, 110, 163, 250 and 350 s post-blast initiation. It is worth noting the change in intensity of the colour of plume and size as a function of time.

Reliable concentration measurements with the mini-DOAS may only be made when the spectrometer is aimed into a sky background above the horizon from the point of observation. In this example, a peak concentration of 580 ppm m was achieved in 163 s post-blast initiation (third image from the left). At this time the plume has risen above the horizon from the point of observation. The plume to mini-DOAS distance at this stage is approximately 500 m, with an estimated plume depth of 105 m. This results in a NO_2 concentration of 5.6 ppm at that particular stage of the plumes' dispersion.

After 350 s, the plume is barely visible and is now estimated to be approximately 650 m from the mini-DOAS unit. The plume depth has increased to 125 m with

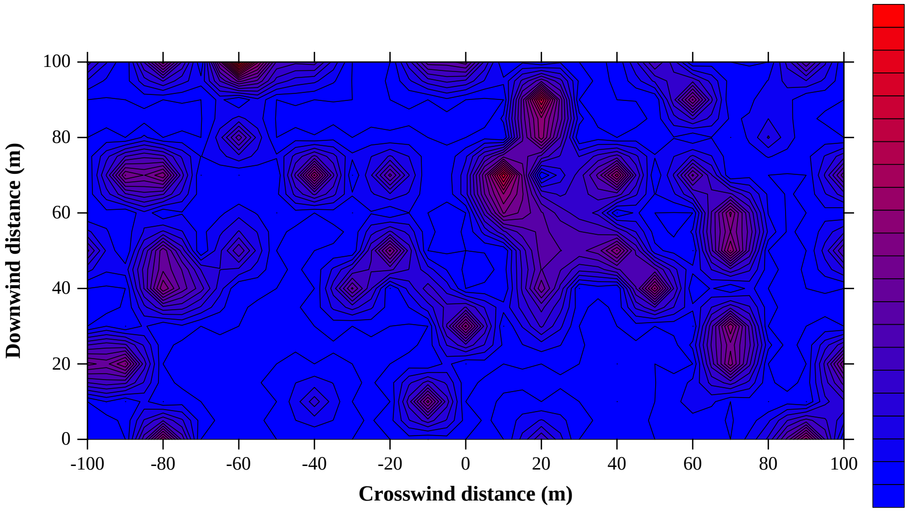

Fig. 4. Example of emission grid for 1 of the 120 scenarios modelled (the scale on the right hand side refers to NO_2 concentration in ppm).

a corresponding increase in plume volume by a factor of two. This expansion of the plume corresponds to a decrease in NO_2 concentration to 2.8 ppm.

At 360 s the plume was no longer visible to the eye and was lost for a short period of time to the mini-DOAS. This, however, was rectified with scanning of the sky with the spectrometer until the invisible plume was tracked for a further period.

Results for all plumes monitored during field work at both mine sites are given in Table 1. The table gives the peak NO_2 concentration as measured by the mini-DOAS above the horizon. Also given in the table is the plume volume at peak concentration and the calculated mass of NO_2 released from the blast. The mass of ANFO typically used in a blast was on average 210 tonnes, ranging from 60 to 565 tonnes. The explosive was distributed over an area of typically 200 m × 100 m containing approximately 200 bole holes with 200 mm diameter and to a depth of 25 m.

From the table the maximum NO_2 concentrations were found to range from 0 to about 7 ppm. This range of concentrations translated to 0–63.3 kg of NO_2 in the plume. However, no correlation can be made between blast charge and NO_2 levels.

During the measurements with the mini-DOAS ground level measurements were also carried out using a portable combustion gas analyser (Greenline 8000) to augment the airborne measurements made by the mini-DOAS. For NO_2 the ground level measures were higher than those observed using the mini-DOAS at higher altitudes. When the results of both measurement methods were applied to

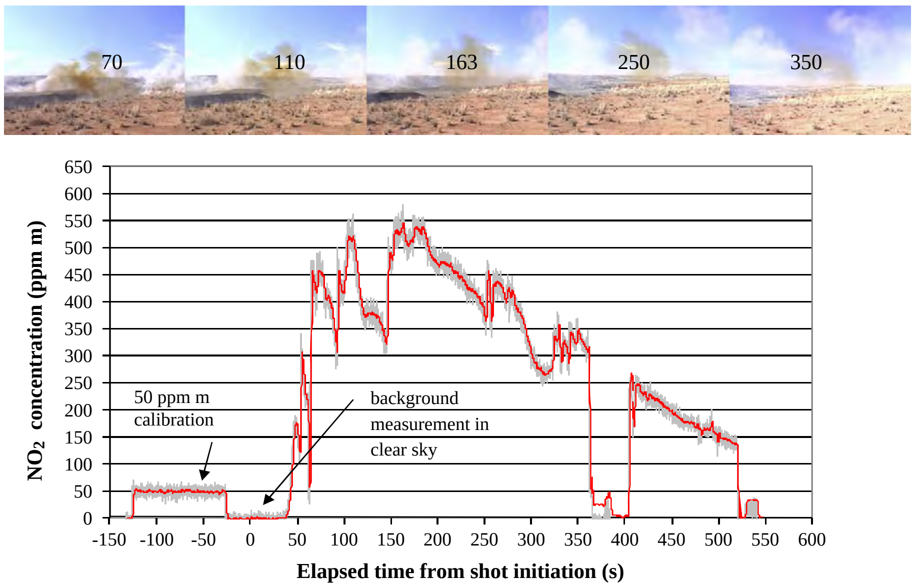

Fig. 5. Typical NO_2 spectrum demonstrating plume colour characteristics relative to concentration level.

Table 1
Through plume measurement results

Date	Total ANFO charge (t)	Peak NO_2 Conc (ppm)	Plume volume ($m^3 \times 10^{-6}$)	Mass of NO_2 (kg)	Emission flux ($kg\,t^{-1}$ ANFO)		
					NO	NO_2	NO_x
12/12/2005	281	3.7	1.4	9.9	0.5	0.03	0.6
13/12/2005	150	0.4	5.3	3.7	0.4	0.03	0.4
14/12/2005	119	0.0	0.0	0.0	0.0	0.00	0.0
21/12/2005	229	1.0	4.4	7.9	0.6	0.04	0.6
22/12/2005	211	0.0	0.0	0.0	0.0	0.00	0.0
23/12/2005	222	0.0	0.0	0.0	0.0	0.00	0.0
5/01/2006	177	1.0	0.2	0.4	0.0	0.00	0.0
6/01/2006	275	1.1	15.3	30.6	1.8	0.12	1.9
12/01/2006	225	1.6	6.2	18.3	1.3	0.08	1.4
18/01/2006	169	1.3	1.7	0.2	0.4	0.02	0.4
23/01/2006	139	2.1	4.2	16.7	1.9	0.12	2.0
25/01/2006	155	0.4	4.4	2.9	0.3	0.02	0.4
30/01/2006	132	0.7	5.3	7.1	0.8	0.05	0.9
22/02/2006	224	0.0	0.00	0.0	0.0	0.00	0.0
1/03/2006	194	1.6	20.6	63.3	5.0	0.32	5.3
12/05/2006	362	6.5	1.9	23.3	1.0	0.06	1.1
15/05/2006	131	0.3	3.2	1.7	0.2	0.01	0.2
19/05/2006	168	0.0	0.00	0.0	0.0	0.00	0.0
30/05/2006	100	0.8	0.00	1.0	0.0	0.00	0.0
1/06/2006	365	0.7	3.5	4.9	0.2	0.01	0.2
6/06/2006	145	0.8	11.5	17.5	1.9	0.12	2.0
15/06/2006	60	0.0	0.00	0.0	0.0	0.00	0.0
26/06/2006	254	4.3	0.3	2.1	0.1	0.01	0.2
27/06/2006	212	5.6	0.9	10.0	0.7	0.04	0.7
28/06/2006	241	0.0	0.00	0.0	0.0	0.00	0.0
6/07/2006	565	2.8	2.7	14.0	0.4	0.03	0.4
13/07/2006	184	7.0	1.0	12.6	1.1	0.07	1.2

dispersion modelling techniques strong agreement was observed.

Point measurements which were made on Greenline 8000 indicated that a loose relationship existed between NO and NO_2 concentration. Although a strong correlation was not found, there is a general trend of increasing NO_2 with increasing NO. It was generally found that the relative proportion of NO to NO_2 from our data set was 27 to 1. This

Table 2
Maximum calculated NO_2 concentrations downwind of source

	200 m	300 m	400 m	500 m	750 m	1000 m	1250 m	1500 m	2000 m	2500 m	3000 m	4000 m	5000 m
WSPD = 0.5 $m\,s^{-1}$													
Stab A	83.0	30.0	14.4	7.9	2.5	0.9	0.4	0.2	0.1	0.0	0.0	0.0	0.0
Stab B	145.8	69.3	40.8	25.4	10.1	4.8	2.6	1.6	0.7	0.4	0.2	0.1	0.1
Stab C	219.4	122.0	80.8	55.9	26.8	14.3	8.6	5.6	2.8	1.6	1.0	0.5	0.3
Stab D	321.1	201.5	146.0	113.1	64.6	40.2	26.1	18.6	10.5	6.7	4.5	2.4	1.4
Stab E	390.2	267.4	204.3	165.5	109.6	75.9	54.6	41.3	26.4	17.9	12.7	7.1	4.5
Stab F	464.1	339.8	269.0	222.6	154.5	114.9	88.6	69.7	50.4	37.0	27.8	16.7	11.0
WSPD = 3 $m\,s^{-1}$													
Stab A	78.5	29.1	14.2	7.7	2.4	0.9	0.4	0.2	0.1	0.0	0.0	0.0	0.0
Stab B	137.6	67.7	39.7	25.1	10.0	4.8	2.6	1.6	0.7	0.4	0.2	0.1	0.1
Stab C	211.6	118.7	77.6	55.2	26.0	14.0	8.6	5.6	2.8	1.6	1.0	0.5	0.3
Stab D	312.5	197.9	143.2	110.0	62.5	39.3	26.1	18.2	10.5	6.7	4.5	2.4	1.4
Stab E	383.0	267.0	202.1	162.6	106.3	73.7	54.1	40.3	26.1	17.7	12.5	7.2	4.5
Stab F	461.5	344.6	268.4	220.8	151.1	112.3	86.1	67.6	48.9	36.4	27.5	16.6	11.0
WSPD = 7.5 $m\,s^{-1}$													
Stab A	62.5	25.5	13.0	7.3	2.3	0.9	0.4	0.2	0.1	0.0	0.0	0.0	0.0
Stab B	111.9	56.1	34.2	22.6	9.4	4.6	2.6	1.6	0.7	0.4	0.2	0.1	0.1
Stab C	173.3	100.4	66.5	47.7	23.8	13.2	8.2	5.4	2.7	1.6	1.0	0.5	0.3
Stab D	261.2	167.9	122.1	92.3	54.8	35.3	23.7	17.2	10.1	6.5	4.4	2.3	1.4
Stab E	325.9	232.2	175.8	139.6	89.5	63.8	46.7	36.0	23.9	16.8	12.1	7.0	4.4
Stab F	394.6	302.7	237.0	194.3	132.2	96.1	73.3	59.0	43.6	33.3	25.7	15.8	10.5
WSPD = 10 $m\,s^{-1}$													
Stab A	53.0	22.6	11.9	6.9	2.3	0.9	0.4	0.2	0.1	0.0	0.0	0.0	0.0
Stab B	92.3	49.7	31.0	20.9	9.0	4.5	2.5	1.5	0.7	0.4	0.2	0.1	0.1
Stab C	140.1	84.2	57.7	42.1	21.7	12.6	7.9	5.3	2.7	1.6	1.0	0.5	0.3
Stab D	205.5	138.3	102.4	79.9	48.6	31.8	22.1	16.4	9.7	6.4	4.3	2.3	1.4
Stab E	254.0	184.0	143.0	116.4	78.0	56.2	42.6	33.1	22.7	16.0	11.6	6.9	4.4
Stab F	306.8	235.8	189.6	157.9	109.9	82.8	64.5	52.2	40.0	30.9	24.0	15.2	10.2

relationship enabled the estimation of the NO fluxes in the blast plume with a reasonable level of confidence.

The results obtained in this study are the only published quantitative data available on blast plume gas composition that the authors are aware of and it is useful to compare them to the emission factors currently used for NPI estimates.

Based on the NO_2 measurements and estimates of NO, the flux for NO_x was calculated to be in the range of 0.04–5.3 kg t^{-1} ANFO. The average flux level for all the blast plumes measured was 0.9 kg t^{-1}. This figure is considerably lower than the current NPI emission factor which is 8 kg t^{-1}.

3.2. Modelling

Results of the modelling runs are summarised in Table 2 and show the peak NO_2 concentrations (ppm) at various points downwind of the blast for the six atmospheric stability classes considered.

Examples of the modelled data are plotted in Fig. 6 and Fig. 7. In Fig. 6 a plot is displayed for the concentration estimate of one scenario at a distance of 200 m from the source origin and for a wind speed of 2 m s^{-1} and a stability class C. In this plot 21 lines are shown representing the dose received directly downwind of the source at the locations displayed in Fig. 3. In this figure it is apparent that there is a considerable difference in the concentration predicted at each of the 21 receptors. It should be noted that the distance of 200 m is defined from the origin of the source area (0, 0) as displayed in Fig. 3. At this distance emission sources at 100 m will cause significantly higher concentrations than those occurring at positions toward the origin. In comparison the concentrations predicted at the receptor array 1 km from the source show more normally defined distributions with maxima occurring towards the middle receptors as a result of crosswind diffusion. Receptors toward the edge of the sample array receive less crosswind influence and are, therefore, smaller in concentration. Also apparent in these two figures is the considerable difference in the predicted peak concentrations with the values at 1 km up to 25 times lower than at 200 m. When viewing Table 2, the peak values at 5 km approach ambient levels for all but the most stable conditions which are quite commonly over predicted with Gaussian models. For future studies it is recommended that a long path technique on a mining lease boundary may provide both a measure of the model accuracy as well as a direct measure of the impact in areas directly surrounding the mining area.

The data presented in this study represent a dose directly downwind of the source and as such are a worst case scenario for exposure. The averages of the 21 receptors (i.e. the average concentration directly downwind of the source) for each of the 120 scenarios modelled were used to determine the selected data. The number of scenarios modelled was arbitrarily chosen to allow 10 scenarios to be run on each machine in a cluster of 12 computers. The maximum concentration in Table 2 is the maximum ensemble average obtained from the average of the 21 receptors for the 120 scenarios modelled. Maximum concentrations at individual locations directly downwind of hot spots are obviously higher than the values reported in this table.

When viewing Table 2 it is apparent that the peak concentrations drop dramatically as the receptor moves away from the source. It is also apparent that the peak concentrations vary little as a function of wind speed although the plume width will vary. In AFTOX a downwind concentration is determined in two steps. In the first step the size of the initial plume envelope is estimated. In its default mode AFTOX determines the size of the envelope (assumed to be a cylinder of equal height and width) from the magnitude of the emission rate. In this report the size is set at 10 m to match the grid structure used for the area

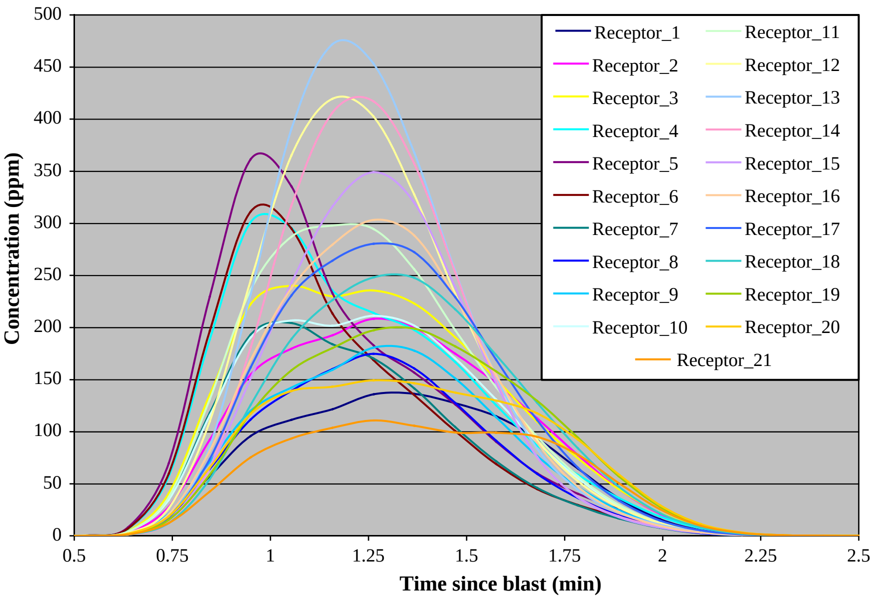

Fig. 6. Calculated NO_2 concentration profiles 200 m from source.

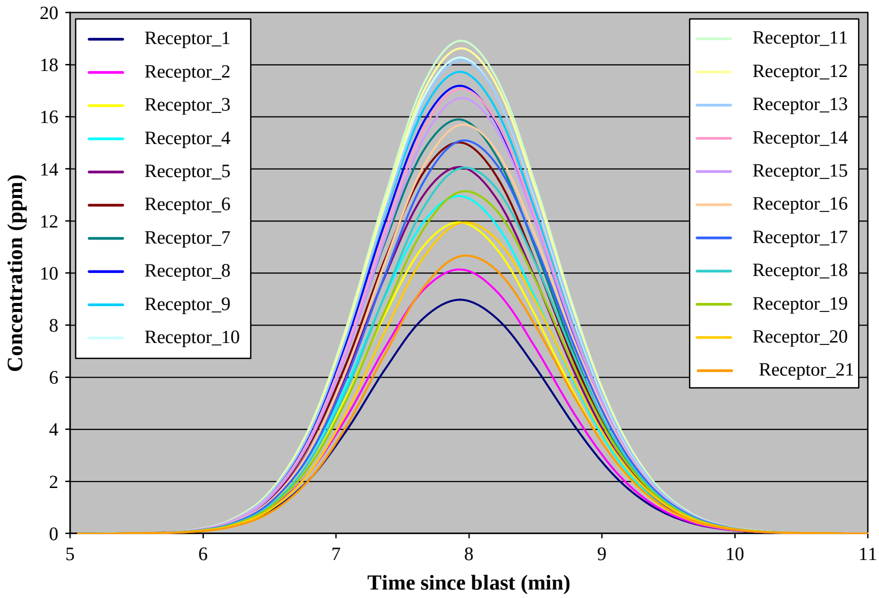

Fig. 7. Calculated NO_2 concentration profiles 1 km from source.

source. AFTOX in this regard ignores the effect of wind speed on the size of the initial envelope and as such the initial concentration of the plume is identical irrespective of wind speed by ignoring longitudinal (i.e. downwind) spread of the initial release. In the second step the concentration downwind of the initial release is determined by estimating the growth of a puff in three dimensions which in this case explicitly includes longitudinal plume spread which is assumed to be equal to the degree of crosswind spread. The degree of this spread is determined solely from the prescribed atmospheric stability class which ignores any wind speed dependence.

While the peak concentrations are similar, the dose received at a receptor is linearly dependent on wind speed. Emissions released into an atmosphere with higher wind speeds result in a receptor receiving doses for a smaller period of time. It should be noted that some of the differences in the peak concentrations displayed in Table 2 result from the number of discrete time steps used to calculate the concentrations. This was set at 25 intervals between the onset and finish of a plume as it passes by the receptor. This time is dependent on atmospheric stability and the distance from the source. In AFTOX, the puffs are assumed to disperse in the direction of plume travel proportionally with the degree of crosswind spread. As such, portions of the plume arrive before and after the main bulk of the emissions and the effect clearly demonstrated in Figs. 6 and 7. The moderate number of discrete times modelled to capture this effect while generally adequate may have led to a degree of variation particularly at larger distances from the source.

Again it should be noted that the modelled figures assume an area wide flux of 100 kg which is larger than observed in the blast recorded during this study. It should also be noted that while some of the concentrations are high close to the source the concentration at a particular location occurs for a brief period of time which is determined by the wind speed.

4. Conclusions

A portable open-path spectroscopic method was found to be effective for measuring NO_2 emissions from blasting. Overall this technique was found to be simpler, safer and more successful than other approaches that in the past have proved to be ineffective in monitoring these short lived plumes.

Quantitative measurements of NO_2 in plumes from blasting were made at two open-cut mines. The results showed that NO_2 was present in most of the plumes but in relatively low concentrations (typically ranging between 0 and 7 ppm). The highest concentration measured during all the field campaigns was about 17 ppm at ground level.

Based on field measurements, the emission factor currently used in compiling the Australian National Pollutant Inventory was found to be approximately eight times greater than that observed in our investigation. This would suggest that an over estimation of NO_x is made if the current factor is used.

Numerical modelling of the behaviour of plumes resulting from blasting was made to assess the possible downwind concentrations of NO_2. These results were compared to ambient NO_x measurements made in Muswellbrook.

- Modelling results were consistent with concentration measurements within the plumes at relatively short distances from the blast (i.e. up to about 1 km).
- Ambient monitoring did not detect NO_x events that could be attributed to individual blasts. Modelling suggested that these emissions would be very low at

distances greater than 5 km from the blast and may be indistinguishable from background levels; typically of the order of several parts per billion, in most cases.

Acknowledgements

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FACTORS AFFECTING ANFO FUMES PRODUCTION

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ABSTRACT

For many years there have been small scale tests available for evaluating the toxic fumes production by cap-sensitive explosives (DOT Class 1.1), but these could not be used with blasting agents due to the large charge sizes and heavy confinement required for proper detonation. Considering the extensive use of blasting agents in construction and mining, there is a need to determine the quantities of toxic fumes generated by blasting agents. At the International Society of Explosive Engineers Twenty Third Annual Conference on Explosives and Blasting Technique in 1997, the authors reported on a facility for detonating large (4.54 kg), confined blasting agent charges in a controlled volume that had been constructed at the National Institute for Occupational Safety and Health's Pittsburgh Research Lab's Experimental Mine. Since 1997, this facility has been used to collect data on toxic fumes produced by the detonation of various ammonium nitrate/fuel oil (ANFO) mixtures and several cap-sensitive explosives.

ANFO composition ranging from 1 to 10 percent (pct) fuel oil have been studied. As expected from previous studies, with an increase in fuel oil content the carbon monoxide production increases, while nitric oxide and nitrogen dioxide production decrease. The detonation velocity varies from 3,000 to 4,000 m/sec for the 1 to 10 pct range of fuel oil content, suggesting that ANFO mixes with improper fuel oil content may appear to detonate properly, while their fume production differs significantly from optimum. The study also considers such factors as degree of confinement, water contamination, and aluminum content on blasting agent fume production. Results indicate that water contamination of the ANFO has little effect on carbon monoxide production, but causes significant increase in nitric oxide and nitrogen dioxide production. Decreasing confinement from Schedule 80 steel pipe to 0.4-mm thick sheet metal also has little effect on carbon monoxide production, but significantly increases nitric oxide and nitrogen dioxide production. Adding 5 and 10 pct aluminum to the ANFO had no clear effect on carbon monoxide, nitric oxide, or nitrogen dioxide production.

INTRODUCTION

In February of 1997 a paper entitled " A Technique for Measuring Toxic Gases Produced by Blasting Agents" was presented at the 23rd Annual Conference on Explosives & Blasting Technique in Las Vegas, Nevada. That paper discussed a method for measuring toxic fumes produced by detonation of blasting agents. The research reported here is a continuation of that work.

Detonating ANFO in steel pipe in the Pittsburgh Research Lab (PRL) mine fumes chamber yields a baseline for comparing relative fumes production for blasting agents, but is by no means a predictor of what will happen in the field. In actual blasting operations, the confinement of the detonating ANFO will probably be less than that offered by the 4-in, Schedule 80 steel pipe employed in most tests. Additionally the ANFO evaluated in the PRL mine chamber is carefully mixed the day before and care is taken to prevent contamination. In practice, ANFO may not be exactly the 94/6 ammonium nitrate/fuel oil ratio desired or may be loaded into boreholes weeks before it is shot, exposing the explosive to water seeping into loaded boreholes and possible fuel oil evaporation. The current research looks at these factors and others in an effort to determine how they affect fumes production. Fumes measurements in the mine chamber were carried out for ANFO mixtures other than 94/6, ANFO contaminated with up to 10 pct water, ANFO detonated with less confinement than that offered by Schedule 80 steel pipe, and ANFO contaminated with limestone rock dust. Additionally, several cap-sensitive explosives, as well as ANFO containing up to10 pct aluminum were also studied to gain an understanding of how detonation behavior affects fumes production. In each case carbon monoxide, nitrogen oxides, and ammonia were the toxic gases of primary interest.

EXPERIMENTAL APPROACH

Detonating large blasting agent charges and confining the fumes requires a larger experimental chamber than was employed in past work on cap-sensitive explosives. Towards this end, a chamber was created in the experimental mine at PRL. The facility consists of a portion of mine entry enclosed between two explosion proof bulkheads. Each bulkhead is 40 inches (1 m) thick, constructed of solid concrete block hitched 1 foot (30 cm) into the roof, ribs, and floor. On the intake side, the bulkhead is fitted with a submarine mandoor and a small port for control and sampling lines. On the return side, the bulkhead is fitted with two sealed ventilation ports. Total volume of the chamber is 9,666 ft^3 (274 m^3). The chamber volume was determined by releasing a known quantity of carbon monoxide into the chamber and sampling the atmosphere after it had mixed. Following the shot, a fan mounted at one end of the chamber mixes the chamber atmosphere at 3,500 ft^3/min, after which the chamber is vented using the mine's airflow. The layout of the chamber is illustrated in Figure 1. Up to 10 pound (4.54 kg) charges can be detonated in the chamber using a variety of confinements.

EXPERIMENTAL

A 28-inch (71-cm) length of 4-inch (20-cm) Schedule 80 seamless steel pipe was chosen to provide confinement in most tests of blasting agents and cap-sensitive explosives. Prior to loading the pipe with explosive, a continuous velocity probe of the type described by Santis is taped to the inner surface of the pipe along its length[1]. In conducting a test of a blasting agent, the commercial blasting agent minus its wrapper, or premixed ANFO are loaded into the pipe to a weight of 10 lb (4.54 kg). Initiation is provided by a 2-inch (5-cm) diameter, 2-inch (5-cm) thick cast pentolite booster, initiated by a number 8 instantaneous electric blasting cap. In conducting a test of a cap-sensitive explosive, the cartridge explosive is loaded into the pipe to a weight of about 10 lb (4.54 kg). Cap-sensitive explosives are initiated by a number 8 instantaneous electric blasting cap.

Following detonation of an explosive in the chamber, the fan is run for about 10 minutes to uniformly mix the chamber atmosphere before fumes samples are taken out of the chamber through 1/4-inch (0.6-cm) Teflon or polyethylene tubes for analysis. Teflon sample lines are used for nitrogen oxides and ammonia to minimize loss of these constituents to absorption on the tube surface. Vacutainer[1] samples are taken and sent to the analytical laboratory for analysis; this technique is appropriate for components that are stable in the Vacutainer, namely hydrogen, carbon monoxide, and carbon dioxide. Nitrogen dioxide, nitrogen oxides, and ammonia are not amenable to analysis by the Vacutainer technique and are instead absorbed in chemical solutions in bubbler trains using the technique described by Santis[2]. That method was modified by eliminating the purging of the system with helium and using a gas meter to measure the volume of fumes bubbled through the solutions rather than measuring gas flow rate. An electrochemical carbon monoxide monitor was also employed to act as a backup to the analytical lab's carbon monoxide analysis of the Vacutainer and to allow monitoring of the mixing of the chamber atmosphere.

RESULTS

An ANFO mixture of 94 pct ammonium nitrate, 6 pct fuel oil is close to optimum from the perspective of minimum toxic fumes production. Previous research and theory show that the detonating ANFO will produce excessive levels of nitrogen oxides if the fuel oil content is too low and will produce excessive levels of carbon monoxide and ammonia if the fuel oil content is too high.[3,4,5] This behavior is supported by data collected in the current research, as illustrated in Figures 2, 3, and 4.

In Figure 5 the data from figures 2, 3, and 4 is presented in terms of oxygen balance. Figure 5 is a plot of carbon monoxide production versus oxygen balance for ANFO and several cap-sensitive explosives. As the oxygen balance is increased for ANFO the carbon monoxide production decreases. This would be expected since there is increasing oxygen to convert the carbon monoxide to carbon dioxide. ANFO mixed at 6 pct fuel oil produces approximately the same amount of carbon monoxide as cap-sensitive explosives of equivalent oxygen balance. The opposite is true when looking at nitrogen oxides production as a function of oxygen balance, as illustrated in Figure 6. When the oxygen balance is increased, the nitrogen oxides and nitrogen dioxide production increased. ANFO mixed at 6 pct fuel oil produced significantly more nitrogen oxides and nitrogen dioxide than cap-sensitive explosives. Figure 7 illustrates that as the oxygen balance for ANFO is increased the ammonia production decreases. With the exception of a couple data points that may be anomalous, ANFO mixed at 6 pct fuel oil produced about the same quantity of ammonia as cap-sensitive explosives of equivalent oxygen balance.

Figure 8 shows that adding water to an ANFO mixture of 94 pct ammonium nitrate and 6 pct fuel oil had little effect on carbon monoxide production for water percentages from 0 to 10 pct. However the nitrogen oxides and nitrogen dioxide increased dramatically when water is added to the ANFO mixture. This is demonstrated in Figure 9. Figure 10 shows the effect of water on ammonia fumes production; adding water to the ANFO yields an erratic trend, indicating that further study is needed.

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[1]Reference to Specific products is for informational purposes and does not imply endorsement by NIOSH.

As mentioned earlier, shooting ANFO in 4-inch schedule 80 seamless steel pipe is probably much more confinement than seen in the field. To examine the effect of reduced confinement on fumes production, ANFO was tested in sheet metal and PVC pipe. As seen in Figure 11, reduced confinement doesn't have much effect on carbon monoxide production. Carbon monoxide production for ANFO shot in the PVC pipe was much higher than that for the steel or sheet metal pipe. The high carbon monoxide might be attributed to burning of the PVC pipe. The degree to which the PVC pipe reacted was not studied in detail, but it is safe to assume that at least some of the PVC burned during the ANFO detonation. The high carbon monoxide production would be consistent with the earlier observation that the higher the fuel content of the explosive, the higher the carbon monoxide production.

Explosive packaging is an important consideration relative to toxic fumes production. For example, a blast pattern may contain a number of boreholes that are contaminated with water and the blaster may decide to insert sleeves into the boreholes contaminated with water to keep the ANFO dry. If the sleeves are made of a combustible material they could add to the carbon monoxide production. Figure 12 shows that the production of nitrogen oxides and nitrogen dioxide increases dramatically with lower confinement, while Figure 13 shows that with less confinement ammonia decreases.

Limestone rock dust (approximately 73 pct through 200 mesh) was added to the ANFO mixture to simulate drill cuttings being mixed with the ANFO as it was loaded into a borehole. The rock dust had little effect on the carbon monoxide production, as illustrated in Figure 14. Figure 15 shows that the addition of the rock dust led to an increase in nitrogen oxides production and a decrease in nitrogen dioxide production. Since the nitrogen oxides consist essentially of nitric oxide and nitrogen dioxide, this indicates that nitric oxide production increased significantly. Figure 16 shows that adding rock dust to the ANFO caused a significant increase in ammonia production .

Aluminum is sometimes added to ANFO to increase the velocity and the output energy. Figure 14 illustrates that the aluminum added to the ANFO mixture has little effect on the production of carbon monoxide. From Figure 15 it is not clear whether or not the nitrogen oxides and nitrogen dioxide production is affected by the added aluminum. The ammonia increased with the added aluminum, as illustrated in figure 16. It should be noted that the addition of aluminum had no clear effect on the ANFO's detonation velocity. The aluminum added to the ANFO mixture was Fine Aluminum Paint Pigment Powder, Alcoa # 422 flake. This type was used to give the fastest possible burning rate for experimental purposes. For commercial explosives, the lowest and least expensive grade of aluminum is typically used, consisting of ground scrap aluminum of various particle sizes.

DISCUSSION

Several factors that may effect the fumes production of ANFO have been investigated. Probably the easiest to control is the fuel oil content. To minimize toxic fumes production , the ANFO should be mixed at 6 pct fuel oil. Deviating from the 6 pct will lead to excessive fumes. Water contamination may not have an affect on carbon monoxide production, but it increases the production of nitrogen oxides and nitrogen dioxide. At the present time in our research it is not clear how the production of ammonia is affected. The confinement of ANFO doesn't appear to make a difference in the production of carbon monoxide, but it makes a difference in the production of nitrogen oxides , nitrogen dioxide, and ammonia.

In the case of nitrogen oxides and nitrogen dioxide the fumes production will increase, while the ammonia fumes production will decrease.

Adding aluminum or rock dust to ANFO does not affect the fumes production of carbon monoxide. The addition of aluminum does not have a significant affect on nitrogen oxides and nitrogen dioxide production, but the addition of rock dust leads to an increased production of nitrogen oxides. Additionally, the rock dust appears to have an effect on the ratio of nitric oxide to nitrogen dioxide. The addition of aluminum and rock dust increased the production of ammonia. The effect of rock dust on fume production was based on limited data and requires further study to look at the effect of particle size and dust type.

Its important to understand that the data reported here applies only to the test conditions under which the data was collected. For example, the schedule 80 steel pipe may provide more confinement than many field blasts. The research reported here shows that the confinement will affect the quantity of toxic fumes produced. In the field the toxic fumes released from a blast will differ significantly from the data reported here. There is a need to collect data from the field to develop an understanding of how data from the PRL fumes chamber compare to fumes production in the field. This, in return, will help in developing improved tests for evaluating fumes production.

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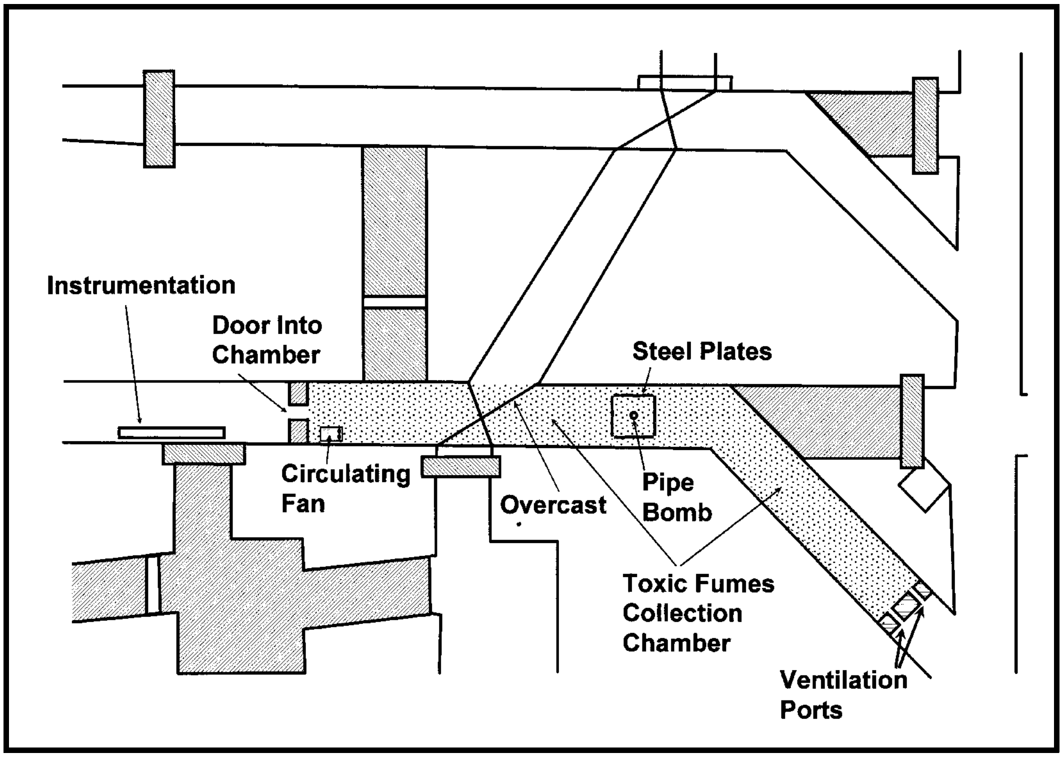


Figure 1. Research was conducted in a chamber created in the underground mine at the Pittsburgh Research Lab.

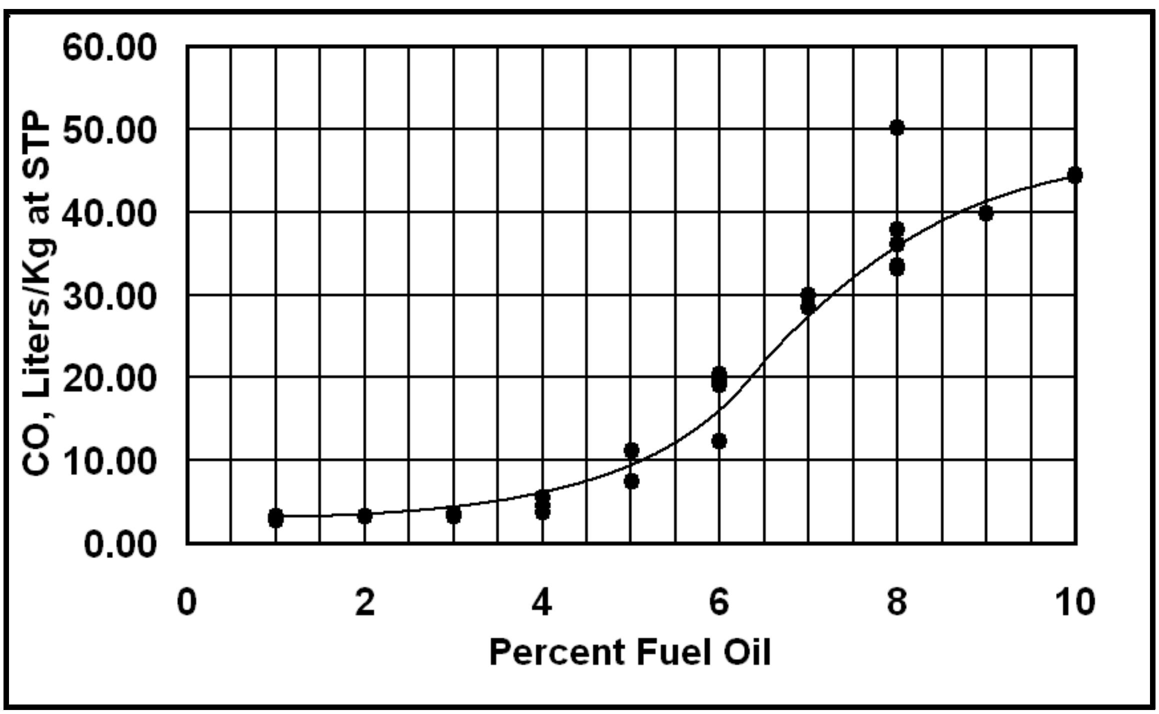


Figure 2. Effect of ANFO fuel oil content on carbon monoxide production. In all figures, the line is a polynomial fit to the data; it is included for illustrative purposes and does not represent a fit of theoretical results.

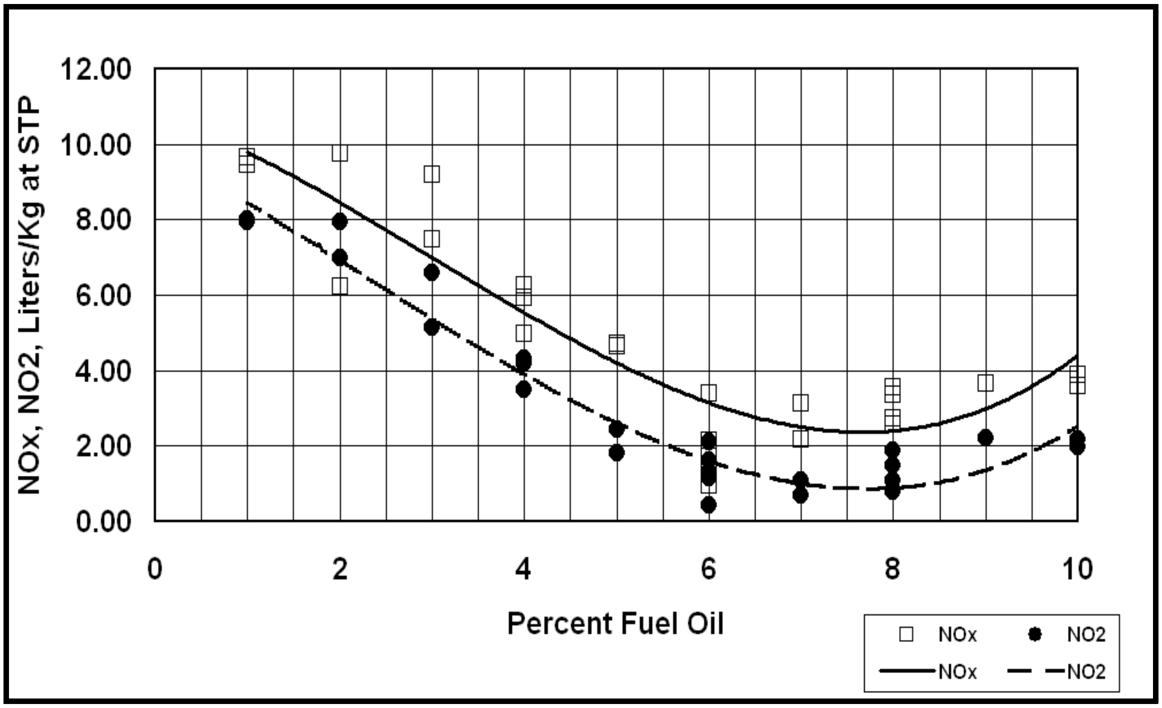


Figure 3. Effect of ANFO fuel oil content on nitrogen oxides and nitrogen dioxide production.

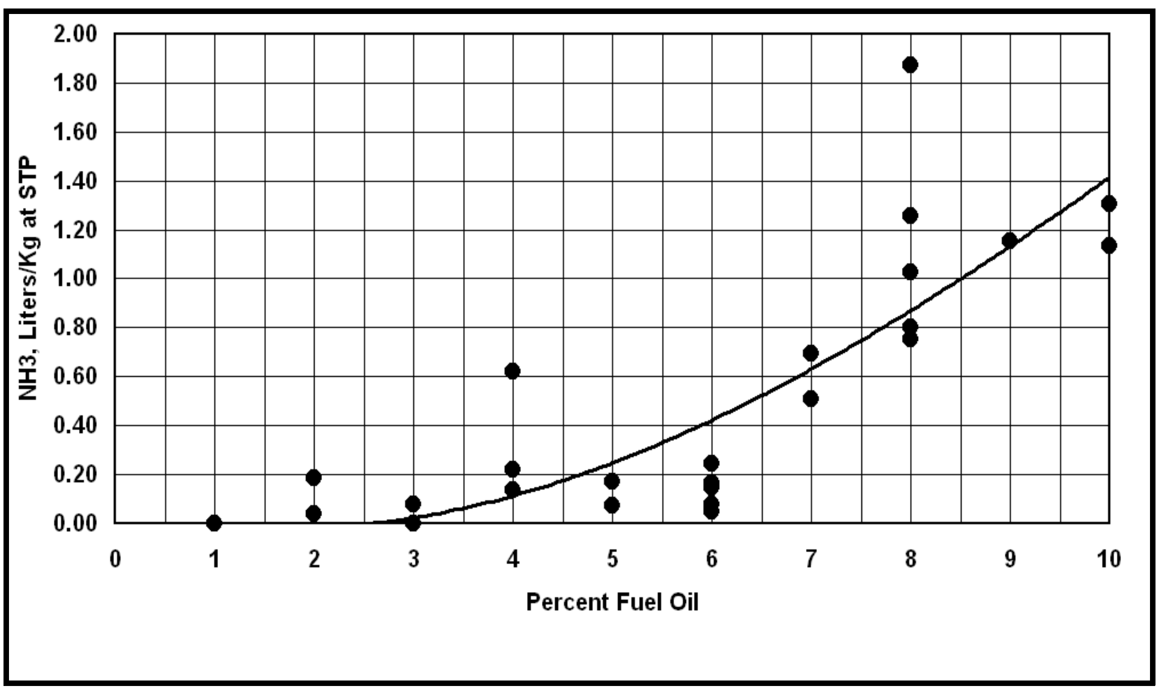


Figure 4. Effect of ANFO fuel oil content on ammonia production.

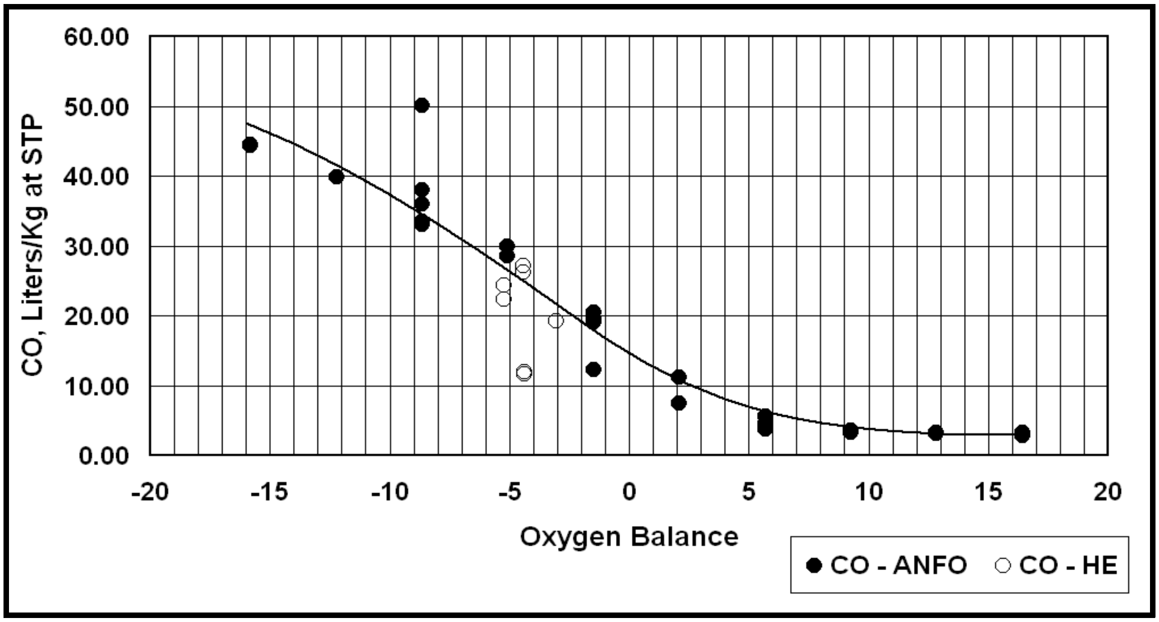


Figure 5. Effect of Oxygen Balance on carbon monoxide production for 94/6 ANFO and high explosives (cap-sensitive explosives).

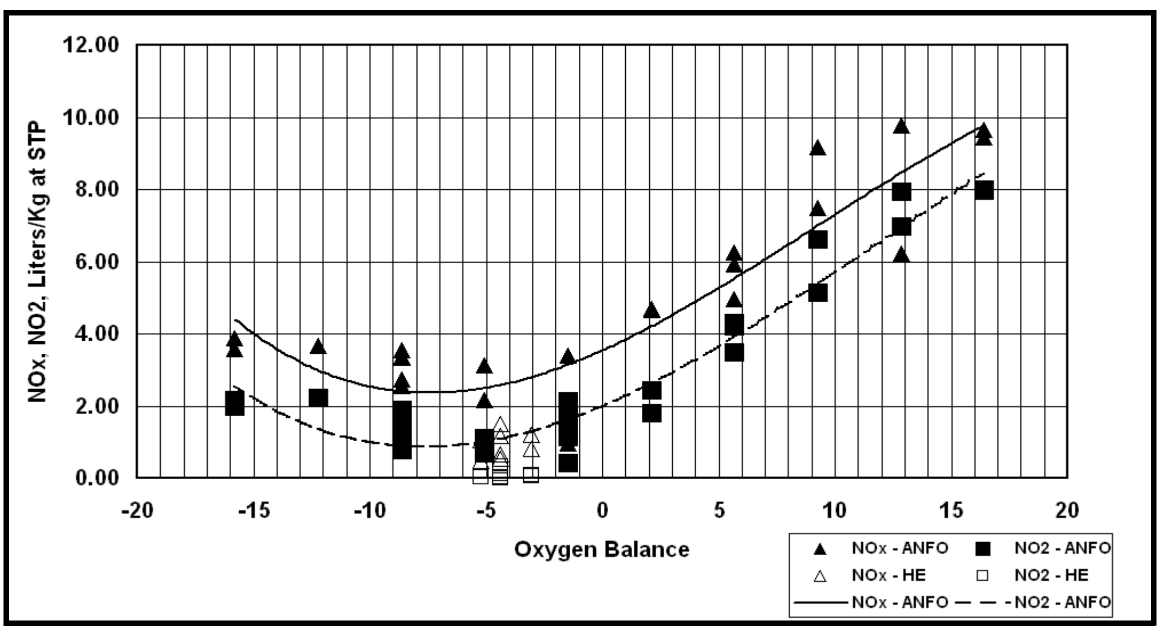


Figure 6. Effect of Oxygen Balance on nitrogen oxides and nitrogen dioxide production for 94/6 ANFO and high explosives (cap-sensitive explosives).

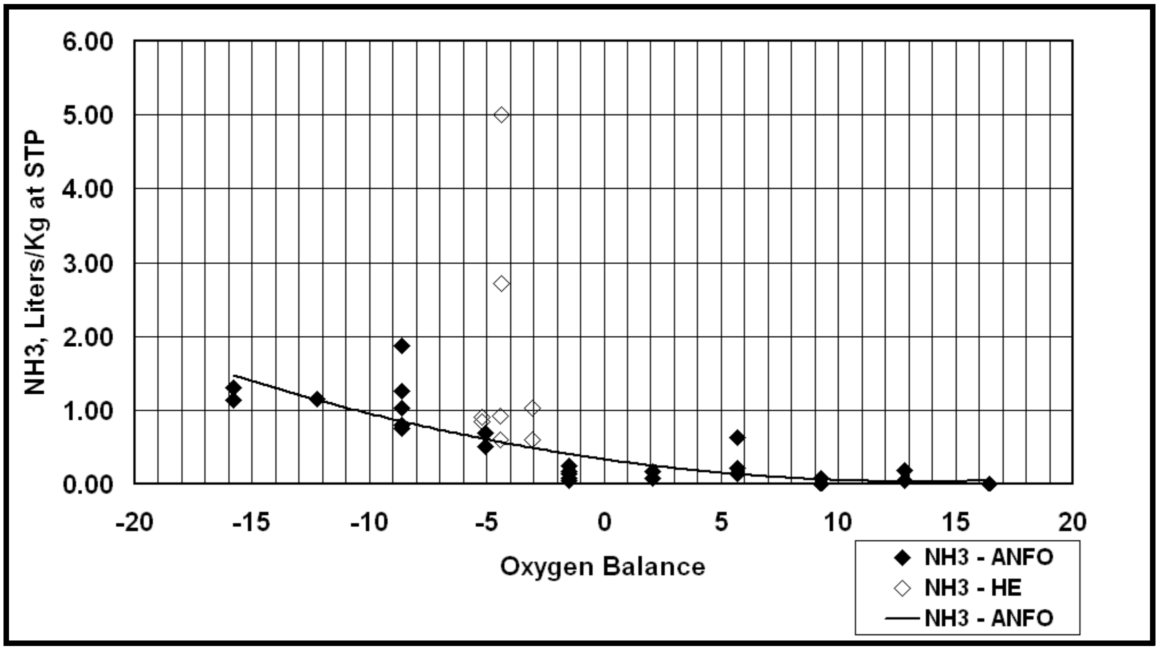


Figure 7. Effect of Oxygen Balance on ammonia production for 94/6 ANFO and high explosives (cap-sensitive explosives).

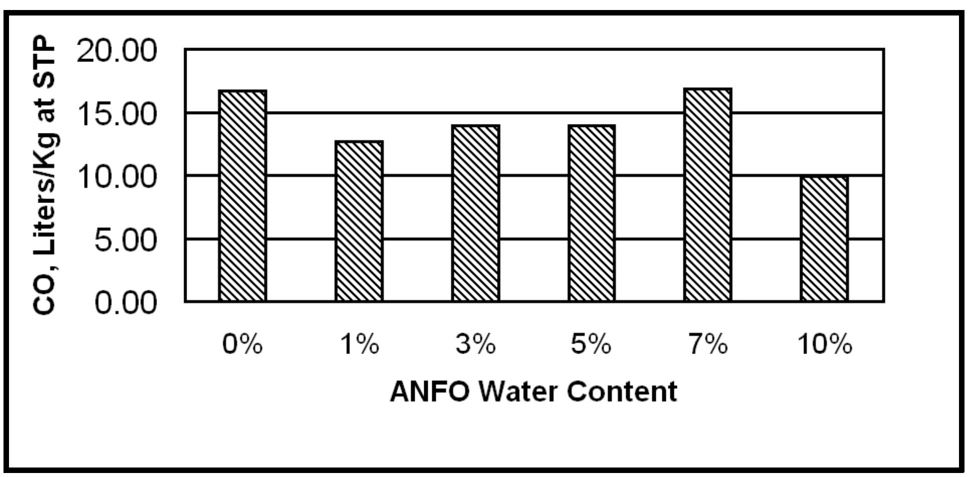


Figure 8. Effect of ANFO water content on carbon monoxide production for a 94/6 mix.

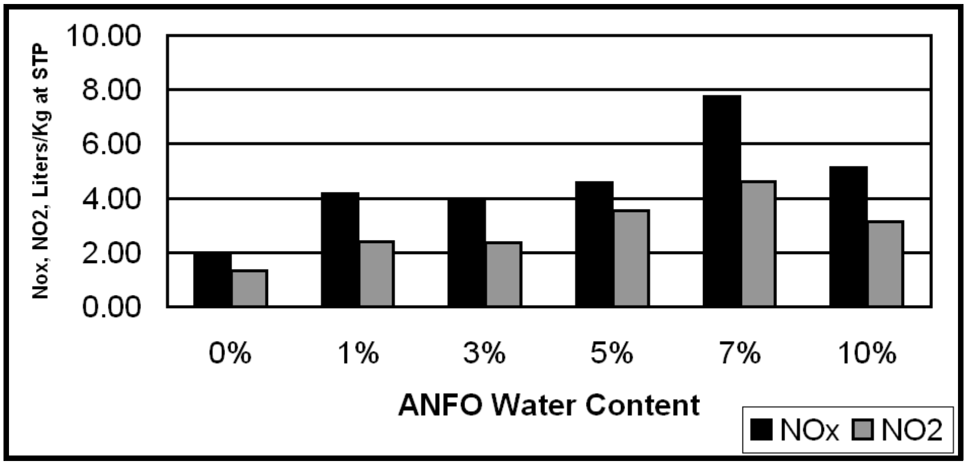


Figure 9. Effect of 94/6 ANFO water content on nitrogen oxides and nitrogen dioxide production.

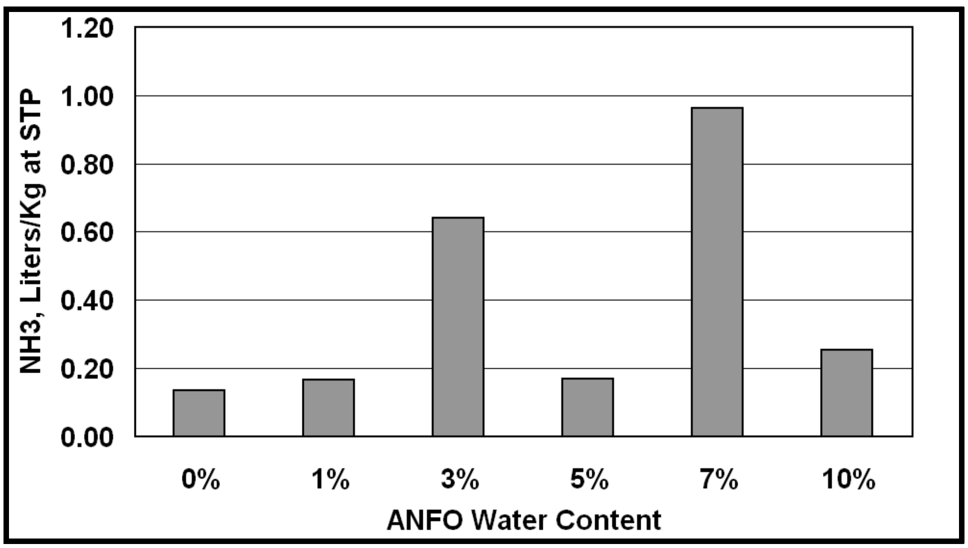


Figure 10. Effect of 94/6 ANFO water content on ammonia production.

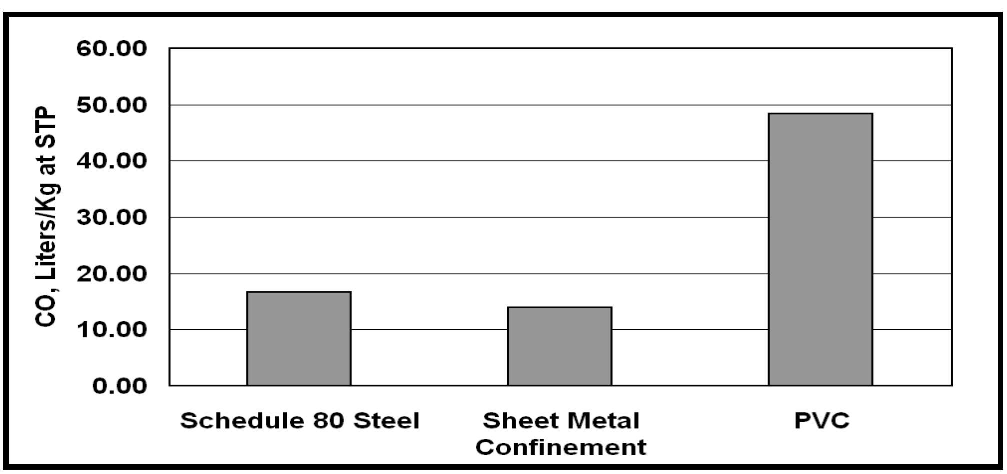


Figure 11. Effect of 94/6 ANFO confinement on carbon monoxide production.

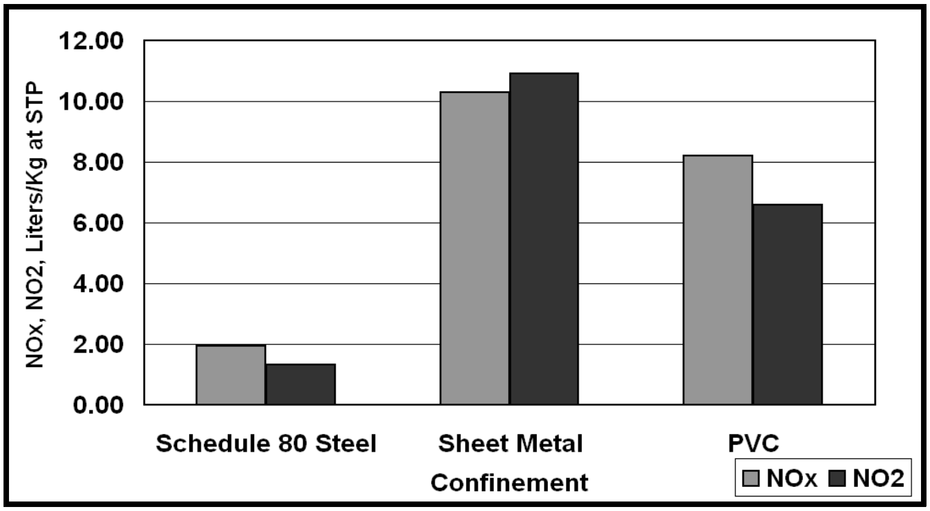


Figure 12. Effect of 94/6 ANFO confinement on nitrogen oxides and nitrogen dioxide production.

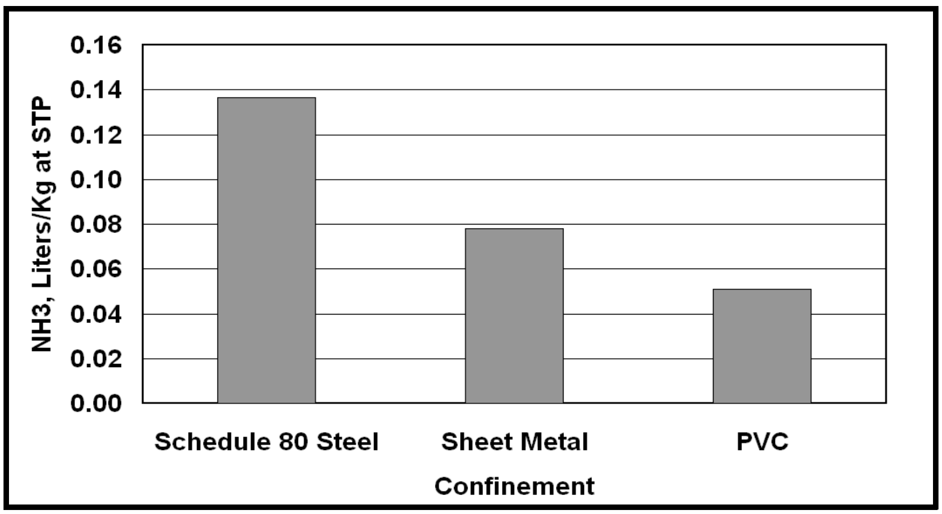


Figure 13. Effect of 94/6 ANFO confinement on ammonia production.

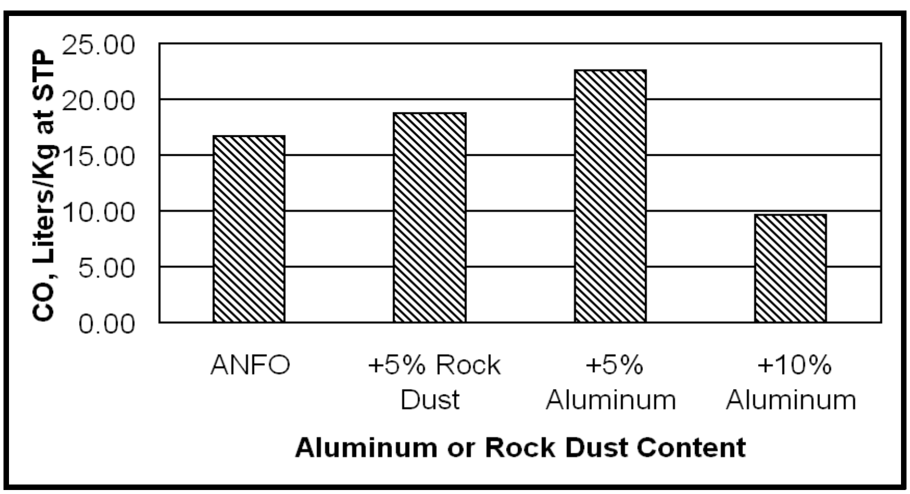


Figure 14. Effect of aluminum and rock dust content on carbon monoxide production.

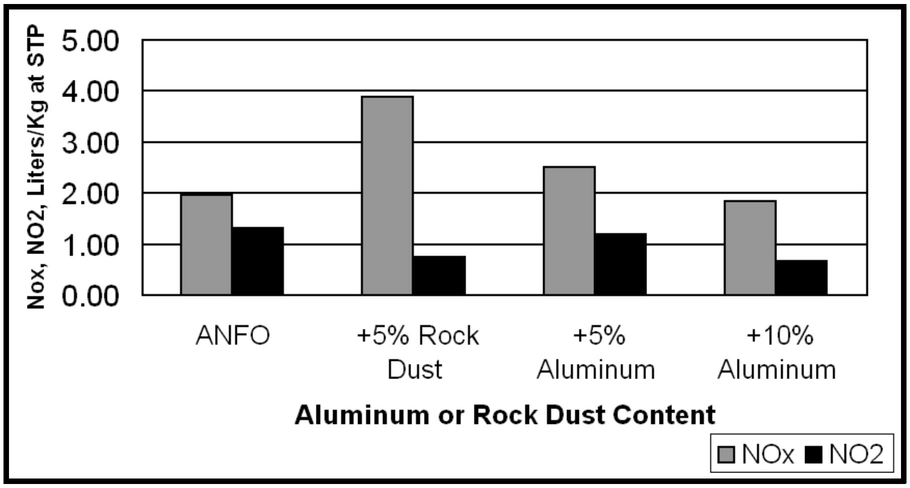


Figure 15. Effect of aluminum and rock dust content on nitrogen oxides and nitrogen dioxide production.

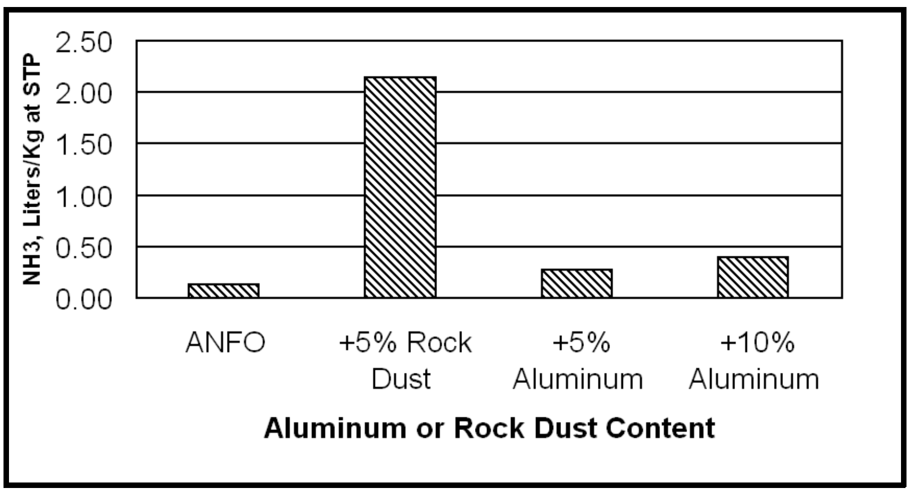


Figure 16. Effect of aluminum or rock dust content on ammonia production.

Table 11.9-1 (English Units). EMISSION FACTOR EQUATIONS FOR UNCONTROLLED OPEN DUST SOURCES AT WESTERN SURFACE COAL MINES[a]

Operation	Material	Emissions By Particle Size Range (Aerodynamic Diameter)[b,c]				Units	EMISSION FACTOR RATING
		Emission Factor Equations		Scaling Factors			
		TSP ≤30 µm	≤15 µm	≤10 µm[d]	≤2.5 µm/TSP[e]		
Blasting[f]	Coal or overburden	$0.000014(A)^{1.5}$	ND	0.52[e]	0.03	lb/blast	C_DD
Truck loading	Coal	$\frac{1.16}{(M)^{1.2}}$	$\frac{0.119}{(M)^{0.9}}$	0.75	0.019	lb/ton	BBCC
Bulldozing	Coal	$\frac{78.4\ (s)^{1.2}}{(M)^{1.3}}$	$\frac{18.6\ (s)^{1.5}}{(M)^{1.4}}$	0.75	0.022	lb/hr	CCDD
	Overburden	$\frac{5.7\ (s)^{1.2}}{(M)^{1.3}}$	$\frac{1.0\ (s)^{1.5}}{(M)^{1.4}}$	0.75	0.105	lb/hr	BCDD
Dragline	Overburden	$\frac{0.0021\ (d)^{1.1}}{(M)^{0.3}}$	$\frac{0.0021\ (d)^{0.7}}{(M)^{0.3}}$	0.75	0.017	lb/yd^3	BCDD
Vehicle traffic[g]							
Grading		$0.040\ (S)^{2.5}$	$0.051\ (S)^{2.0}$	0.60	0.031	lb/VMT	CCDD
Active storage pile[h] (wind erosion and maintenance)	Coal	0.72 u	ND	ND	ND	$\frac{lb}{(acre)(hr)}$	C[i]_ _ _

[a] Reference 1, except as noted. VMT = vehicle miles traveled. ND = no data. Quality ratings coded where “Q, X, Y, Z” are ratings for ≤30 µm, ≤15 µm, ≤10 µm, and ≤2.5 µm, respectively. See also note below.

[b] Particulate matter less than or equal to 30 µm in aerodynamic diameter is sometimes termed “suspendable particulate” and is often used as a surrogate for TSP (total suspended particulate). TSP denotes what is measured by a standard high volume sampler (see Section 13.2).

[c] Symbols for equations:

- A = horizontal area (ft^2), with blasting depth ≤ 70 ft. Not for vertical face of a bench.
- M = material moisture content (%)
- s = material silt content (%)
- u = wind speed (mph)
- d = drop height (ft)
- W = mean vehicle weight (tons)
- S = mean vehicle speed (mph)
- w = mean number of wheels

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of September 14, 2020

Title 40 → Chapter I → Subchapter C → Part 98 → Subpart A → Appendix

Title 40: Protection of Environment
PART 98—MANDATORY GREENHOUSE GAS REPORTING
Subpart A—General Provision

Table A-1 to Subpart A of Part 98—Global Warming Potentials

[100-Year Time Horizon]

Name	CAS No.	Chemical formula	Global warming potential (100 yr.)
Chemical-Specific GWPs			
Carbon dioxide	124-38-9	CO_2	1
Methane	74-82-8	CH_4	[a]25
Nitrous oxide	10024-97-2	N_2O	[a]298
Fully Fluorinated GHGs			
Sulfur hexafluoride	2551-62-4	SF_6	[a]22,800
Trifluoromethyl sulphur pentafluoride	373-80-8	SF_5CF_3	17,700
Nitrogen trifluoride	7783-54-2	NF_3	17,200
PFC-14 (Perfluoromethane)	75-73-0	CF_4	[a]7,390
PFC-116 (Perfluoroethane)	76-16-4	C_2F_6	[a]12,200
PFC-218 (Perfluoropropane)	76-19-7	C_3F_8	[a]8,830
Perfluorocyclopropane	931-91-9	$C\text{-}C_3F_6$	17,340
PFC-3-1-10 (Perfluorobutane)	355-25-9	C_4F_{10}	[a]8,860
PFC-318 (Perfluorocyclobutane)	115-25-3	$C\text{-}C_4F_8$	[a]10,300
PFC-4-1-12 (Perfluoropentane)	678-26-2	C_5F_{12}	[a]9,160
PFC-5-1-14 (Perfluorohexane, FC-72)	355-42-0	C_6F_{14}	[a]9,300
PFC-6-1-12	335-57-9	C_7F_{16}; $CF_3(CF_2)_5CF_3$	[b]7,820
PFC-7-1-18	307-34-6	C_8F_{18}; $CF_3(CF_2)_6CF_3$	[b]7,620
PFC-9-1-18	306-94-5	$C_{10}F_{18}$	7,500
PFPMIE (HT-70)	NA	$CF_3OCF(CF_3)CF_2OCF_2OCF_3$	10,300
Perfluorodecalin (cis)	60433-11-6	$Z\text{-}C_{10}F_{18}$	[b]7,236
Perfluorodecalin (trans)	60433-12-7	$E\text{-}C_{10}F_{18}$	[b]6,288
Saturated Hydrofluorocarbons (HFCs) With Two or Fewer Carbon-Hydrogen Bonds			
HFC-23	75-46-7	CHF_3	[a]14,800
HFC-32	75-10-5	CH_2F_2	[a]675
HFC-125	354-33-6	C_2HF_5	[a]3,500

HFC-134	359-35-3	$C_2H_2F_4$	[a]1,100
HFC-134a	811-97-2	CH_2FCF_3	[a]1,430
HFC-227ca	2252-84-8	$CF_3CF_2CHF_2$	[b]2640
HFC-227ea	431-89-0	C_3HF_7	[a]3,220
HFC-236cb	677-56-5	$CH_2FCF_2CF_3$	1,340
HFC-236ea	431-63-0	CHF_2CHFCF_3	1,370
HFC-236fa	690-39-1	$C_3H_2F_6$	[a]9,810
HFC-329p	375-17-7	$CHF_2CF_2CF_2CF_3$	[b]2360
HFC-43-10mee	138495-42-8	$CF_3CFHCFHCF_2CF_3$	[a]1,640
Saturated Hydrofluorocarbons (HFCs) With Three or More Carbon-Hydrogen Bonds			
HFC-41	593-53-3	CH_3F	[a]92
HFC-143	430-66-0	$C_2H_3F_3$	[a]353
HFC-143a	420-46-2	$C_2H_3F_3$	[a]4,470
HFC-152	624-72-6	CH_2FCH_2F	53
HFC-152a	75-37-6	CH_3CHF_2	[a]124
HFC-161	353-36-6	CH_3CH_2F	12
HFC-245ca	679-86-7	$C_3H_3F_5$	[a]693
HFC-245cb	1814-88-6	$CF_3CF_2CH_3$	[b]4620
HFC-245ea	24270-66-4	$CHF_2CHFCHF_2$	[b]235
HFC-245eb	431-31-2	$CH_2FCHFCF_3$	[b]290
HFC-245fa	460-73-1	$CHF_2CH_2CF_3$	1,030
HFC-263fb	421-07-8	$CH_3CH_2CF_3$	[b]76
HFC-272ca	420-45-1	$CH_3CF_2CH_3$	[b]144
HFC-365mfc	406-58-6	$CH_3CF_2CH_2CF_3$	794
Saturated Hydrofluoroethers (HFEs) and Hydrochlorofluoroethers (HCFEs) With One Carbon-Hydrogen Bond			
HFE-125	3822-68-2	CHF_2OCF_3	14,900
HFE-227ea	2356-62-9	$CF_3CHFOCF_3$	1,540
HFE-329mcc2	134769-21-4	$CF_3CF_2OCF_2CHF_2$	919
HFE-329me3	428454-68-6	$CF_3CFHCF_2OCF_3$	[b]4,550
1,1,1,2,2,3,3-Heptafluoro-3-(1,2,2,2-tetrafluoroethoxy)-propane	3330-15-2	$CF_3CF_2CF_2OCHFCF_3$	[b]6,490
Saturated HFEs and HCFEs With Two Carbon-Hydrogen Bonds			
HFE-134 (HG-00)	1691-17-4	CHF_2OCHF_2	6,320
HFE-236ca	32778-11-3	$CHF_2OCF_2CHF_2$	[b]4,240
HFE-236ca12 (HG-10)	78522-47-1	$CHF_2OCF_2OCHF_2$	2,800
HFE-236ea2 (Desflurane)	57041-67-5	$CHF_2OCHFCF_3$	989
HFE-236fa	20193-67-3	$CF_3CH_2OCF_3$	487
HFE-338mcf2	156053-88-2	$CF_3CF_2OCH_2CF_3$	552
HFE-338mmz1	26103-08-2	$CHF_2OCH(CF_3)_2$	380
HFE-338pcc13 (HG-01)	188690-78-0	$CHF_2OCF_2CF_2OCHF_2$	1,500
HFE-43-10pccc (H-Galden 1040x, HG-11)	E1730133	$CHF_2OCF_2OC_2F_4OCHF_2$	1,870
HCFE-235ca2 (Enflurane)	13838-16-	CHF_2OCF_2CHFCl	[b]583

	9		
HCFE-235da2 (Isoflurane)	26675-46-7	$CHF_2OCHClCF_3$	350
HG-02	205367-61-9	$HF_2C\text{-}(OCF_2CF_2)_2\text{-}OCF_2H$	[b]3,825
HG-03	173350-37-3	$HF_2C\text{-}(OCF_2CF_2)_3\text{-}OCF_2H$	[b]3,670
HG-20	249932-25-0	$HF_2C\text{-}(OCF_2)_2\text{-}OCF_2H$	[b]5,300
HG-21	249932-26-1	$HF_2C\text{-}OCF_2CF_2OCF_2OCF_2O\text{-}CF_2H$	[b]3,890
HG-30	188690-77-9	$HF_2C\text{-}(OCF_2)_3\text{-}OCF_2H$	[b]7,330
1,1,3,3,4,4,6,6,7,7,9,9,10,10,12,12,13,13,15,15-eicosafluoro-2,5,8,11,14-Pentaoxapentadecane	173350-38-4	$HCF_2O(CF_2CF_2O)_4CF_2H$	[b]3,630
1,1,2-Trifluoro-2-(trifluoromethoxy)-ethane	84011-06-3	$CHF_2CHFOCF_3$	[b]1,240
Trifluoro(fluoromethoxy)methane	2261-01-0	CH_2FOCF_3	[b]751
Saturated HFEs and HCFEs With Three or More Carbon-Hydrogen Bonds			
HFE-143a	421-14-7	CH_3OCF_3	756
HFE-245cb2	22410-44-2	$CH_3OCF_2CF_3$	708
HFE-245fa1	84011-15-4	$CHF_2CH_2OCF_3$	286
HFE-245fa2	1885-48-9	$CHF_2OCH_2CF_3$	659
HFE-254cb2	425-88-7	$CH_3OCF_2CHF_2$	359
HFE-263fb2	460-43-5	$CF_3CH_2OCH_3$	11
HFE-263m1; R-E-143a	690-22-2	$CF_3OCH_2CH_3$	[b]29
HFE-347mcc3 (HFE-7000)	375-03-1	$CH_3OCF_2CF_2CF_3$	575
HFE-347mcf2	171182-95-9	$CF_3CF_2OCH_2CHF_2$	374
HFE-347mmy1	22052-84-2	$CH_3OCF(CF_3)_2$	343
HFE-347mmz1 (Sevoflurane)	28523-86-6	$(CF_3)_2CHOCH_2F$	[c]216
HFE-347pcf2	406-78-0	$CHF_2CF_2OCH_2CF_3$	580
HFE-356mec3	382-34-3	$CH_3OCF_2CHFCF_3$	101
HFE-356mff2	333-36-8	$CF_3CH_2OCH_2CF_3$	[b]17
HFE-356mmz1	13171-18-1	$(CF_3)_2CHOCH_3$	27
HFE-356pcc3	160620-20-2	$CH_3OCF_2CF_2CHF_2$	110
HFE-356pcf2	50807-77-7	$CHF_2CH_2OCF_2CHF_2$	265
HFE-356pcf3	35042-99-0	$CHF_2OCH_2CF_2CHF_2$	502
HFE-365mcf2	22052-81-9	$CF_3CF_2OCH_2CH_3$	[b]58
HFE-365mcf3	378-16-5	$CF_3CF_2CH_2OCH_3$	11
HFE-374pc2	512-51-6	$CH_3CH_2OCF_2CHF_2$	557
HFE-449s1 (HFE-7100) Chemical blend	163702-07-6	$C_4F_9OCH_3$	297
	163702-08-7	$(CF_3)_2CFCF_2OCH_3$	
HFE-569sf2 (HFE-7200) Chemical blend	163702-05-4	$C_4F_9OC_2H_5$	59

	163702-06-5	$(CF_3)_2CFCF_2OC_2H_5$	
HG'-01	73287-23-7	$CH_3OCF_2CF_2OCH_3$	[b]222
HG'-02	485399-46-0	$CH_3O(CF_2CF_2O)_2CH_3$	[b]236
HG'-03	485399-48-2	$CH_3O(CF_2CF_2O)_3CH_3$	[b]221
Difluoro(methoxy)methane	359-15-9	CH_3OCHF_2	[b]144
2-Chloro-1,1,2-trifluoro-1-methoxyethane	425-87-6	CH_3OCF_2CHFCl	[b]122
1-Ethoxy-1,1,2,2,3,3,3-heptafluoropropane	22052-86-4	$CF_3CF_2CF_2OCH_2CH_3$	[b]61
2-Ethoxy-3,3,4,4,5-pentafluorotetrahydro-2,5-bis[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]-furan	920979-28-8	$C_{12}H_5F_{19}O_2$	[b]56
1-Ethoxy-1,1,2,3,3,3-hexafluoropropane	380-34-7	$CF_3CHFCF_2OCH_2CH_3$	[b]23
Fluoro(methoxy)methane	460-22-0	CH_3OCH_2F	[b]13
1,1,2,2-Tetrafluoro-3-methoxy-propane; Methyl 2,2,3,3-tetrafluoropropyl ether	60598-17-6	$CHF_2CF_2CH_2OCH_3$	[b]0.5
1,1,2,2-Tetrafluoro-1-(fluoromethoxy)ethane	37031-31-5	$CH_2FOCF_2CF_2H$	[b]871
Difluoro(fluoromethoxy)methane	461-63-2	CH_2FOCHF_2	[b]617
Fluoro(fluoromethoxy)methane	462-51-1	CH_2FOCH_2F	[b]130
Fluorinated Formates			
Trifluoromethyl formate	85358-65-2	$HCOOCF_3$	[b]588
Perfluoroethyl formate	313064-40-3	$HCOOCF_2CF_3$	[b]580
1,2,2,2-Tetrafluoroethyl formate	481631-19-0	$HCOOCHFCF_3$	[b]470
Perfluorobutyl formate	197218-56-7	$HCOOCF_2CF_2CF_2CF_3$	[b]392
Perfluoropropyl formate	271257-42-2	$HCOOCF_2CF_2CF_3$	[b]376
1,1,1,3,3,3-Hexafluoropropan-2-yl formate	856766-70-6	$HCOOCH(CF_3)_2$	[b]333
2,2,2-Trifluoroethyl formate	32042-38-9	$HCOOCH_2CF_3$	[b]33
3,3,3-Trifluoropropyl formate	1344118-09-7	$HCOOCH_2CH_2CF_3$	[b]17
Fluorinated Acetates			
Methyl 2,2,2-trifluoroacetate	431-47-0	CF_3COOCH_3	[b]52
1,1-Difluoroethyl 2,2,2-trifluoroacetate	1344118-13-3	$CF_3COOCF_2CH_3$	[b]31
Difluoromethyl 2,2,2-trifluoroacetate	2024-86-4	$CF_3COOCHF_2$	[b]27
2,2,2-Trifluoroethyl 2,2,2-trifluoroacetate	407-38-5	$CF_3COOCH_2CF_3$	[b]7
Methyl 2,2-difluoroacetate	433-53-4	HCF_2COOCH_3	[b]3
Perfluoroethyl acetate	343269-97-6	$CH_3COOCF_2CF_3$	[b]2.1
Trifluoromethyl acetate	74123-20-9	CH_3COOCF_3	[b]2.0
Perfluoropropyl acetate	1344118-10-0	$CH_3COOCF_2CF_2CF_3$	[b]1.8
Perfluorobutyl acetate	209597-28-4	$CH_3COOCF_2CF_2CF_2CF_3$	[b]1.6
Ethyl 2,2,2-trifluoroacetate	383-63-1	$CF_3COOCH_2CH_3$	[b]1.3
Carbonofluoridates			

Carbonofluoridates			
Methyl carbonofluoridate	1538-06-3	$FCOOCH_3$	[b]95
1,1-Difluoroethyl carbonofluoridate	1344118-11-1	$FCOOCF_2CH_3$	[b]27
Fluorinated Alcohols Other Than Fluorotelomer Alcohols			
Bis(trifluoromethyl)-methanol	920-66-1	$(CF_3)_2CHOH$	195
(Octafluorotetramethy-lene) hydroxymethyl group	NA	$X\text{-}(CF_2)_4CH(OH)\text{-}X$	73
2,2,3,3,3-Pentafluoropropanol	422-05-9	$CF_3CF_2CH_2OH$	42
2,2,3,3,4,4,4-Heptafluorobutan-1-ol	375-01-9	C_3F_7CH2OH	[b]25
2,2,2-Trifluoroethanol	75-89-8	CF_3CH_2OH	[b]20
2,2,3,4,4,4-Hexafluoro-1-butanol	382-31-0	$CF_3CHFCF_2CH_2OH$	[b]17
2,2,3,3-Tetrafluoro-1-propanol	76-37-9	$CHF_2CF_2CH_2OH$	[b]13
2,2-Difluoroethanol	359-13-7	CHF_2CH2OH	[b]3
2-Fluoroethanol	371-62-0	CH_2FCH_2OH	[b]1.1
4,4,4-Trifluorobutan-1-ol	461-18-7	$CF_3(CH_2)_2CH_2OH$	[b]0.05
Unsaturated Perfluorocarbons (PFCs)			
PFC-1114; TFE	116-14-3	$CF_2 = CF_2$; C_2F_4	[b]0.004
PFC-1216; Dyneon HFP	116-15-4	C_3F_6; $CF_3CF = CF_2$	[b]0.05
PFC C-1418	559-40-0	$c\text{-}C_5F_8$	[b]1.97
Perfluorobut-2-ene	360-89-4	$CF_3CF = CFCF_3$	[b]1.82
Perfluorobut-1-ene	357-26-6	$CF_3CF_2CF = CF_2$	[b]0.10
Perfluorobuta-1,3-diene	685-63-2	$CF_2 = CFCF = CF_2$	[b]0.003
Unsaturated Hydrofluorocarbons (HFCs) and Hydrochlorofluorocarbons (HCFCs)			
HFC-1132a; VF2	75-38-7	$C_2H_2F_2$, $CF_2 = CH_2$	[b]0.04
HFC-1141; VF	75-02-5	C_2H_3F, $CH_2 = CHF$	[b]0.02
(E)-HFC-1225ye	5595-10-8	$CF_3CF = CHF(E)$	[b]0.06
(Z)-HFC-1225ye	5528-43-8	$CF_3CF = CHF(Z)$	[b]0.22
Solstice 1233zd(E)	102687-65-0	$C_3H_2ClF_3$; $CHCl = CHCF_3$	[b]1.34
HFC-1234yf; HFO-1234yf	754-12-1	$C_3H_2F_4$; $CF_3CF = CH_2$	[b]0.31
HFC-1234ze(E)	1645-83-6	$C_3H_2F_4$; trans-$CF_3CH = CHF$	[b]0.97
HFC-1234ze(Z)	29118-25-0	$C_3H_2F_4$; cis-$CF_3CH = CHF$; $CF_3CH = CHF$	[b]0.29
HFC-1243zf; TFP	677-21-4	$C_3H_3F_3$, $CF_3CH = CH_2$	[b]0.12
(Z)-HFC-1336	692-49-9	$CF_3CH = CHCF_3(Z)$	[b]1.58
HFC-1345zfc	374-27-6	$C_2F_5CH = CH_2$	[b]0.09
Capstone 42-U	19430-93-4	$C_6H_3F_9$, $CF_3(CF_2)_3CH = CH_2$	[b]0.16
Capstone 62-U	25291-17-2	$C_8H_3F_{13}$, $CF_3(CF_2)_5CH = CH_2$	[b]0.11
Capstone 82-U	21652-58-4	$C_{10}H_3F_{17}$, $CF_3(CF_2)_7CH = CH_2$	[b]0.09
Unsaturated Halogenated Ethers			
PMVE; HFE-216	1187-93-5	$CF_3OCF = CF_2$	[b]0.17
Fluoroxene	406-90-6	$CF_3CH_2OCH = CH_2$	[b]0.05
Fluorinated Aldehydes			
3,3,3-Trifluoro-propanal	460-40-2	CF_3CH_2CHO	[b]0.01
Fluorinated Ketones			
Novec 1230 (perfluoro (2-methyl-3-pentanone))	756-13-8	$CF_3CF_2C(O)CF\ (CF3)_2$	[b]0.1
Fluorotelomer Alcohols			
3,3,4,4,5,5,6,6,7,7,7-Undecafluoroheptan-1-ol	185689-	$CF_3(CF_2)_4CH_2CH_2OH$	[b]0.43

	57-0		
3,3,3-Trifluoropropan-1-ol	2240-88-2	$CF_3CH_2CH_2OH$	[b]0.35
3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-Pentadecafluorononan-1-ol	755-02-2	$CF_3(CF_2)_6CH_2CH_2OH$	[b]0.33
3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-Nonadecafluoroundecan-1-ol	87017-97-8	$CF_3(CF_2)_8CH_2CH_2OH$	[b]0.19
Fluorinated GHGs With Carbon-Iodine Bond(s)			
Trifluoroiodomethane	2314-97-8	CF_3I	[b]0.4
Other Fluorinated Compounds			
Dibromodifluoromethane (Halon 1202)	75-61-6	CBR_2F_2	[b]231
2-Bromo-2-chloro-1,1,1-trifluoroethane (Halon-2311/Halothane)	151-67-7	$CHBrClF_3$	[b]41

Fluorinated GHG Group[d]	Global warming potential (100 yr.)
Default GWPs for Compounds for Which Chemical-Specific GWPs Are Not Listed Above	
Fully fluorinated GHGs	10,000
Saturated hydrofluorocarbons (HFCs) with 2 or fewer carbon-hydrogen bonds	3,700
Saturated HFCs with 3 or more carbon-hydrogen bonds	930
Saturated hydrofluoroethers (HFEs) and hydrochlorofluoroethers (HCFEs) with 1 carbon-hydrogen bond	5,700
Saturated HFEs and HCFEs with 2 carbon-hydrogen bonds	2,600
Saturated HFEs and HCFEs with 3 or more carbon-hydrogen bonds	270
Fluorinated formates	350
Fluorinated acetates, carbonofluoridates, and fluorinated alcohols other than fluorotelomer alcohols	30
Unsaturated perfluorocarbons (PFCs), unsaturated HFCs, unsaturated hydrochlorofluorocarbons (HCFCs), unsaturated halogenated ethers, unsaturated halogenated esters, fluorinated aldehydes, and fluorinated ketones	1
Fluorotelomer alcohols	1
Fluorinated GHGs with carbon-iodine bond(s)	1
Other fluorinated GHGs	2,000

[a]The GWP for this compound was updated in the final rule published on November 29, 2013 [78 FR 71904] and effective on January 1, 2014.

[b]This compound was added to Table A-1 in the final rule published on December 11, 2014, and effective on January 1, 2015.

[c]The GWP for this compound was updated in the final rule published on December 11, 2014, and effective on January 1, 2015 .

[d]For electronics manufacturing (as defined in §98.90), the term “fluorinated GHGs” in the definition of each fluorinated GHG group in §98.6 shall include fluorinated heat transfer fluids (as defined in §98.98), whether or not they are also fluorinated GHGs.

[79 FR 73779, Dec. 11, 2014]

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of September 14, 2020

Title 40: Protection of Environment
PART 98—MANDATORY GREENHOUSE GAS REPORTING
Subpart C—General Stationary Fuel Combustion Sources

Table C-1 to Subpart C of Part 98—Default CO_2 Emission Factors and High Heat Values for Various Types of Fuel

Default CO_2 Emission Factors and High Heat Values for Various Types of Fuel

Fuel type	Default high heat value	Default CO_2 emission factor
Coal and coke	mmBtu/short ton	kg CO_2/mmBtu
Anthracite	25.09	103.69
Bituminous	24.93	93.28
Subbituminous	17.25	97.17
Lignite	14.21	97.72
Coal Coke	24.80	113.67
Mixed (Commercial sector)	21.39	94.27
Mixed (Industrial coking)	26.28	93.90
Mixed (Industrial sector)	22.35	94.67
Mixed (Electric Power sector)	19.73	95.52
Natural gas	mmBtu/scf	kg CO_2/mmBtu
(Weighted U.S. Average)	1.026×10^{-3}	53.06
Petroleum products—liquid	mmBtu/gallon	kg CO_2/mmBtu
Distillate Fuel Oil No. 1	0.139	73.25
Distillate Fuel Oil No. 2	0.138	73.96
Distillate Fuel Oil No. 4	0.146	75.04
Residual Fuel Oil No. 5	0.140	72.93
Residual Fuel Oil No. 6	0.150	75.10
Used Oil	0.138	74.00
Kerosene	0.135	75.20
Liquefied petroleum gases (LPG)[1]	0.092	61.71
Propane[1]	0.091	62.87
Propylene[2]	0.091	67.77
Ethane[1]	0.068	59.60
Ethanol	0.084	68.44
Ethylene[2]	0.058	65.96
Isobutane[1]	0.099	64.94
	0.103	68.86

Isobutylene[1]	0.103	68.86
Butane[1]	0.103	64.77
Butylene[1]	0.105	68.72
Naphtha (<401 deg F)	0.125	68.02
Natural Gasoline	0.110	66.88
Other Oil (>401 deg F)	0.139	76.22
Pentanes Plus	0.110	70.02
Petrochemical Feedstocks	0.125	71.02
Special Naphtha	0.125	72.34
Unfinished Oils	0.139	74.54
Heavy Gas Oils	0.148	74.92
Lubricants	0.144	74.27
Motor Gasoline	0.125	70.22
Aviation Gasoline	0.120	69.25
Kerosene-Type Jet Fuel	0.135	72.22
Asphalt and Road Oil	0.158	75.36
Crude Oil	0.138	74.54
Petroleum products—solid	mmBtu/short ton	kg CO_2/mmBtu.
Petroleum Coke	30.00	102.41.
Petroleum products—gaseous	mmBtu/scf	kg CO_2/mmBtu.
Propane Gas	2.516×10^{-3}	61.46.
Other fuels—solid	mmBtu/short ton	kg CO_2/mmBtu
Municipal Solid Waste	9.95[3]	90.7
Tires	28.00	85.97
Plastics	38.00	75.00
Other fuels—gaseous	mmBtu/scf	kg CO_2/mmBtu
Blast Furnace Gas	0.092×10^{-3}	274.32
Coke Oven Gas	0.599×10^{-3}	46.85
Fuel Gas[4]	1.388×10^{-3}	59.00
Biomass fuels—solid	mmBtu/short ton	kg CO_2/mmBtu
Wood and Wood Residuals (dry basis)[5]	17.48	93.80
Agricultural Byproducts	8.25	118.17
Peat	8.00	111.84
Solid Byproducts	10.39	105.51
Biomass fuels—gaseous	mmBtu/scf	kg CO_2/mmBtu
Landfill Gas	0.485×10^{-3}	52.07
Other Biomass Gases	0.655×10^{-3}	52.07
Biomass Fuels—Liquid	mmBtu/gallon	kg CO_2/mmBtu
Ethanol	0.084	68.44
Biodiesel (100%)	0.128	73.84
Rendered Animal Fat	0.125	71.06
Vegetable Oil	0.120	81.55

[1]The HHV for components of LPG determined at 60 °F and saturation pressure with the exception of ethylene.

[2]Ethylene HHV determined at 41 °F (5 °C) and saturation pressure.

[3]Use of this default HHV is allowed only for: (a) Units that combust MSW, do not generate steam, and are allowed to use Tier 1; (b) units that derive no more than 10 percent

of their annual heat input from MSW and/or tires; and (c) small batch incinerators that combust no more than 1,000 tons of MSW per year.

[4]Reporters subject to subpart X of this part that are complying with §98.243(d) or subpart Y of this part may only use the default HHV and the default CO_2 emission factor for fuel gas combustion under the conditions prescribed in §98.243(d)(2)(i) and (d)(2)(ii) and §98.252(a)(1) and (a)(2), respectively. Otherwise, reporters subject to subpart X or subpart Y shall use either Tier 3 (Equation C-5) or Tier 4.

[5]Use the following formula to calculate a wet basis HHV for use in Equation C-1: $HHV_w = ((100 - M)/100)*HHV_d$ where HHV_w = wet basis HHV, M = moisture content (percent) and HHV_d = dry basis HHV from Table C-1.

[78 FR 71950, Nov. 29, 2013, as amended at 81 FR 89252, Dec. 9, 2016]

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of September 14, 2020

Title 40: Protection of Environment
PART 98—MANDATORY GREENHOUSE GAS REPORTING
Subpart C—General Stationary Fuel Combustion Sources

Table C-2 to Subpart C of Part 98—Default CH_4 and N_2O Emission Factors for Various Types of Fuel

Fuel type	**Default CH_4 emission factor ($kg\ CH_4/mmBtu$)**	**Default N_2O emission factor ($kg\ N_2O/mmBtu$)**
Coal and Coke (All fuel types in Table C-1)	1.1×10^{-02}	1.6×10^{-03}
Natural Gas	1.0×10^{-03}	1.0×10^{-04}
Petroleum Products (All fuel types in Table C-1)	3.0×10^{-03}	6.0×10^{-04}
Fuel Gas	3.0×10^{-03}	6.0×10^{-04}
Other Fuels—Solid	3.2×10^{-02}	4.2×10^{-03}
Blast Furnace Gas	2.2×10^{-05}	1.0×10^{-04}
Coke Oven Gas	4.8×10^{-04}	1.0×10^{-04}
Biomass Fuels—Solid (All fuel types in Table C-1, except wood and wood residuals)	3.2×10^{-02}	4.2×10^{-03}
Wood and wood residuals	7.2×10^{-03}	3.6×10^{-03}
Biomass Fuels—Gaseous (All fuel types in Table C-1)	3.2×10^{-03}	6.3×10^{-04}
Biomass Fuels—Liquid (All fuel types in Table C-1)	1.1×10^{-03}	1.1×10^{-04}

Note: Those employing this table are assumed to fall under the IPCC definitions of the “Energy Industry” or “Manufacturing Industries and Construction”. In all fuels except for coal the values for these two categories are identical. For coal combustion, those who fall within the IPCC “Energy Industry” category may employ a value of 1g of CH_4/mmBtu.

[78 FR 71952, Nov. 29, 2013, as amended at 81 FR 89252, Dec. 9, 2016]

Need assistance?

Section 7

Information Used to Determine Emissions

Mine Handling (Fugitive)

- AP-42 Chapter 11.19.2

Table 11.19.2-2 (English Units). EMISSION FACTORS FOR CRUSHED STONE PROCESSING OPERATIONS (lb/Ton)[a]

Source [b]	Total Particulate Matter [r,s]	EMISSION FACTOR RATING	Total PM-10	EMISSION FACTOR RATING	Total PM-2.5	EMISSION FACTOR RATING
Primary Crushing (SCC 3-05-020-01)	ND		ND[n]		ND[n]	
Primary Crushing (controlled) (SCC 3-05-020-01)	ND		ND[n]		ND[n]	
Secondary Crushing (SCC 3-05-020-02)	ND		ND[n]		ND[n]	
Secondary Crushing (controlled) (SCC 3-05-020-02)	ND		ND[n]		ND[n]	
Tertiary Crushing (SCC 3-050030-03)	0.0054[d]	E	0.0024[o]	C	ND[n]	
Tertiary Crushing (controlled) (SCC 3-05-020-03)	0.0012[d]	E	0.00054[p]	C	0.00010[q]	E
Fines Crushing (SCC 3-05-020-05)	0.0390[e]	E	0.0150[e]	E	ND	
Fines Crushing (controlled) (SCC 3-05-020-05)	0.0030[f]	E	0.0012[f]	E	0.000070[q]	E
Screening (SCC 3-05-020-02, 03)	0.025[c]	E	0.0087[l]	C	ND	
Screening (controlled) (SCC 3-05-020-02, 03)	0.0022[d]	E	0.00074[m]	C	0.000050[q]	E
Fines Screening (SCC 3-05-020-21)	0.30[g]	E	0.072[g]	E	ND	
Fines Screening (controlled) (SCC 3-05-020-21)	0.0036[g]	E	0.0022[g]	E	ND	
Conveyor Transfer Point (SCC 3-05-020-06)	0.0030[h]	E	0.00110[h]	D	ND	
Conveyor Transfer Point (controlled) (SCC 3-05-020-06)	0.00014[i]	E	4.6×10^{-5}[i]	D	1.3×10^{-5}[q]	E
Wet Drilling - Unfragmented Stone (SCC 3-05-020-10)	ND		8.0×10^{-5}[j]	E	ND	
Truck Unloading -Fragmented Stone (SCC 3-05-020-31)	ND		1.6×10^{-5}[j]	E	ND	
Truck Loading - Conveyor, crushed stone (SCC 3-05-020-32)	ND		0.00010[k]	E	ND	

a. Emission factors represent uncontrolled emissions unless noted. Emission factors in lb/Ton of material of throughput. SCC = Source Classification Code. ND = No data.

b. Controlled sources (with wet suppression) are those that are part of the processing plant that employs current wet suppression technology similar to the study group. The moisture content of the study group without wet suppression systems operating (uncontrolled) ranged from 0.21 to 1.3 percent, and the same facilities operating wet suppression systems (controlled) ranged from 0.55 to 2.88 percent. Due to carry over of the small amount of moisture required, it has been shown that each source, with the exception of crushers, does not need to employ direct water sprays. Although the moisture content was the only variable measured, other process features may have as much influence on emissions from a given source. Visual observations from each source under normal operating conditions are probably the best indicator of which emission factor is most appropriate. Plants that employ substandard control measures as indicated by visual observations should use the uncontrolled factor with an appropriate control efficiency that best reflects the effectiveness of the controls employed.

c. References 1, 3, 7, and 8

d. References 3, 7, and 8

Section 7

Information Used to Determine Emissions

Mine Hauling (Fugitive)

- AP-42 Chapter 13.2.2
- NMED Memo: "Department Accepted Values for: Aggregate Handling, Storage Pile, and Haul Road Emissions"
- Western Regional Air Partnership (WRAP) Fugitive Dust Handbook, September 7, 2006.

13.2.2 Unpaved Roads

13.2.2.1 General

When a vehicle travels an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed.

The particulate emission factors presented in the previous draft version of this section of AP-42, dated October 2001, implicitly included the emissions from vehicles in the form of exhaust, brake wear, and tire wear as well as resuspended road surface material[25]. EPA included these sources in the emission factor equation for unpaved public roads (equation 1b in this section) since the field testing data used to develop the equation included both the direct emissions from vehicles and emissions from resuspension of road dust.

This version of the unpaved public road emission factor equation only estimates particulate emissions from resuspended road surface material [23, 26]. The particulate emissions from vehicle exhaust, brake wear, and tire wear are now estimated separately using EPA's MOBILE6.2 [24]. This approach eliminates the possibility of double counting emissions. Double counting results when employing the previous version of the emission factor equation in this section and MOBILE6.2 to estimate particulate emissions from vehicle traffic on unpaved public roads. It also incorporates the decrease in exhaust emissions that has occurred since the unpaved public road emission factor equation was developed. The previous version of the unpaved public road emission factor equation includes estimates of emissions from exhaust, brake wear, and tire wear based on emission rates for vehicles in the 1980 calendar year fleet. The amount of PM released from vehicle exhaust has decreased since 1980 due to lower new vehicle emission standards and changes in fuel characteristics.

13.2.2.2 Emissions Calculation And Correction Parameters[1-6]

The quantity of dust emissions from a given segment of unpaved road varies linearly with the volume of traffic. Field investigations also have shown that emissions depend on source parameters that characterize the condition of a particular road and the associated vehicle traffic. Characterization of these source parameters allow for "correction" of emission estimates to specific road and traffic conditions present on public and industrial roadways.

Dust emissions from unpaved roads have been found to vary directly with the fraction of silt (particles smaller than 75 micrometers [µm] in diameter) in the road surface materials.[1] The silt fraction is determined by measuring the proportion of loose dry surface dust that passes a 200-mesh screen, using the ASTM-C-136 method. A summary of this method is contained in Appendix C of AP-42. Table 13.2.2-1 summarizes measured silt values for industrial unpaved roads. Table 13.2.2-2 summarizes measured silt values for public unpaved roads. It should be noted that the ranges of silt content vary over two orders of magnitude. Therefore, the use of data from this table can potentially introduce considerable error. Use of this data is strongly discouraged when it is feasible to obtain locally gathered data.

Since the silt content of a rural dirt road will vary with geographic location, it should be measured for use in projecting emissions. As a conservative approximation, the silt content of the parent soil in the area can be used. Tests, however, show that road silt content is normally lower than in the surrounding parent soil, because the fines are continually removed by the vehicle traffic, leaving a higher percentage of coarse particles.

Other variables are important in addition to the silt content of the road surface material. For example, at industrial sites, where haul trucks and other heavy equipment are common, emissions are highly correlated with vehicle weight. On the other hand, there is far less variability in the weights of cars and pickup trucks that commonly travel publicly accessible unpaved roads throughout the United States. For those roads, the moisture content of the road surface material may be more dominant in determining differences in emission levels between, for example a hot, desert environment and a cool, moist location.

The PM-10 and TSP emission factors presented below are the outcomes from stepwise linear regressions of field emission test results of vehicles traveling over unpaved surfaces. Due to a limited amount of information available for PM-2.5, the expression for that particle size range has been scaled against the result for PM-10. Consequently, the quality rating for the PM-2.5 factor is lower than that for the PM-10 expression.

Table 13.2.2-1. TYPICAL SILT CONTENT VALUES OF SURFACE MATERIAL ON INDUSTRIAL UNPAVED ROADS[a]

Industry	Road Use Or Surface Material	Plant Sites	No. Of Samples	Silt Content (%)	
				Range	Mean
Copper smelting	Plant road	1	3	16 - 19	17
Iron and steel production	Plant road	19	135	0.2 - 19	6.0
Sand and gravel processing	Plant road	1	3	4.1 - 6.0	4.8
	Material storage area	1	1	-	7.1
Stone quarrying and processing	Plant road	2	10	2.4 - 16	10
	Haul road to/from pit	4	20	5.0-15	8.3
Taconite mining and processing	Service road	1	8	2.4 - 7.1	4.3
	Haul road to/from pit	1	12	3.9 - 9.7	5.8
Western surface coal mining	Haul road to/from pit	3	21	2.8 - 18	8.4
	Plant road	2	2	4.9 - 5.3	5.1
	Scraper route	3	10	7.2 - 25	17
	Haul road (freshly graded)	2	5	18 - 29	24
Construction sites	Scraper routes	7	20	0.56-23	8.5
Lumber sawmills	Log yards	2	2	4.8-12	8.4
Municipal solid waste landfills	Disposal routes	4	20	2.2 - 21	6.4

[a]References 1,5-15.

The following empirical expressions may be used to estimate the quantity in pounds (lb) of size-specific particulate emissions from an unpaved road, per vehicle mile traveled (VMT):

For vehicles traveling on unpaved surfaces at industrial sites, emissions are estimated from the following equation:

$$E = k\ (s/12)^a (W/3)^b \qquad (1a)$$

and, for vehicles traveling on publicly accessible roads, dominated by light duty vehicles, emissions may be estimated from the following:

$$E = \frac{k\ (s/12)^a (S/30)^d}{(M/0.5)^c} - C \qquad (1b)$$

where k, a, b, c and d are empirical constants (Reference 6) given below and

E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
M = surface material moisture content (%)
S = mean vehicle speed (mph)
C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear.

The source characteristics s, W and M are referred to as correction parameters for adjusting the emission estimates to local conditions. The metric conversion from lb/VMT to grams (g) per vehicle kilometer traveled (VKT) is as follows:

1 lb/VMT = 281.9 g/VKT

The constants for Equations 1a and 1b based on the stated aerodynamic particle sizes are shown in Tables 13.2.2-2 and 13.2.2-4. The PM-2.5 particle size multipliers (k-factors) are taken from Reference 27.

Table 13.2.2-2. CONSTANTS FOR EQUATIONS 1a AND 1b

Constant	Industrial Roads (Equation 1a)			Public Roads (Equation 1b)		
	PM-2.5	PM-10	PM-30*	PM-2.5	PM-10	PM-30*
k (lb/VMT)	0.15	1.5	4.9	0.18	1.8	6.0
a	0.9	0.9	0.7	1	1	1
b	0.45	0.45	0.45	-	-	-
c	-	-	-	0.2	0.2	0.3
d	-	-	-	0.5	0.5	0.3
Quality Rating	B	B	B	B	B	B

*Assumed equivalent to total suspended particulate matter (TSP)
"-" = not used in the emission factor equation

Table 13.2.2-2 also contains the quality ratings for the various size-specific versions of Equation 1a and 1b. The equation retains the assigned quality rating, if applied within the ranges of source conditions, shown in Table 13.2.2-3, that were tested in developing the equation:

Table 13.2.2-3. RANGE OF SOURCE CONDITIONS USED IN DEVELOPING EQUATION 1a AND 1b

Emission Factor	Surface Silt Content, %	Mean Vehicle Weight		Mean Vehicle Speed		Mean No. of Wheels	Surface Moisture Content, %
		Mg	ton	km/hr	mph		
Industrial Roads (Equation 1a)	1.8-25.2	1.8-260	2-290	8-69	5-43	4-17[a]	0.03-13
Public Roads (Equation 1b)	1.8-35	1.4-2.7	1.5-3	16-88	10-55	4-4.8	0.03-13

[a] See discussion in text.

As noted earlier, the models presented as Equations 1a and 1b were developed from tests of traffic on unpaved surfaces. Unpaved roads have a hard, generally nonporous surface that usually dries quickly after a rainfall or watering, because of traffic-enhanced natural evaporation. (Factors influencing how fast a road dries are discussed in Section 13.2.2.3, below.) The quality ratings given above pertain to the mid-range of the measured source conditions for the equation. A higher mean vehicle weight and a higher than normal traffic rate may be justified when performing a worst-case analysis of emissions from unpaved roads.

The emission factors for the exhaust, brake wear and tire wear of a 1980's vehicle fleet (*C*) was obtained from EPA's MOBILE6.2 model [23]. The emission factor also varies with aerodynamic size range as shown in Table 13.2.2-4

Table 13.2.2-4. EMISSION FACTOR FOR 1980'S VEHICLE FLEET EXHAUST, BRAKE WEAR AND TIRE WEAR

Particle Size Range[a]	*C*, Emission Factor for Exhaust, Brake Wear and Tire Wear[b] lb/VMT
$PM_{2.5}$	0.00036
PM_{10}	0.00047
PM_{30}[c]	0.00047

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.

[b] Units shown are pounds per vehicle mile traveled (lb/VMT).

[c] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

It is important to note that the vehicle-related source conditions refer to the average weight, speed, and number of wheels for all vehicles traveling the road. For example, if 98 percent of traffic on the road are 2-ton cars and trucks while the remaining 2 percent consists of 20-ton trucks, then the mean weight is 2.4 tons. More specifically, Equations 1a and 1b are *not* intended to be used to calculate a separate emission factor for each vehicle class within a mix of traffic on a given unpaved road. That is, in the example, one should *not* determine one factor for the 2-ton vehicles and a second factor for the 20-ton trucks. Instead, only one emission factor should be calculated that represents the "fleet" average of 2.4 tons for all vehicles traveling the road.

Moreover, to retain the quality ratings when addressing a group of unpaved roads, it is necessary that reliable correction parameter values be determined for the road in question. The field and laboratory procedures for determining road surface silt and moisture contents are given in AP-42 Appendices C.1 and C.2. Vehicle-related parameters should be developed by recording visual observations of traffic. In some cases, vehicle parameters for industrial unpaved roads can be determined by reviewing maintenance records or other information sources at the facility.

In the event that site-specific values for correction parameters cannot be obtained, then default values may be used.In the absence of site-specific silt content information, an appropriate mean value from Table 13.2.2-1 may be used as a default value, but the quality rating of the equation is reduced by two letters. Because of significant differences found between different types of road surfaces and between different areas of the country, use of the default moisture content value of 0.5 percent in Equation 1b is discouraged. The quality rating should be downgraded two letters when the default moisture content value is used. (It is assumed that readers addressing industrial roads have access to the information needed to develop average vehicle information in Equation 1a for their facility.)

The effect of routine watering to control emissions from unpaved roads is discussed below in Section 13.2.2.3, “Controls”. However, all roads are subject to some natural mitigation because of rainfall and other precipitation. The Equation 1a and 1b emission factors can be extrapolated to annual average uncontrolled conditions (but including natural mitigation) under the simplifying assumption that annual average emissions are inversely proportional to the number of days with measurable (more than 0.254 mm [0.01 inch]) precipitation:

$$E_{ext} = E\ [(365 - P)/365] \qquad (2)$$

where:

E_{ext} = annual size-specific emission factor extrapolated for natural mitigation, lb/VMT

E = emission factor from Equation 1a or 1b

P = number of days in a year with at least 0.254 mm (0.01 in) of precipitation (see below)

Figure 13.2.2-1 gives the geographical distribution for the mean annual number of "wet" days for the United States.

Equation 2 provides an estimate that accounts for precipitation on an annual average basis for the purpose of inventorying emissions. It should be noted that Equation 2 does not account for differences in the temporal distributions of the rain events, the quantity of rain during any event, or the potential for the rain to evaporate from the road surface. In the event that a finer temporal and spatial resolution is desired for inventories of public unpaved roads, estimates can be based on a more complex set of assumptions. These assumptions include:

1. The moisture content of the road surface material is increased in proportion to the quantity of water added;
2. The moisture content of the road surface material is reduced in proportion to the Class A pan evaporation rate;
3. The moisture content of the road surface material is reduced in proportion to the traffic volume; and
4. The moisture content of the road surface material varies between the extremes observed in the area. The CHIEF Web site (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html) has a file which contains a spreadsheet program for calculating emission factors which are temporally and spatially resolved. Information required for use of the spreadsheet program includes monthly Class A pan evaporation values, hourly meteorological data for precipitation, humidity and snow cover, vehicle traffic information, and road surface material information.

It is emphasized that <u>the simple assumption underlying Equation 2 and the more complex set of assumptions underlying the use of the procedure which produces a finer temporal and spatial resolution</u> have not been verified in any rigorous manner. For this reason, the quality ratings for either approach should be downgraded one letter from the rating that would be applied to Equation 1.

13.2.2.3 Controls[18-22]

A wide variety of options exist to control emissions from unpaved roads. Options fall into the following three groupings:

1. <u>Vehicle restrictions</u> that limit the speed, weight or number of vehicles on the road;

2. Surface improvement, by measures such as (a) paving or (b) adding gravel or slag to a dirt road; and

3. Surface treatment, such as watering or treatment with chemical dust suppressants.

Available control options span broad ranges in terms of cost, efficiency, and applicability. For example, traffic controls provide moderate emission reductions (often at little cost) but are difficult to enforce. Although paving is highly effective, its high initial cost is often prohibitive. Furthermore, paving is not feasible for industrial roads subject to very heavy vehicles and/or spillage of material in transport. Watering and chemical suppressants, on the other hand, are potentially applicable to most industrial roads at moderate to low costs. However, these require frequent reapplication to maintain an acceptable level of control. Chemical suppressants are generally more cost-effective than water but not in cases of temporary roads (which are common at mines, landfills, and construction sites). In summary, then, one needs to consider not only the type and volume of traffic on the road but also how long the road will be in service when developing control plans.

Vehicle restrictions. These measures seek to limit the amount and type of traffic present on the road or to lower the mean vehicle speed. For example, many industrial plants have restricted employees from driving on plant property and have instead instituted bussing programs. This eliminates emissions due to employees traveling to/from their worksites. Although the heavier average vehicle weight of the busses increases the base emission factor, the decrease in vehicle-miles-traveled results in a lower overall emission rate.

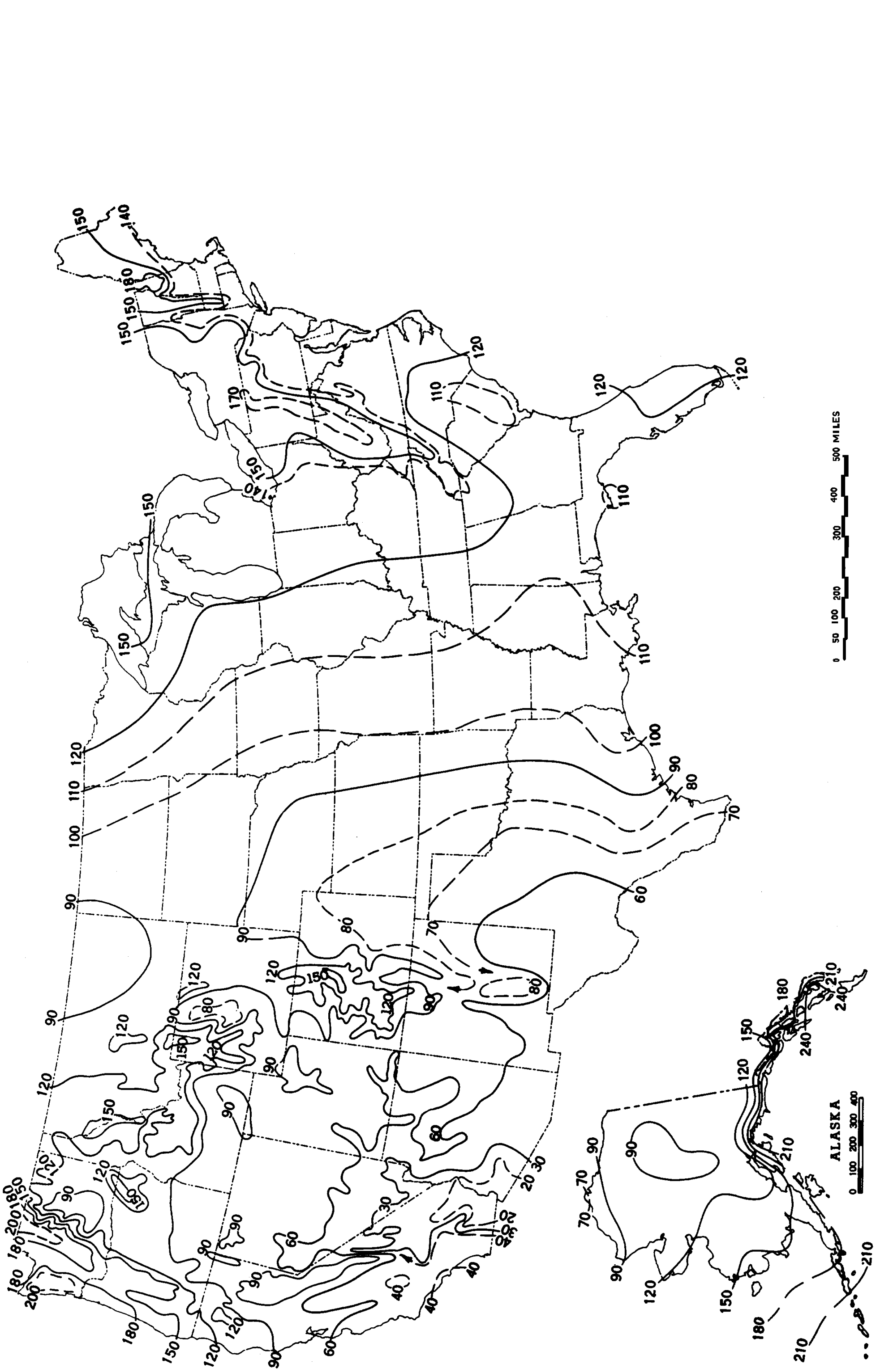


Figure 13.2.2-1. Mean number of days with 0.01 inch or more of precipitation in United States.

New Mexico
ENVIRONMENT DEPARTMENT

505 Camino de los Marquez, Suite 1
Santa Fe, NM 87505
Phone (505) 476-4300
Fax (505) 476-4375
www.env.nm.gov

SUSANA MARTINEZ
GOVERNOR

JOHN A. SANCHEZ
LIEUTENANT GOVERNOR

BUTCH TONGATE
CABINET SECRETARY-DESIGATE

JC BORREGO
DEPUTY SECRETARY

DEPARTMENT ACCEPTED VALUES FOR:
AGGREGATE HANDLING, STORAGE PILE, and HAUL ROAD EMISSIONS

TO: Applicants and Air Quality Bureau Permitting Staff

SUBJECT: Department accepted default values for percent silt, wind speed, moisture content, and control efficiencies for haul road control measures

This guidance document provides the Department accepted default values for correction parameters in the emission calculation equations for aggregate handling and storage piles emissions in construction permit applications and notices of intent submitted under 20.2.72 and 20.2.73 NMAC; and the Department accepted control efficiencies for haul road control measures for applications submitted under 20.2.72 NMAC.

<u>Aggregate Handling and Storage Pile Emission Calculations</u>

Applicants should calculate the particulate matter emissions from aggregate handling and storage piles using the EPA's AP-42 Chapter 13.2.4.
http://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0204.pdf

Equation 1 from Chapter 13.2.4 requires users to input values for two correction parameters, U and M, where U = mean wind speed and M = material moisture content. Below are the accepted values for U and M:

Default Values for Chapter 13.2.4, Equation 1:

Parameter	Default Value
U = Mean wind speed (miles per hour)	11 mph
M = Material moisture content (% water)	2%

Applicants must receive preapproval from the Department if they wish to assume a higher moisture content and/or a lower wind speed in these calculations. Higher moisture contents may require site specific testing either as a permit condition or submitted with the application. Applicants may assume higher wind speeds and lower percent moisture content in their calculations without prior approval from the Department.

<u>Haul Road Emissions and Control Measure Efficiencies</u>

Applicants should calculate the particulate matter emissions from unpaved haul roads using the EPA's AP-42 Chapter 13.2.2. http://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0202.pdf

Equation 1(a) from Chapter 13.2.2 requires users to input values for two correction parameters, s and W, where s = surface material silt content (%) and W = mean vehicle weight (tons). The applicant should calculate the mean vehicle weight in accordance with the chapter's instructions. Below is the accepted value for the parameter s:

Default Values for Chapter 13.2.2, Equation 1(a):

Parameter	Default Value
s = surface material silt content (%)	4.8%

Applicants may use a higher silt content without prior approval from the Department. Use of a lower silt content requires prior approval from the Department and may require site specific testing in support of the request.

Equation 2 from Chapter 13.2.2 allows users to take credit for the number of days that receive precipitation in excess of 0.01 inches, in the annual emissions calculation, where P = number of days in a year with at least 0.01 inches of precipitation.

Default Values for Chapter 13.2.2, Equation 2:

Parameter	Default Value
P = number of days in a year with at least 0.01 inches of precipitation	70 days

Applications submitted under Part 72 may request to apply control measures to reduce the particulate matter emissions from facility haul roads. Applications submitted under Part 73 may not consider any emission reduction from control measures in the potential emission rate calculation, as registrations issued under Part 73 are not federally enforceable under the Clean Air Act or the New Mexico Air Quality Control Act. In order for those control measures to be federally enforceable, the controls must be a requirement in an air quality permit.

Below are the Department accepted control efficiencies for various haul road control measures:

Haul Road Control Measures and Control Efficiency:

Control Measure	Control Efficiency
None	0%
Base course **or** watering	60%
Base course **and** watering	80%
Base course **and** surfactant	90%
Paved **and** Swept	95%

WRAP Fugitive Dust Handbook

Prepared for:

Western Governors' Association
1515 Cleveland Place, Suite 200
Denver, Colorado 80202

Prepared by:

Countess Environmental
4001 Whitesail Circle
Westlake Village, CA 91361
(WGA Contract No. 30204-111)

September 7, 2006

Fugitive Dust Control Measures Applicable for the WRAP Region

Source Category	Control Measure	Published PM10 Control Efficiency
Agricultural Tilling	Reduce tilling during high winds	1 – 5%
	Roughen surface	15 – 64%
	Modify equipment	50%
	Employ sequential cropping	50%
	Increase soil moisture	90%
	Use other conservation management practices	25 - 100%
Agricultural Harvesting	Limited activity during high winds	5 – 70%
	Modify equipment	50%
	Night farming	10%
	New techniques for drying fruit	25 –60%
Construction/Demolition	Water unpaved surfaces	10 – 74%
	Limit on-site vehicle speed to 15 mph	57%
	Apply dust suppressant to unpaved areas	84%
	Prohibit activities during high winds	98%
Materials Handling	Implement wet suppression	50 – 90%
	Erect 3-sided enclosure around storage piles	75%
	Cover storage pile with a tarp during high winds	90%
Paved Roads	Sweep streets	4 – 26%
	Minimize trackout	40 – 80%
	Remove deposits on road ASAP	> 90%
Unpaved Roads	Limit vehicle speed to 25 mph	44%
	Apply water	10 – 74%
	Apply dust suppressant	84%
	Pave the surface	>90%
Mineral Products Industry	Cyclone or muliclone	68 –79%
	Wet scrubber	78 –98%
	Fabric filter	99 – 99.8%
	Electrostatic precipitator	90 – 99.5%
Abrasive Blasting	Water spray	50 – 93%
	Fabric filter	> 95%
Livestock Husbandry	Daily watering of corrals and pens	> 10%
	Add wood chips or mulch to working pens	> 10%
Wind Erosion (agricultural, open area, and storage piles)	Plant trees or shrubs as a windbreak	25%
	Create cross-wind ridges	24 – 93%
	Erect artificial wind barriers	4 – 88%
	Apply dust suppressant or gravel	84%
	Revegetate; apply cover crop	90%
	Water exposed area before high winds	90%

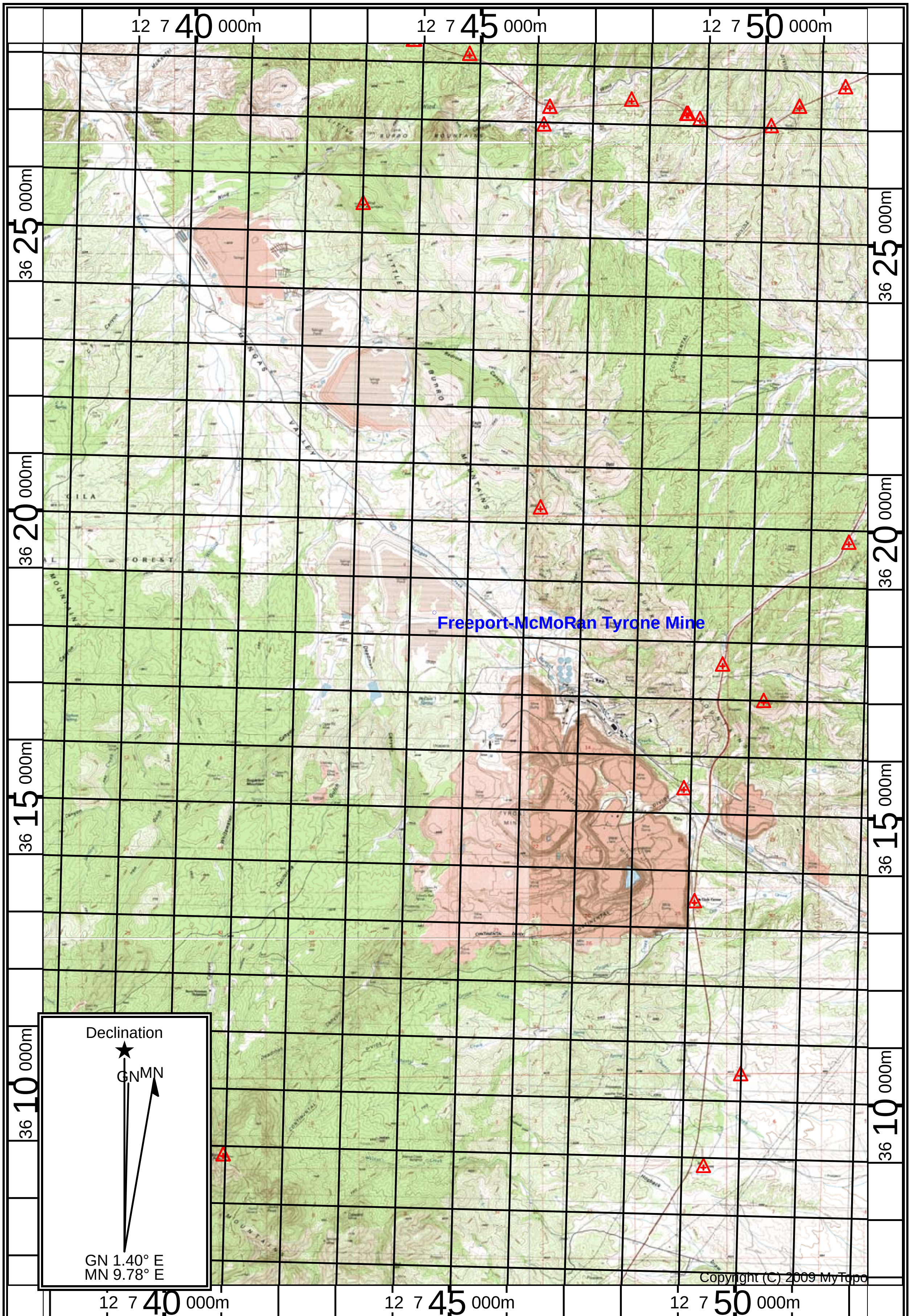
Section 8

Map(s)

A map such as a 7.5 minute topographic quadrangle showing the exact location of the source. The map shall also include the following:

The UTM or Longitudinal coordinate system on both axes	An indicator showing which direction is north
A minimum radius around the plant of 0.8km (0.5 miles)	Access and haul roads
Topographic features of the area	Facility property boundaries
The name of the map	The area which will be restricted to public access
A graphical scale	

Please see the enclosed quad map.



Map Name: WIND MT
Print Date: 06/06/2019

Scale: 1 inch = 8,000 ft.
Map Center: 12 0744818 E 36175

Horizontal Datum: WGS84

Section 9

Proof of Public Notice

(for NSR applications submitting under 20.2.72 or 20.2.74 NMAC)
(This proof is required by: 20.2.72.203.A.14 NMAC “Documentary Proof of applicant’s public notice”)

☑ **I have read the AQB “Guidelines for Public Notification for Air Quality Permit Applications”**
This document provides detailed instructions about public notice requirements for various permitting actions. It also provides public notice examples and certification forms. Material mistakes in the public notice will require a re-notice before issuance of the permit.

Unless otherwise allowed elsewhere in this document, the following items document proof of the applicant’s Public Notification. Please include this page in your proof of public notice submittal with checkmarks indicating which documents are being submitted with the application.

New Permit and **Significant Permit Revision** public notices must include all items in this list.

Technical Revision public notices require only items 1, 5, 9, and 10.

Per the Guidelines for Public Notification document mentioned above, include:

1. ☑ A copy of the certified letter receipts with post marks (20.2.72.203.B NMAC)
2. ☑ A list of the places where the public notice has been posted in at least four publicly accessible and conspicuous places, including the proposed or existing facility entrance. (e.g: post office, library, grocery, etc.)
3. ☑ A copy of the property tax record (20.2.72.203.B NMAC).
4. ☑ A sample of the letters sent to the owners of record.
5. ☑ A sample of the letters sent to counties, municipalities, and Indian tribes.
6. ☑ A sample of the public notice posted and a verification of the local postings.
7. ☑ A table of the noticed citizens, counties, municipalities and tribes and to whom the notices were sent in each group.
8. ☑ A copy of the public service announcement (PSA) sent to a local radio station and documentary proof of submittal.
9. ☑ A copy of the classified or legal ad including the page header (date and newspaper title) or its affidavit of publication stating the ad date, and a copy of the ad. When appropriate, this ad shall be printed in both English and Spanish.
10. ☑ A copy of the display ad including the page header (date and newspaper title) or its affidavit of publication stating the ad date, and a copy of the ad. When appropriate, this ad shall be printed in both English and Spanish.
11. ☑ A map with a graphic scale showing the facility boundary and the surrounding area in which owners of record were notified by mail. This is necessary for verification that the correct facility boundary was used in determining distance for notifying land owners of record.

Please see the enclosed proof of public notice.

Section 9 - Public Notice

Property Owners

Recipient	Address		City	State	Zip Code
Pacific Western Land Company		PO Box 571	Tyrone	NM	88065
U Bar Ranch	HCR 88061-Box 10199	Hwy 180 W.	Silver City	NM	88061
Las Cruces District Office	Bureau of Land Management	1800 Marquess Street	Las Cruces	NM	88005
Mr. George Bender & Diana L. Bender		PO Box 1126	Silver City	NM	88062
US Forest Service		3005 Camino del Bosque	Silver City	NM	88061
Annie A. Brown Estate Trust c/o James McCauley		PO Box 1497	Silver City	NM	88062
Mr. David C. & Mary Dee Estes		215 E. 7th Street	Safford	AZ	85546
Cordova Associates		1039 E. Badillo St.	Covina	CA	91724
Mr. David R. Woodward		PO Box 231	Tyrone	NM	88065
Mr. Jason & Julie Turner		PO Box 2222	Silver City	NM	88062
LT Ranch LLC		PO Box 1497	Silver City	NM	88062

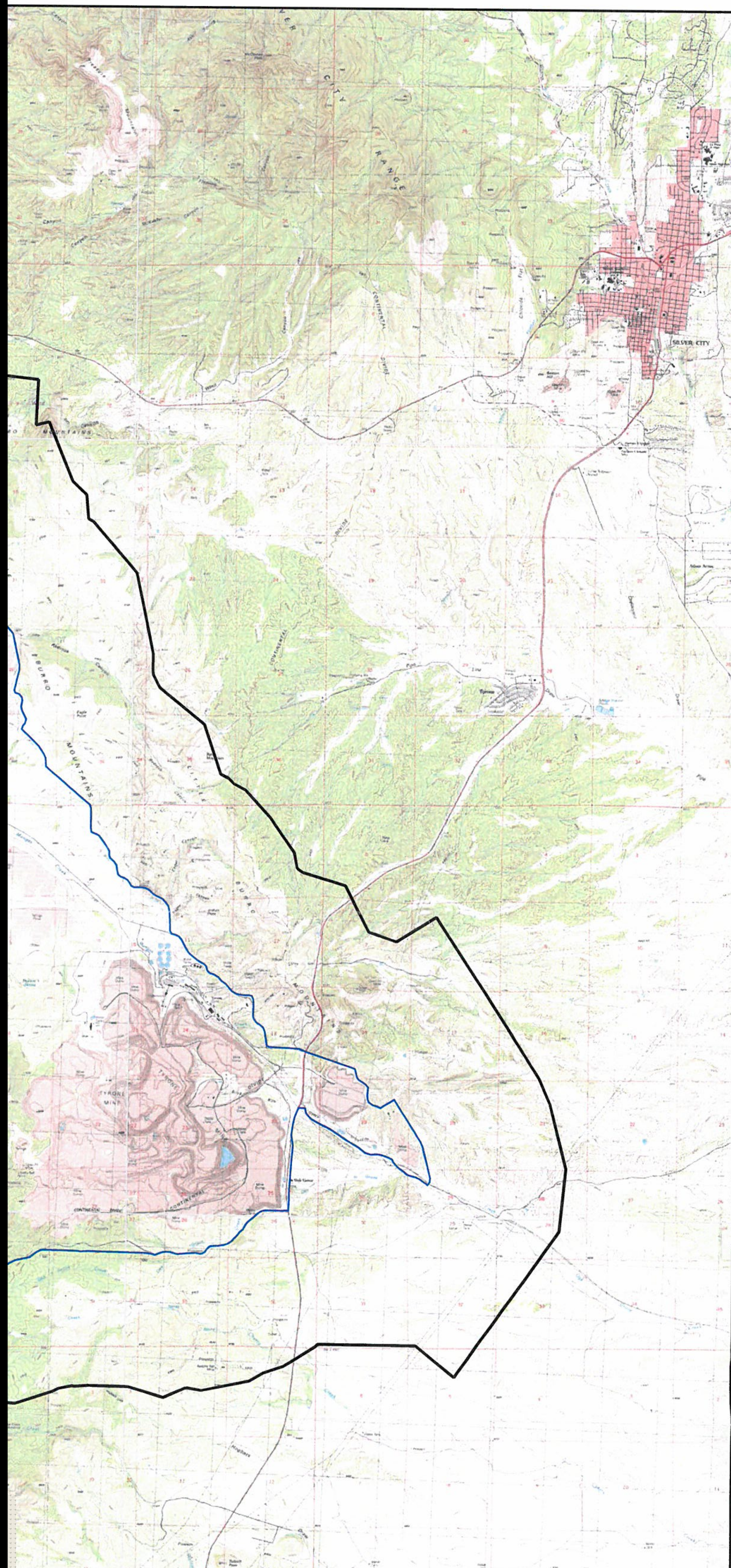
Municipalities

Recipient	Address		City	State	Zip Code
Mr. Alex Brown	Manager, Town of Silver City	PO Box 1188	Silver City	NM	88062
The Honorable Ken Ladner	Mayor, Town of Silver City	PO Box 1188	Silver City	NM	88062

Counties

Recipient	Address		City	State	Zip Code
Ms. Charlene Webb	Manager, County of Grant	PO Box 898	Silver City	NM	88062

There are no Indian Tribes within a 10 mile radius of the facility boundary.



Legend

- Public Notice 1.5 Mile Boundary (black line)
- Property Boundary (blue line)

FREEPORT-McMoRAN COPPER & GOLD

Public Notice Property Boundary

Scale: As Noted	Date:
Dept. Environmental Services	Notes:
Drawn By: mm	Checked By: cm

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Mr. Jason & Julie Turner
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215 E. 7th Street
Safford, AZ 85546

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Cordova Associates
1039 E. Badillo St.
Covina, CA 91724

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P.O. Box 231
Tyrone, NM 88065

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Diana L. Bender
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Bureau of Land Management
1800 Marquess Street
Las Cruces, NM 88005-3370

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$7.00

Pacific Western Land Company
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- ☐ Return Receipt (electronic) $ $0.00
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P.O. Box 1497
Silver City, NM 88062

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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Silver City, NM 88062

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Postmark Here — TYRONE, NM APR 22 2021 USPS

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20210422-100

04/22/2021

$7.00

The Honorable Ken Ladner
Mayor, Town of Silver City
P.O. Box 1188
Silver City, NM 88062

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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☐ Adult Signature Required	$ $0.00	
☐ Adult Signature Restricted Delivery	$	
Postage	$0.55	
$		
Total	$7.00	04/22/2021

TYRONE, NM APR 22 2021

20210422-100

Mr. Alex Brown
Manager, Town of Silver City
P.O. Box 1188
Silver City, NM 88062

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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Certified Mail Fee	$3.60	0871
$	$2.85	5
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☐ Return Receipt (electronic)	$ $0.00	Postmark Here
☐ Certified Mail Restricted Delivery	$ $0.00	
☐ Adult Signature Required	$ $0.00	
☐ Adult Signature Restricted Delivery	$	
Postage	$0.55	
$		
Total	$7.00	04/22/2021

TYRONE, NM APR 22 2021 USPS

20210422-100

Ms. Charlene Webb
Manager, County of Grant
P.O. Box 898
Silver City, NM 88062

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

Tax Account

Summary

Account Id	P000229
Parcel Number	
Owners	TURNER JASON & TURNER JULIE
Address	PO BOX 2222 SILVER CITY, NM 88062
Situs Address	
Legal	

Inquiry

As Of 02/15/2018

Payment Type ○ First

◉ Full

Total Due $0.00

Value

	Area Id	**Taxes**
Special Assessment	DCLPEN	$37.60
Area Id		**Mill Levy**
01O_NR - 01O_NR		20.8240000
	Actual	**Assessed**
CATTLE-COWS - 500	66,774	22,258
CATTLE-HEIFERS CALVES - 530	14,975	4,992
CATTLE-STEER CALVES - 540	19,578	6,526
CATTLE-BULLS - 550	7,062	2,354
Total Value	108,389	36,130
Taxes		$752.36
	Area Id	**Taxes**
Special Assessment	951 - CATTLE INDEMNITY	$361.30
Total Billed		**$1,151.26**

The amounts of taxes due on this page are based on **last year's** property value assesments.

Tax Account

Summary

Account Id	R085738
Parcel Number	3086114330264
Owners	LT RANCH LLC
Address	PO BOX 1497 SILVER CITY, NM 88062
Situs Address	
Legal	Quarter: NE S: 35 T: 19S R: 15W GOV LOT 2 GOV LOT 4 GOV LOT 5 (PT NEQ) NWQNEQ Quarter: SE S: 35 T: 19S R: 15W GOV LOT 6 GOV LOT 7 (PT EHSEQ) WHSEQ Quarter: SW S: 35 T: 19S R: 15W SWQ Quarter: NW S: 35 T: 19S R: 15W GOV LOT 1 GOV LOT 3 (PT WHNWQ) EHNWQ 571.200 AC, SELF GRAZED P066643

Inquiry

As Of 02/15/2018

Payment Type
- ○ First
- ◉ Full

Total Due $0.00

Value

Area Id		Mill Levy
01O_NR - 01O_NR		20.8240000
	Actual	**Assessed**
GRAZING - ALL ONE CLASS - 0010	3,084	1,028
Taxes		$21.40

The amounts of taxes due on this page are based on **last year's** property value assesments.

Tax Account

Summary

Account Id	R087845
Parcel Number	3087114185238
Owners	BROWN ANNIE A ESTATE TRUST
Address	PO BOX 1497 SILVER CITY, NM 88062
Situs Address	
Legal	Quarter: NE S: 34 T: 19S R: 15W Quarter: SE S: 34 T: 19S R: 15W MINE: CHERRY CREEK - MS 1782 13.96 MineAcres 13.960 AC, LEASE LT RANCH P066643

Inquiry

As Of 02/15/2018

Payment Type ○ First ◉ Full

Total Due $0.00

Value

	Area Id	**Taxes**
Special Assessment	MINTAX	$0.00
	Area Id	**Taxes**
Special Assessment	ADMINFEE	$4.48
Area Id		**Mill Levy**
01O_NR - 01O_NR		20.8240000
	Actual	**Assessed**
GRAZING - ALL ONE CLASS - 0010	75	25
Taxes		$0.52

Original Taxes	$5.00
Adjustments	$0.00
Total Billed	**$5.00**

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Tax Account

Summary

Account Id	R088189
Parcel Number	3088113376071
Owners	ESTES ROCKY
Address	215 E 7TH ST SAFFORD, AZ 85546
Situs Address	
Legal	Quarter: NW S: 28 T: 19S R: 15W GOV LOT 2 (PT EHNWQ) 18.190 AC. NOTE: PROCESSED WITH RECOGNIZED DEED ERROR - CHAIN OF TITLE

Inquiry

As Of 02/15/2018

Payment Type ○ First

◉ Full

Total Due $0.00

Value

Area Id		Mill Levy
010_NR - 010_NR		20.8240000
	Actual	**Assessed**
MISC N/R LAND - 0081	72,760	24,253
Taxes		$505.04

The amounts of taxes due on this page are based on **last year's** property value assesments.

Tax Account

Summary

Account Id	R087987
Parcel Number	3085110010400
Owners	CORDOVA ASSOCIATES
Address	1039 E BADILLO ST COVINA, CA 91724
Situs Address	
Legal	Quarter: SE S: 12 T: 19S R: 15W PT GOV LOTS 1, 6 LYING E OF NM HWY 90 R/W 5.786 AC

Inquiry

As Of 02/15/2018

Payment Type ○ First

◉ Second

Taxes Due $11.04

Total Due $11.04

Value

Area Id		Mill Levy
01O_NR - 01O_NR		20.8240000
	Actual	**Assessed**
MISC N/R LAND - 0081	3.182	1,061
Taxes		$22.08

The amounts of taxes due on this page are based on **last year's** property value assesments.

Tax Account

Summary

Account Id	R087488
Parcel Number	3084109396132
Owners	WOODWARD DAVID R WOODWARD JOAN M
Address	PO BOX 231 TYRONE, NM 88065
Situs Address	190 BALD MTN RANCH RD
Legal	Quarter: NW S: 06 T: 19S R: 14W GOV LOT 3 (NEQNWQ) GOV LOT 4 (NWQNWQ) GOV LOT 5 (SWQNWQ) SEQNWQ 165.600 AC, SELF GRAZED P066921

Inquiry

As Of 02/1 52018

Payment Type ○ First

◉ Full

Total Due $0.00

Value

Area Id		Mill Levy
01O_NR - 01O_NR		20.8240000
	Actual	**Assessed**
GRAZING - ALL ONE CLASS - 0010	894	298
Taxes		$6.20

The amounts of taxes due on this page are based on **last year's** property value assesments.

Tax Account

Summary

Account Id	P065988
Parcel Number	L00363540508D154548
Owners	U BAR RANCH PARTNERSHIP
Address	PO BOX 10 GILA, NM 88038
Situs Address	
Legal	

Inquiry

As Of 02/15/2018

Payment Type ○ First
◉ Full

Total Due $0.00

Value

Area Id		Mill Levy
010_NR - 010_NR		20.8240000
	Actual	**Assessed**
CATTLE-COWS - 500	809,186	269,729
CATTLE-HEIFERS CALVES - 530	99,434	33,145
CATTLE-BULLS - 550	153,010	51,003
CATTLE-HEIFER (REPLACEMENT) - 551	122,464	40,821
CATTLE-REG. COWS - 560	210,092	70,031
CATTLE-REG. HEIFER CALVES - 580	33,040	11,013
CATTLE-REG.BULLS - 590	11,368	3,789
CATTLE-REG. HEIFER (REPLACEMENT) - 591	41,244	13,748
HORSES-HORSES - 900	15,300	5,100
Total Value	1,495,138	498,379
Taxes		$10,378.24
	Area Id	**Taxes**
Special Assessment	951 - CATTLE INDEMNITY	$4,932.80
	Area Id	**Taxes**
Special Assessment	954 - EQUINE	$35.52
Total Billed		**$15,346.56**

The amounts of taxes due on this page are based on **last year's** property value assesments.

Tax Account

Summary

Account Id	R087725
Parcel Number	3088109099033
Owners	PACIFIC WESTERN LAND COMPANY
Address	PO BOX 571 TYRONE, NM 88065
Situs Address	
Legal	Quarter: NE S: 04 T: 19S R: 15W GOV LOT 1 (NEQNEQ) PT GOV LOT 2 (NWQNEQ) 71.460 AC

Inquiry

As Of 02/15/2018

Payment Type ○ First
◉ Full

Total Due $0.00

Value

	Area Id	Taxes
Special Assessment	MINTAX	$0.00
	Area Id	**Taxes**
Special Assessment	ADMINFEE	$2.32
Area Id		**Mill Levy**
01O_NR - 01O_NR		20.8240000
	Actual	**Assessed**
GRAZING - ALL ONE CLASS - 0010	386	129
Taxes		$2.68

Original Taxes	$5.00
Adjustments	$0.00
Total Billed	**$5.00**

The amounts of taxes due on this page are based on **last year's** property value assesments.

FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266712
Return Receipt Requested

Dear Neighbor:

Freeport-McMoRan Tyrone Inc. announces its application to the New Mexico Environment Department for an air quality permit for the **modification** of its **mine** facility. The expected date of application submittal to the Air Quality Bureau is **April 30, 2021.**

The exact location for the facility known as, **Tyrone Mine** is at latitude **32** deg, **40** min, **34.5** sec and longitude **-108** deg, **23** min, **35.8** sec. The approximate location of this facility is **4.5** miles **southwest** of **Tyrone, NM** in **Grant County.**

The proposed **significant revision** consists of incorporating three new mine operating scenarios and one new emergency generator into the permit. Tyrone is not requesting any changes to any other activities that were submitted in the M6 permit application.

The estimated maximum quantities of **fugitive + stack** regulated air contaminants for the entire facility while operating under the three new mining scenarios will be as follows in pound per hour (pph) and tons per year (tpy). These reported emissions could change slightly during the course of the Department's review:

Pollutant:	**Pounds per hour**	**Tons per year**
Particulate Matter (PM)	1,610 pph	4,510 tpy
PM_{10}	630 pph	1,320 tpy
$PM_{2.5}$	60 pph	130 tpy
Sulfur Dioxide (SO_2)	30 pph	30 tpy
Nitrogen Oxides (NO_x)	860 pph	380 tpy
Carbon Monoxide (CO)	5,210 pph	3,700 tpy
Volatile Organic Compounds (VOC)	50 pph	70 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	10 pph	20 tpy
Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

The standard and maximum operating schedule of the facility will be continuous: **24 hours a day for everything but blasting and the screening and crushing plant; 7 days a week; and 52 weeks per year.**

The owner and/or operator of the Facility is:

Freeport-McMoRan Tyrone Inc.
P.O. Box 571, Tyrone, NM 88065

If you have any comments about the construction or operation of this facility, and you want your comments to be made as part of the permit review process, you must submit your comments in writing to this address: Permit Programs Manager; New Mexico Environment Department; Air Quality Bureau; 525 Camino de los Marquez, Suite 1; Santa Fe, New Mexico; 87505-1816; (505) 476-4300; 1 800 224-7009; https://www.env.nm.gov/aqb/permit/aqb_draft_permits.html. Other comments and questions may be submitted verbally.

Please refer to the company name and facility name or send a copy of this notice along with your comments, since the Department may have not yet received the permit application. Please include a legible return mailing address with your comments. Once the Department has performed a preliminary review of the application and its air quality impacts, the Department's notice will be published in the legal section of a newspaper circulated near the facility location.

Attención
Este es un aviso de la oficina de Calidad del Aire del Departamento del Medio Ambiente de Nuevo México, acerca de las emisiones producidas por un establecimiento en esta área. Si usted desea información en español, por favor comuníquese con esa oficina al teléfono 505-476-5557.

Sincerely,

Erich J. Bower
President; General Manager
Freeport-McMoRan Tyrone Inc.

20210422-100

Notice of Non-Discrimination
NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Part 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non-discrimination programs, policies or procedures, or if you believe that you have been discriminated against with respect to a NMED program or activity, you may contact: Kristine Yurdin, Non-Discrimination Coordinator, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855, nd.coordinator@state.nm.us. You may also visit our website at https://www.env.nm.gov/non-employee-discrimination-complaint-page/ to learn how and where to file a complaint of discrimination.

FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266729
Return Receipt Requested

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Pollutant:	**Pounds per hour**	**Tons per year**
Particulate Matter (PM)	1,610 pph	4,510 tpy
PM_{10}	630 pph	1,320 tpy
$PM_{2.5}$	60 pph	130 tpy
Sulfur Dioxide (SO_2)	30 pph	30 tpy
Nitrogen Oxides (NO_x)	860 pph	380 tpy
Carbon Monoxide (CO)	5,210 pph	3,700 tpy
Volatile Organic Compounds (VOC)	50 pph	70 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	10 pph	20 tpy
Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

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Sincerely,

Erich J. Bower
President; General Manager
Freeport-McMoRan Tyrone Inc.

20210422-100

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FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266736
Return Receipt Requested

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Nitrogen Oxides (NO_x)	860 pph	380 tpy
Carbon Monoxide (CO)	5,210 pph	3,700 tpy
Volatile Organic Compounds (VOC)	50 pph	70 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	10 pph	20 tpy
Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

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FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266743
Return Receipt Requested

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Attención
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Sincerely,

Erich J. Bower
President; General Manager
Freeport-McMoRan Tyrone Inc.

20210422-100

Notice of Non-Discrimination
NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Part 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non-discrimination programs, policies or procedures, or if you believe that you have been discriminated against with respect to a NMED program or activity, you may contact: Kristine Yurdin, Non-Discrimination Coordinator, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855, nd.coordinator@state.nm.us. You may also visit our website at https://www.env.nm.gov/non-employee-discrimination-complaint-page/ to learn how and where to file a complaint of discrimination.

FREEPORT-McMoRAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266750
Return Receipt Requested

Dear Neighbor:

Freeport-McMoRan Tyrone Inc. announces its application to the New Mexico Environment Department for an air quality permit for the **modification** of its **mine** facility. The expected date of application submittal to the Air Quality Bureau is **April 30, 2021.**

The exact location for the facility known as, **Tyrone Mine** is at latitude **32** deg, **40** min, **34.5** sec and longitude **-108** deg, **23** min, **35.8** sec. The approximate location of this facility is **4.5** miles **southwest** of **Tyrone, NM** in **Grant County.**

The proposed **significant revision** consists of incorporating three new mine operating scenarios and one new emergency generator into the permit. Tyrone is not requesting any changes to any other activities that were submitted in the M6 permit application.

The estimated maximum quantities of **fugitive + stack** regulated air contaminants for the entire facility while operating under the three new mining scenarios will be as follows in pound per hour (pph) and tons per year (tpy). These reported emissions could change slightly during the course of the Department's review:

Pollutant:	**Pounds per hour**	**Tons per year**
Particulate Matter (PM)	1,610 pph	4,510 tpy
PM_{10}	630 pph	1,320 tpy
$PM_{2.5}$	60 pph	130 tpy
Sulfur Dioxide (SO_2)	30 pph	30 tpy
Nitrogen Oxides (NO_x)	860 pph	380 tpy
Carbon Monoxide (CO)	5,210 pph	3,700 tpy
Volatile Organic Compounds (VOC)	50 pph	70 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	10 pph	20 tpy
Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

The standard and maximum operating schedule of the facility will be continuous: **24 hours a day for everything but blasting and the screening and crushing plant; 7 days a week; and 52 weeks per year.**

The owner and/or operator of the Facility is:

Freeport-McMoRan Tyrone Inc.
P.O. Box 571, Tyrone, NM 88065

If you have any comments about the construction or operation of this facility, and you want your comments to be made as part of the permit review process, you must submit your comments in writing to this address: Permit Programs Manager; New Mexico Environment Department; Air Quality Bureau; 525 Camino de los Marquez, Suite 1; Santa Fe, New Mexico; 87505-1816; (505) 476-4300; 1 800 224-7009; https://www.env.nm.gov/aqb/permit/aqb_draft_permits.html. Other comments and questions may be submitted verbally.

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FREEPORT-McMoRAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266767
Return Receipt Requested

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Carbon Monoxide (CO)	5,210 pph	3,700 tpy
Volatile Organic Compounds (VOC)	50 pph	70 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	10 pph	20 tpy
Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

The standard and maximum operating schedule of the facility will be continuous: **24 hours a day for everything but blasting and the screening and crushing plant; 7 days a week; and 52 weeks per year.**

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P.O. Box 571, Tyrone, NM 88065

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FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266774
Return Receipt Requested

US Forest Service
3005 Camino de Bosque
Silver City, NM 88061

To Whom It Concerns:

Freeport-McMoRan Tyrone Inc. announces its application to the New Mexico Environment Department for an air quality permit for the **modification** of its **mine** facility. The expected date of application submittal to the Air Quality Bureau is **April 30, 2021.**

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Volatile Organic Compounds (VOC)	50 pph	70 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	10 pph	20 tpy
Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

The standard and maximum operating schedule of the facility will be continuous: **24 hours a day for everything but blasting and the screening and crushing plant; 7 days a week; and 52 weeks per year.**

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P.O. Box 571, Tyrone, NM 88065

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FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266781
Return Receipt Requested

U Bar Ranch
HCR 88061-Box 10199
Hwy 180 W
Silver City, NM 88061

To Whom It Concerns:

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Total sum of all Hazardous Air Pollutants (HAPs)	10 pph	20 tpy
Toxic Air Pollutant (TAP)	N/A	N/A
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The standard and maximum operating schedule of the facility will be continuous: **24 hours a day for everything but blasting and the screening and crushing plant; 7 days a week; and 52 weeks per year.**

The owner and/or operator of the Facility is:

Freeport-McMoRan Tyrone Inc.
P.O. Box 571, Tyrone, NM 88065

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FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266798
Return Receipt Requested

Las Cruces District Office
Bureau of Land Management
1800 Marquess Street
Las Cruces, NM 88005-3370

To Whom It Concerns:

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FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266804
Return Receipt Requested

Pacific Western Land Company
P.O. Box 571
Tyrone, NM

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Erich J. Bower
President; General Manager
Freeport-McMoRan Tyrone Inc.

20210422-100

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FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266811
Return Receipt Requested

LT Ranch LLC
P.O. Box 1497
Silver City, NM 88062

To Whom It Concerns:

Freeport-McMoRan Tyrone Inc. announces its application to the New Mexico Environment Department for an air quality permit for the **modification** of its **mine** facility. The expected date of application submittal to the Air Quality Bureau is **April 30, 2021.**

The exact location for the facility known as, **Tyrone Mine** is at latitude **32** deg, **40** min, **34.5** sec and longitude **-108** deg, **23** min, **35.8** sec. The approximate location of this facility is **4.5** miles **southwest** of **Tyrone, NM** in **Grant County.**

The proposed **significant revision** consists of incorporating three new mine operating scenarios and one new emergency generator into the permit. Tyrone is not requesting any changes to any other activities that were submitted in the M6 permit application.

The estimated maximum quantities of **fugitive + stack** regulated air contaminants for the entire facility while operating under the three new mining scenarios will be as follows in pound per hour (pph) and tons per year (tpy). These reported emissions could change slightly during the course of the Department's review:

Pollutant:	**Pounds per hour**	**Tons per year**
Particulate Matter (PM)	1,610 pph	4,510 tpy
PM_{10}	630 pph	1,320 tpy
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Nitrogen Oxides (NO_x)	860 pph	380 tpy
Carbon Monoxide (CO)	5,210 pph	3,700 tpy
Volatile Organic Compounds (VOC)	50 pph	70 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	10 pph	20 tpy
Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

The standard and maximum operating schedule of the facility will be continuous: **24 hours a day for everything but blasting and the screening and crushing plant; 7 days a week; and 52 weeks per year.**

The owner and/or operator of the Facility is:

Freeport-McMoRan Tyrone Inc.
P.O. Box 571, Tyrone, NM 88065

If you have any comments about the construction or operation of this facility, and you want your comments to be made as part of the permit review process, you must submit your comments in writing to this address: Permit Programs Manager; New Mexico Environment Department; Air Quality Bureau; 525 Camino de los Marquez, Suite 1; Santa Fe, New Mexico; 87505-1816; (505) 476-4300; 1 800 224-7009; https://www.env.nm.gov/aqb/permit/aqb_draft_permits.html. Other comments and questions may be submitted verbally.

Please refer to the company name and facility name or send a copy of this notice along with your comments, since the Department may have not yet received the permit application. Please include a legible return mailing address with your comments. Once the Department has performed a preliminary review of the application and its air quality impacts, the Department's notice will be published in the legal section of a newspaper circulated near the facility location.

Attención
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Sincerely,

Erich J. Bower
President; General Manager
Freeport-McMoRan Tyrone Inc.

20210422-100

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FREEPORT-McMoRAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266828
Return Receipt Requested

The Honorable Ken Ladner
Mayor, Town of Silver City
P.O. Box 1188
Silver City, NM 88062

Dear Mr. Ladner:

Freeport-McMoRan Tyrone Inc. announces its application to the New Mexico Environment Department for an air quality permit for the **modification** of its **mine** facility. The expected date of application submittal to the Air Quality Bureau is **April 30, 2021.**

The exact location for the facility known as, **Tyrone Mine** is at latitude **32** deg, **40** min, **34.5** sec and longitude **-108** deg, **23** min, **35.8** sec. The approximate location of this facility is **4.5** miles **southwest** of **Tyrone, NM** in **Grant County.**

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Total sum of all Hazardous Air Pollutants (HAPs)	10 pph	20 tpy
Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

The standard and maximum operating schedule of the facility will be continuous: **24 hours a day for everything but blasting and the screening and crushing plant; 7 days a week; and 52 weeks per year.**

The owner and/or operator of the Facility is:

Freeport-McMoRan Tyrone Inc.
P.O. Box 571, Tyrone, NM 88065

If you have any comments about the construction or operation of this facility, and you want your comments to be made as part of the permit review process, you must submit your comments in writing to this address: Permit Programs Manager; New Mexico Environment Department; Air Quality Bureau; 525 Camino de los Marquez, Suite 1; Santa Fe, New Mexico; 87505-1816; (505) 476-4300; 1 800 224-7009; https://www.env.nm.gov/aqb/permit/aqb_draft_permits.html. Other comments and questions may be submitted verbally.

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Sincerely,

Erich J. Bower
President; General Manager
Freeport-McMoRan Tyrone Inc.

20210422-100

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FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266835
Return Receipt Requested

Mr. Alex Brown
Manager, Town of Silver City
P.O. Box 1188
Silver City, NM 88062

Dear Mr. Brown:

Freeport-McMoRan Tyrone Inc. announces its application to the New Mexico Environment Department for an air quality permit for the **modification** of its **mine** facility. The expected date of application submittal to the Air Quality Bureau is **April 30, 2021.**

The exact location for the facility known as, **Tyrone Mine** is at latitude **32** deg, **40** min, **34.5** sec and longitude **-108** deg, **23** min, **35.8** sec. The approximate location of this facility is **4.5** miles **southwest** of **Tyrone, NM** in **Grant County.**

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Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

The standard and maximum operating schedule of the facility will be continuous: **24 hours a day for everything but blasting and the screening and crushing plant; 7 days a week; and 52 weeks per year.**

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P.O. Box 571, Tyrone, NM 88065

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Sincerely,

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President; General Manager
Freeport-McMoRan Tyrone Inc.

20210422-100

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FREEPORT-MCMORAN

Tyrone Operations
P.O. Box 571
Tyrone, NM 88065

April 22, 2021

Certified Mail #70150640000476266842
Return Receipt Requested

Ms. Charlene Webb
Manager, County of Grant
P.O. Box 898
Silver City, NM 88062

Dear Ms. Webb:

Freeport-McMoRan Tyrone Inc. announces its application to the New Mexico Environment Department for an air quality permit for the **modification** of its **mine** facility. The expected date of application submittal to the Air Quality Bureau is **April 30, 2021.**

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Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

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Sincerely,

Erich J. Bower
President; General Manager
Freeport-McMoRan Tyrone Inc.

20210422-100

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General Posting of Notices – Certification

I, Erich J. Bower, the undersigned, certify that on April 22, 2021, posted a true and correct copy of the attached Public Notice in the following publicly accessible and conspicuous places in the towns of Tyrone and Silver City in Grant County, State of New Mexico on the following dates:

1. Tyrone Property Boundary; April 22, 2021
2. Tyrone Security Gate; April 22, 2021
3. Tyrone Post Office/Community Center; April 22, 2021
4. Silver City Public Library; April 22, 2021
5. Grant County Administration Building; April 22, 2021

Signed this 22 day of April, 2021

Signature

4/22/2021
Date

Erich J. Bower
Printed Name

President; General Manager, Freeport-McMoRan Tyrone Inc.
Title

NOTICE

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Toxic Air Pollutant (TAP)	N/A	N/A
Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

The standard and maximum operating schedule of the facility will be continuous: **24 hours a day for everything but blasting and the screening and crushing plant; 7 days a week; and 52 weeks per year.**

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P.O. Box 571, Tyrone, NM 88065

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4/22/21

Public Notice Posted at the Grant County Administration Building 4/22/2021

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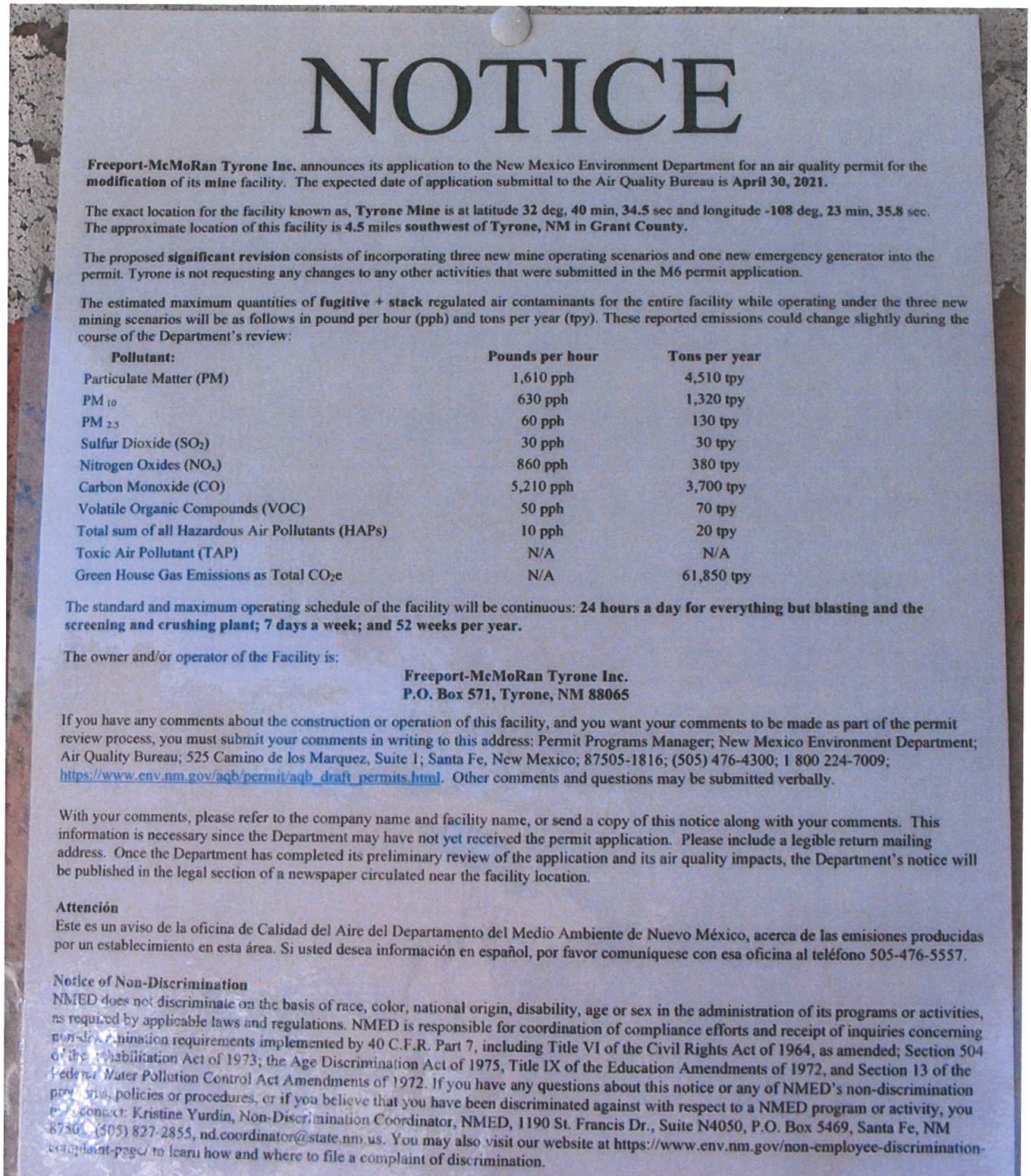

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Green House Gas Emissions as Total CO_2e	N/A	61,850 tpy

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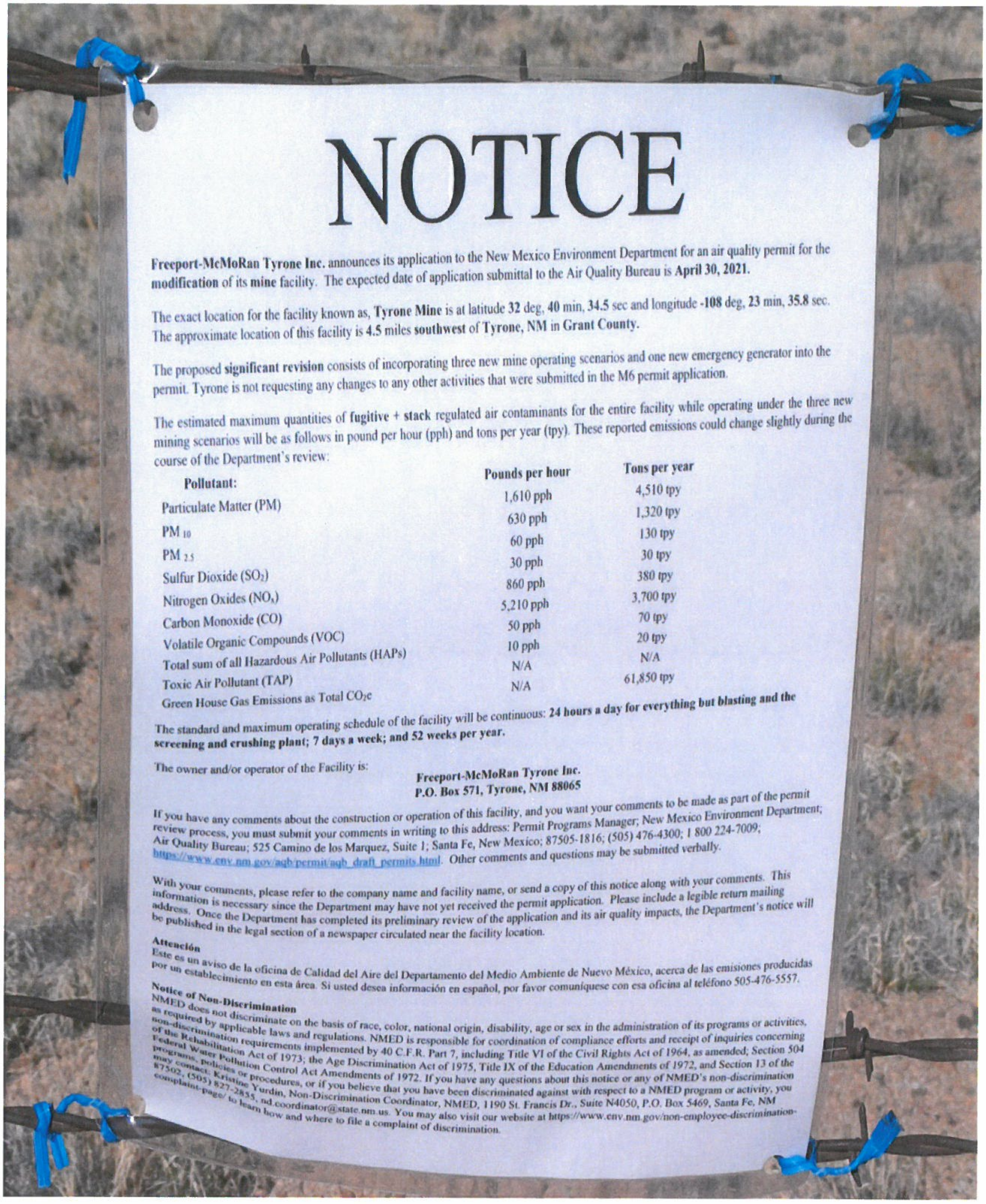

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Public Notice Posted at the Tyrone Security Gate 4/22/2021

Hometown Homesteading

by Kathryn Sanderson

Adding 16 chicks, with ducklings to come

HEN AND CHICK

I walked out to feed today and heard chirping. I excitedly went down to the coop, knowing exactly which hen hatched out the chicks that I was hearing.

I've been keeping an eye on her, and knew she had been sitting on a clutch of eggs inside a doghouse that I have for the ladies to use as a nest box. It is in the corner of the run, attached to our coop. She seemed to feel safe there, since it is where she chose to spend the last 21 days, patiently waiting for the eggs under her to develop.

I've been concerned about her having chosen this place. Agnes, the old turkey I agreed to take and not kill, lives in the coop, and I have watched her chase chicks and try to attack them. I debated moving the hen and her clutch, but I opted not to. I decided that nature would do what nature does.

As I walked down to the coop, I spotted a single chick standing out in the middle of the run, loudly chirping. Even at just hours old, these chicks have a variety of calls that vary in intensity, volume and tone. This was definitely a distress chirp.

I was wondering if this little chick was being adventurous, and wandered away from mom as mom continued to sit and wait for additional eggs to hatch. I peeked inside the coop and spotted mom hen. With her, she had the most chicks I have yet to see hatched from a single hen.

I collected the loudly chirping chick that had been separated from the rest. As I tucked it under its mom, another chick emerged from the doghouse and also started calling. I got it and checked the doghouse to make sure there weren't even more waiting for their opportunity to come out. Thankfully, it was empty, aside from a handful of eggs that were abandoned, unhatched.

I haven't been able to count all of the chicks. They are very active, and the mom hen seems to have a few tucked under her every time I try to count. I think she has around 16 chicks.

I don't expect all of them to make it. In years past, there have usually been a few casualties to goats, as the chickens free-range, and often spend time digging through the hay the goats have dropped. I will lose some to drowning, as they occasionally get into the goat water troughs. I don't think Agnes helps the situation, but that is what I get for taking in a pet turkey. There are consequences to my actions and decisions.

I'm sure we have lost and will lose some to aerial predators. There is no shortage of wildlife that would enjoy some chicken nuggets.

Sixteen (or possibly more) chicks is a lot of chicks to keep track of, but this hen has definitely stacked her odds in favor of having some survivors. I am hopeful that a majority of them make it.

On a similar note, I put 26 duck eggs into my incubator last week. I just checked on their development, and have 21 that are developing. I may have some good growth this year. After a couple of years of struggle and loss, this is refreshing.

Keep plugging along, friends — your tomorrow may be full of abundance, even if it doesn't feel like it today. Until next time.

Kathryn Sanderson is a Grant County native whose column is published each Friday. She and her husband operate a small business, raise their family and attempt to raise their own food, going back to basics one small step at a time.

Senior Centers Menu

April 26-30

Monday: Bean burrito, Spanish rice, cucumber and tomato salad, graham crackers, banana

Tuesday: Chicken noodle soup, mixed veggies, biscuit, ice cream

Wednesday: Beef tacos, lettuce, tomatoes, Spanish rice, pinto beans, strawberries

Thursday: Chicken fettuccini Alfredo, Italian vegetables, spinach salad, breadstick, apricots

Friday: Turkey sandwich with lettuce and tomatoes, baked chips, carrots sticks with ranch, cookie

Call your senior center before 9 a.m. or make reservations the day before the meal. Call 388-2545 for the Silver City center, 537-5254 for Santa Clara, 536-9990 for Mimbres and 535-2888 for Gila. All donations are accepted. Menu is subject to change without notice.

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Obituaries

POSEY: On Jan. 22, 2021, in Billings, Mont., at the Billings Clinic, the Lord received Laura Cayleen Simpson Posey. She was born Jan. 24, 1969, in Farmington, N.M., and moved to Silver City shortly thereafter. Laura graduated from high school in 1987 and her first child, Summer Hauber, was born in 1989. She eventually earned her associate degree in drafting in 1993, and a year later her son, Andrew Kohn, was born, in 1994. Laura is survived by her loving husband, Steve Posey; parents, Ruby Davis, Cleve Simpson, and Danny Davis; siblings, Connie and Buddy Simpson; grandchildren, Declan, Xyrus, and Cassie; many dear nieces, nephews, and friends; and of course her fur babies she rescued. She was the stepdaughter of Kathy Shanks Simpson. She was preceded in death by her grandparents, Conn and Laura Brown, originally from Cliff, and Archie and Pauline Simpson, of Donalsonville, Ga. She enjoyed gardening, camping, fishing, crafting, and spending time with her grandchildren and pets. She was dear to many and her spirit lives on. Honorary pallbearers were Seth Pacheco, Tristin Simpson, Chase Simpson, Andrew Kohn, Buddy Simpson, and Danny Davis.

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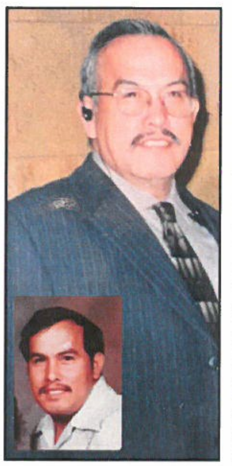

VILLANUEVA: Pedro Cortez Villanueva, 68, of Henderson, Nev., passed away April 10, 2021, in Henderson. Pedro was born in Hidalgo Del Parral, Chihuahua, Mexico, to Casiano and Maria Cortez Villanueva on Feb. 20, 1953. Pedro was born in Mexico but was raised in a small village called Central, N.M. He attended Cobre High School and went on to marry his high school sweetheart, Zenaida. He joined the United States Marine Corps in 1971 where he honorably served his time as a sergeant in Camp Lejeune, Jacksonville, N.C. After his military career ended, Pedro moved his wife and children back to New Mexico. He loved spending his free time fishing and hunting. Pedro also loved coaching his children in wrestling, softball, baseball and soccer. Pedro worked for UV Industries in Fierro, N.M. He graduated from Western New Mexico University with a master's degree in computer science. After graduating, Pedro moved his wife and their four children to Las Vegas, Nev., where he worked in the casinos for many years. Pedro was a hardworking man. He spent the rest of his days helping raise his grandchildren with great love and earning the nickname "Java." He taught his grandchildren how to drive and enjoyed going to their games. His military career inspired three of his grandchildren to follow in his footsteps. He enjoyed playing the slots. Every morning he would put on a pot of coffee and open all the blinds to let the sunshine in. He was a quiet man with a great sense of humor. "We miss him dearly." Pedro was preceded in death by his parents, Casiano and Maria Villanueva; three brothers, Jose, Simon, and Roberto Villanueva; a sister, Juana Villanueva; and a nephew, Jose Villanueva Jr. Pedro is survived by his ex-wife, Zenaida; his two sons, Pedro Villanueva, and Bryan Villanueva and his wife, Alisha, of Las Vegas, Nev.; two daughters, Pamela Villanueva and her partner, Manuel Peru Jr., of Bayard, and Frances Villanueva of Las Vegas, Nev.; 13 grandchildren, Jerika (Gabriel), Elijah (Joe), Paris (Chris), Pedro III, Xavier, Michael, Devin, Madison, Deun, Keun, Kaytlyn, Kenwyn and Naima; four great-grandchildren, Amara, Onyx, Rome and Xiomara; three brothers, Ricardo Villanueva and wife, Irene, Marcy Villanueva and wife, Viola, and Armando Villanueva and wife, Margarita; two sisters, Isabel Villanueva Fernandez and husband, Jose, and Alice Villanueva Nunez and husband, Steve; and numerous nieces and nephews. Visitation will be from 9:30 to 11:30 a.m. Friday, April 30, at Davis Funeral Home in Las Vegas, Nev. Funeral services will be held from 11:30 a.m. to 12:30 p.m. Friday, April 30, also at Davis Funeral Home. Burial will follow at Southern Nevada Veterans Memorial Cemetery. Pallbearers will be Pedro Villanueva III, Xavier Villanueva, Michael Vasquez II, Devin Villanueva, Deun Villanueva, Keun Villanueva, and Kenwyn Villanueva. Honorary pallbearers are Jose Leyba and Rome Alejandro Marquez.

—

HEIDEN: Kenneth R. Heiden, 73, of Silver City, entered eternal rest Tuesday, April 20, 2021, at UNM Hospital in Albuquerque. Arrangements are pending with **Terrazas Funeral Chapels**. Phone 575-537-0777.

—

MARTIN: Loretta Martin, 83, of Silver City, entered eternal rest Wednesday, April 21, 2021, at her residence. Arrangements are pending with **Terrazas Funeral Chapels**. Phone 575-537-0777.

—

ROWLAND: Alice Sue Rowland, 80, of Hurley, passed away Sunday, April 18, 2021, surrounded by her family at Gila Regional Medical Center. Services are pending with **Baca's Funeral Chapels**.

GRMC...

From Page 1

needs about five years ago.

In a press release, the Economic Development Administration said the project is expected to retain 344 jobs and generate $62 million in private investment.

"We've been working on this grant since last September," said Priscilla Lucero, executive director for the Southwest New Mexico Council of Governments. "The Southwest New Mexico COG prepared the application, and will also administer the award. GRMC received the financial assistance award [Thursday], and once reviewed and signed by GRMC — they have 30 days to sign, if necessary — it will be a 60-month performance period."

The grant guarantees reimbursement for costs associated with the roof and HVAC project.

"The effective date of the award is April 22, 2021, so any eligible expenses after this date are reimbursable," Lucero said.

Grant County Commissioner and Gila Regional Medical Center Governing Board Chairperson Alicia Edwards said that Lucero and U.S. Sen. Martin Heinrich were instrumental in securing the grant, which will allow the nonprofit county-owned hospital to finally begin work on the long-planned project.

"Last year, when Gila Regional Medical Center was experiencing major financial difficulties brought on by the pandemic, I fought alongside Congresswoman Xochitl Torres Small to expedite an accelerated advance Medicare payment of $6.8 million through the CARES Act that helped the hospital keep its doors open and keep serving patients in southwest New Mexico," Heinrich said. "I'm pleased to see additional CARES Act support will allow GRMC to invest in critical HVAC improvements, and keep its facilities staffed and fully operational."

Lt. Gov. Howie Morales, who was employed by Gila Regional as Gila REACH director until that job was eliminated in 2017, told the Daily Press that the federal funds were "long overdue."

"Today's announcement is welcoming news of continued investments in rural communities across our state," Morales said. "These long overdue capital improvements have been needed for years, and thanks to the coordination of our federal delegation, state leaders and local community efforts spearheaded by Grant County and our Southwest New Mexico Council of Governments, GRMC is well positioned for delivery of enhanced patient-centered services for decades to come."

The $2.5 million grant was one of two CARES Act grants that Raimondo awarded in southern New Mexico this week.

LiftFund Inc., a micro-lending organization that partnered with the the city of Las Cruces last year to build a community support program to help small businesses navigate the pandemic economy, will receive a $1 million CARES Act Recovery Assistance grant "to capitalize and administer a revolving loan fund to provide critical gap financing to small businesses and entrepreneurs adversely affected by the coronavirus pandemic in Doña Ana, Sierra and Socorro counties," according to the release.

That project also requires a $250,000 match in local funds, and is expected to retain 74 jobs, create 61 jobs and generate $17.5 million in private investment.

"The Economic Development Administration is committed to helping communities across the nation implement strategies to mitigate economic hardships brought on by the coronavirus pandemic," said Dennis Alvord, acting assistant secretary of commerce for economic development. "These EDA investments will support local businesses through building renovations and HVAC improvements and will support the capital needs of businesses in south central New Mexico."

—GEOFFREY PLANT

Legal

Quorum Notice – April 27th & 28th 2021

A quorum of The Gila Regional Medical Center Governing Board may be in attendance during GRMC Governing Board Meetings on the following days: Tuesday, April 27, 2021 and Wednesday, April 28, 2021. This is not a formal meeting for the Gila Regional Medical Center's Governing Board and no action will be taken. For more information contact JoAnn Holguin, Executive assistant to the CEO, at the Administration office (575) 538-4098.

Scott Manis, ICEO
By: (s) JoAnn Holguin,
Executive Assistant

A23

Legal

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NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Part 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non-discrimination programs, policies or procedures, or if you believe that you have been discriminated against with respect to a NMED program or activity, you may contact: Kristine Yurdin, Non-Discrimination Coordinator, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855, nd.coordinator@state.nm.us. You may also visit our website at https://www.env.nm.gov/non-employee-discrimination-complaint-page/ to learn how and where to file a complaint of discrimination.

A23

Submittal of Public Service Announcement – Certification

I, Claire Booth, the undersigned, certify that on **April 14, 2021**, submitted a public service announcement to **Silver City Radio (SkyWest Media, LLC) for KNFT-AM** that serves **Silver City, Grant County**, New Mexico, in which the source is or is proposed to be located and that **Silver City Radio responded that it would air the announcement.**

Signed this 28 day of April, 2021.

Claire Booth (signature) — 4/28/2021

Signature — Date

Claire Booth

Printed Name

Senior Env. Engineer (Consultant)

Title {APPLICANT OR RELATIONSHIP TO APPLICANT}

SkyWest Media, LLC
P.O. Box 2577
Silver City, NM 88062
(575) 538-3396

KNFT-AM Order Confirmation

OrderID: 1038-002

Sponsor:	Array Environmental, LLC
Product:	Array Environmental, LLC
Estimate/PO:	
AccountRep:	House Accounts
BillingCycle:	Calendar Month
InvoiceType:	Detail
Run Dates:	4/23/2021 - 4/23/2021
Items Ordered:	01
Ordered Amount:	$250.00
+State, County, City Tax as of 7-1-15	$20.00
Total Amount:	$270.00

ARRAY ENVIRONMENTAL, LLC
1496 CONESTOGA CIRCLE
STEAMBOAT SPRINGS, CO 80487

Scheduled Station(s): KNFT-AM

Array Environmental, LLC

Printed 4/14/2021 3:47:53 PM **Page 1**

	Run Dates	Run Weeks	Run Times	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Week Total	Length	Description	Avail Type	Copy ID	Qty	Item Cost	Total Cost
01	4/23/2021 - 4/23/2021	All Weeks	06:00 AM - 10:00 AM					1			1	2:00	Public Affairs		7627	1	250.00	250.00

Calendar Month Projected Billing:

Apr-21	250.00	May-21	0.00	Jun-21	0.00	Q2-2021	250.00

Net due 30 after receipt of invoice

Accepted for KNFT-AM

Confirmed Correct; Payment Guaranteed

claire@arrayenvironmental.com

From: claire@arrayenvironmental.com
Sent: Wednesday, April 14, 2021 3:43 PM
To: 'Sabrina Pack'
Subject: RE: FW: PSA Request for Air Quality Permit - Tyrone Mine

Great, thank you Sabrina! Here are the details:

DATE: Run no earlier than April 22, 2021.

NUMBER OF AIRS: Only has to be read once.

SCRIPT: Freeport McMoRan Tyrone, Inc. principal owner and operator of the Tyrone Mine is submitting an air permit application to the New Mexico Environment Department Air Quality Bureau. Tyrone Mine is a copper mine located 4.5 miles southwest of Tyrone, New Mexico in Grant County. The air permit application is being submitted to incorporate three new mine operating scenarios and one new emergency generator into the permit. Notices have been posted at the Tyrone Mine Property Boundary, Tyrone Mine Security Gate, Tyrone Post Office/Community Center, Silver City Public Library, and the Grant County Administration Building. Comments may be directed to the New Mexico Environment Department, Air Quality Bureau, Permitting Section via mail at 525 Camino de los Marquez, Suite 1, Santa Fe, New Mexico, 87505-1816 or via phone at (505) 476-4300.

Please let me know if you need anything else.

Thanks!
Claire

Claire Booth, PE // Array Environmental, LLC
720.316.9935 (o) // 352.328.5764 (m) // claire@arrayenvironmental.com
Palisade, Colorado // www.arrayenvironmental.com

From: Sabrina Pack <sabrina@silvercityradio.com>
Sent: Wednesday, April 14, 2021 3:33 PM
To: claire@arrayenvironmental.com
Subject: Re: FW: PSA Request for Air Quality Permit - Tyrone Mine

Certainly. Just need to know what you need. Do you have your script and requirements for number of times needing to be aired, etc.?

Sabrina

On Wed, Apr 14, 2021 at 3:27 PM <claire@arrayenvironmental.com> wrote:

> Hi Sabrina,
>
> Can you help me with another radio spot for the Tyrone Mine?

Section 10

Written Description of the Routine Operations of the Facility

<u>A written description of the routine operations of the facility</u>. Include a description of how each piece of equipment will be operated, how controls will be used, and the fate of both the products and waste generated. For modifications and/or revisions, explain how the changes will affect the existing process. In a separate paragraph describe the major process bottlenecks that limit production. The purpose of this description is to provide sufficient information about plant operations for the permit writer to determine appropriate emission sources.

<u>Mining Activities</u>

Mine operations begin with drilling, blasting, and loading copper bearing ore or waste rock within the active areas of the open pit mine. Drilling is performed with mobile drills. Blast holes are drilled to depth and are partially filled with blasting agents. The remaining top portion of each blast hole is filled with stemming material, which is a sand and gravel mixture. Blast holes are drilled on a variable spacing but most often are drilled on a spacing of approximately 24 to 30 feet. Once the rock is blasted, electric shovels and/or loaders load haul trucks that deliver rock to stockpiles for leaching or waste.

The following operational scenarios are included in this permit application and are based on pit-specific throughputs. Note that the scenario numbering begins with "8" because these scenarios are intended to be added to the one (1) Gettysburg + Mohawk operating scenario approved in NSR Permit No. PSD2448-M5 and the six (6) operating scenarios approved in NSR Permit No. PSD2448-M6.

Operating Scenario	Pit Name	Maximum Blasting Agent Usage per Blast (lbs/blast)	Maximum No. of Blasts per Day	Maximum Daily Blasting Agent Usage (lbs/day)	Maximum Blast Area per Blast (ft^2/blast)	Maximum Mining Rates (tons/day)
Scenario 8	Emma	200,000	2	400,000	125,000	200,000
	Burro Chief	200,000	2	400,000	125,000	200,000
Scenario 9	Emma	200,000	2	400,000	125,000	200,000
	Little Rock 6	100,000	1	100,000	125,000	90,000
Scenario 10	Emma	200,000	2	400,000	125,000	200,000
	Mohawk	150,000	2	300,000	125,000	200,000

The main assumptions that go into the operational scenario emission calculations are that only one scenario can be operated during a given day, both pits within a scenario may be blasted in a day, and only one blast may occur in an hour. Therefore, it is assumed that the emissions from one blast are equivalent to the maximum hourly emissions.

Maximum emissions associated with each pit's worst-case stockpiles (leach and/or waste) and worst-case haul roads operating simultaneously within each scenario were assessed in the model.

<u>Reclamation Activities</u>

Reclamation is done under the multi-year reclamation plan approved by the New Mexico Environment Department and the New Mexico Energy, Minerals and Natural Resources Department – Mining and Minerals Division. Reclamation activities may entail the crushing and screening of material, loading, hauling, and unloading of material for various reclamation purposes. There are no changes to the reclamation activities from those presented in the M6 permit application.

<u>Leaching</u>

Collected ore is delivered to stockpiles where a slightly acidic solution called raffinate is sprinkled on its surface. The solution percolates through the copper bearing ore, dissolving copper minerals contained in it. The resulting copper-laden solution, referred to in the mining industry as pregnant leach solution (PLS), exits the bottom of the stockpile where it is collected and pumped to storage ponds. The PLS is gravity fed to the solution extraction/electrowinning (SX/EW) plant for further processing.

SX/EW Plant

The SX/EW Plant consists of a series of ten mixer-settler tanks followed by a series of two EW tankhouses. The SX/EW Plant has two circuits of mixer-settler tanks with a flow capacity of approximately 32,000 gallons per minute (gpm). In the SX tanks, PLS is mixed vigorously with an equal volume of an organic solution that consists of approximately 90 percent diluent, which is a highly refined petroleum-based solvent. It is also mixed with 10 percent extraction reagent, which is a specialty chemical that selectively extracts copper from aqueous solutions under specific conditions.

Once the PLS and organic solution are sufficiently mixed, settling occurs. During this process, the less-dense organic solution extracts copper ions while the now barren leach solution settles to the bottom of the tank. The organic solution, now called "loaded" since it contains copper ions, floats to the top of the tank and is pumped to the next component of the plant. The settled solution is called "raffinate", and since it is barren of copper, is sent to an organic recovery tank to recycle any carryover organic solution back to the extraction tanks. The raffinate is sent back to the leach stockpiles for another leach cycle.

The loaded organic solution is mixed with a strong aqueous solution of sulfuric acid, called "electrolyte", which strips copper ions from the organic solution. The mixed solutions are sent to a settling tank where the copper-rich electrolyte solution settles to the bottom and the organic solution floats to the top. The organic solution is recycled back to the extraction process. The copper-rich electrolyte solution is pumped to the EW tankhouse where it is routed through a series of tanks, or cells. Insoluble lead plates are hung in the cells and serve as an anode. Copper "starter sheets" are placed in the cells as cathodes. An electric current in the solution causes the copper ions from the electrolyte solution to plate onto the cathodes. Once the sheets contain enough copper, they are removed from the EW cells and shipped to off-site facilities for further processing into copper products. The remaining "lean" electrolyte solution is pumped back to the SX/EW Plant and the entire process is repeated.

Crushing & Screening Plant

Routine operations for the Tyrone Mine include the periodic use of a portable crushing and/or screening plant for reclamation purposes or to support mining activities, such as road base. Crushing and/or screening activities are operated by a contractor under GCP-2. The crushing and/or screening plant is powered by facility electric power.

Insignificant Sources

Insignificant sources at the Tyrone Mine include natural gas or propane-fired water heaters, space heaters, small engines for welders, portable pumps, and mixing tanks. A comprehensive list of sources is provided in Table 2-B of this application.

Power Plant

The Tyrone Mine and related facilities rely on power purchased from PNM Electric. During unavoidable loss of commercial power, a power plant is available to provide backup power. The power plant consists of ten (10) Nordberg compression-ignition internal combustion engines, combusting dual-fuel – a mixture of mostly natural gas and diesel – to initiate ignition. The only exception is the Engine 15 (PPG-15), which runs on diesel only. Each engine drives a 2 MW (approximate) generator that provides power to the mine and related facilities. The Nordberg engines each operate less than 500 hours per year.

Section 11

Source Determination

Source submitting under 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC

Sources applying for a construction permit, PSD permit, or operating permit shall evaluate surrounding and/or associated sources (including those sources directly connected to this source for business reasons) and complete this section. Responses to the following questions shall be consistent with the Air Quality Bureau's permitting guidance, Single Source Determination Guidance, which may be found on the Applications Page in the Permitting Section of the Air Quality Bureau website.

Typically, buildings, structures, installations, or facilities that have the same SIC code, that are under common ownership or control, and that are contiguous or adjacent constitute a single stationary source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes. Submission of your analysis of these factors in support of the responses below is optional, unless requested by NMED.

A. Identify the emission sources evaluated in this section (list and describe)**:**

See Table 2-A in Section 2 of this application.

B. Apply the 3 criteria for determining a single source:

SIC Code: Surrounding or associated sources belong to the same 2-digit industrial grouping (2-digit SIC code) as this facility, OR surrounding or associated sources that belong to different 2-digit SIC codes are support facilities for this source.

☑ **Yes** ☐ **No**

Common Ownership or Control: Surrounding or associated sources are under common ownership or control as this source.

☑ **Yes** ☐ **No**

Contiguous or Adjacent: Surrounding or associated sources are contiguous or adjacent with this source.

☑ **Yes** ☐ **No**

C. Make a determination:

☑ The source, as described in this application, constitutes the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes. If in "A" above you evaluated only the source that is the subject of this application, all "**YES**" boxes should be checked. If in "A" above you evaluated other sources as well, you must check **AT LEAST ONE** of the boxes "**NO**" to conclude that the source, as described in the application, is the entire source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes.

☐ The source, as described in this application, **does not** constitute the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes (A permit may be issued for a portion of a source). The entire source consists of the following facilities or emissions sources (list and describe):

There are no other industrial facilities outside the Tyrone Mine property boundary that could be considered part of the Tyrone Mine stationary source for air quality permitting purposes.

Section 12

Section 12.A

PSD Applicability Determination for All Sources

(Submitting under 20.2.72, 20.2.74 NMAC)

A PSD applicability determination for all sources. For sources applying for a significant permit revision, apply the applicable requirements of 20.2.74.AG and 20.2.74.200 NMAC and to determine whether this facility is a major or minor PSD source, and whether this modification is a major or a minor PSD modification. It may be helpful to refer to the procedures for Determining the Net Emissions Change at a Source as specified by Table A-5 (Page A.45) of the EPA New Source Review Workshop Manual to determine if the revision is subject to PSD review.

A. This facility is:

- ☑ **a minor PSD source before and after this modification (if so, delete C and D below).**
- ☐ **a major PSD source before this modification. This modification will make this a PSD minor source.**
- ☐ **an existing PSD Major Source that has never had a major modification requiring a BACT analysis.**
- ☐ **an existing PSD Major Source that has had a major modification requiring a BACT analysis**
- ☐ **a new PSD Major Source after this modification.**

B. **This facility is not one of the listed 20.2.74.501 Table I – PSD Source Categories so fugitive emissions do not have to be counted for PSD applicability. The only emissions resulting from this project are fugitive and no new point sources or modifications to existing point sources are being proposed in this permit application.**

The Tyrone Mine is currently a PSD minor source and will remain a PSD minor source after this application since the project consists only of fugitive emissions from mine blasting, material handling, and haul roads.

Section 13

Determination of State & Federal Air Quality Regulations

This section lists each state and federal air quality regulation that may apply to your facility and/or equipment that are stationary sources of regulated air pollutants.

Not all state and federal air quality regulations are included in this list. Go to the Code of Federal Regulations (CFR) or to the Air Quality Bureau's regulation page to see the full set of air quality regulations.

Required Information for Specific Equipment:
For regulations that apply to specific source types, in the 'Justification' column **provide any information needed to determine if the regulation does or does not apply**. **For example**, to determine if emissions standards at 40 CFR 60, Subpart IIII apply to your three identical stationary engines, we need to know the construction date as defined in that regulation; the manufacturer date; the date of reconstruction or modification, if any; if they are or are not fire pump engines; if they are or are not emergency engines as defined in that regulation; their site ratings; and the cylinder displacement.

Required Information for Regulations that Apply to the Entire Facility:
See instructions in the 'Justification' column for the information that is needed to determine if an 'Entire Facility' type of regulation applies (e.g. 20.2.70 or 20.2.73 NMAC).

Regulatory Citations for Regulations That Do Not, but Could Apply:
If there is a state or federal air quality regulation that does not apply, but you have a piece of equipment in a source category for which a regulation has been promulgated, you must **provide the low level regulatory citation showing why your piece of equipment is not subject to or exempt from the regulation. For example** if you have a stationary internal combustion engine that is not subject to 40 CFR 63, Subpart ZZZZ because it is an existing 2 stroke lean burn stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions, your citation would be 40 CFR 63.6590(b)(3)(i). **We don't want a discussion of every non-applicable regulation, but if it is possible a regulation could apply, explain why it does not. For example,** if your facility is a power plant, you do not need to include a citation to show that 40 CFR 60, Subpart OOO does not apply to your non-existent rock crusher.

Regulatory Citations for Emission Standards:
For each unit that is subject to an emission standard in a source specific regulation, such as 40 CFR 60, Subpart OOO or 40 CFR 63, Subpart HH, include the low level regulatory citation of that emission standard. Emission standards can be numerical emission limits, work practice standards, or other requirements such as maintenance. **Here are examples:** a glycol dehydrator is subject to the general standards at 63.764C(1)(i) through (iii); an engine is subject to 63.6601, Tables 2a and 2b; a crusher is subject to 60.672(b), Table 3 and all transfer points are subject to 60.672(e)(1)

Federally Enforceable Conditions:
All federal regulations are federally enforceable. All Air Quality Bureau State regulations are federally enforceable except for the following: affirmative defense portions at 20.2.7.6.B, 20.2.7.110(B)(15), 20.2.7.11 through 20.2.7.113, 20.2.7.115, and 20.2.7.116; 20.2.37; 20.2.42; 20.2.43; 20.2.62; 20.2.63; 20.2.86; 20.2.89; and 20.2.90 NMAC. Federally enforceable means that EPA can enforce the regulation as well as the Air Quality Bureau and federally enforceable regulations can count toward determining a facility's potential to emit (PTE) for the Title V, PSD, and nonattainment permit regulations.

INCLUDE ANY OTHER INFORMATION NEEDED TO COMPLETE AN APPLICABILITY DETERMINATION OR THAT IS RELEVENT TO YOUR FACILITY'S NOTICE OF INTENT OR PERMIT.

EPA Applicability Determination Index for 40 CFR 60, 61, 63, etc: http://cfpub.epa.gov/adi/

Table for STATE REGULATIONS:

STATE REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION: (You may delete instructions or statements that do not apply in the justification column to shorten the document.)
20.2.1 NMAC	General Provisions	**Yes**	**Facility**	General Provisions apply to Notice of Intent, Construction, and Title V permit applications.
20.2.3 NMAC	Ambient Air Quality Standards NMAAQS	**Yes**	**Facility**	20.2.3 NMAC is a State Implementation Plan (SIP) approved regulation that limits the maximum allowable concentration of Total Suspended Particulates, Sulfur Compounds, Carbon Monoxide and Nitrogen Dioxide. The facility is subject to this regulation.
20.2.7 NMAC	Excess Emissions	**Yes**	**Facility**	If your entire facility or individual pieces of equipment are subject to emissions limits in a permit or numerical emissions standards in a federal or state regulation, this applies.
20.2.33 NMAC	Gas Burning Equipment - Nitrogen Dioxide	No	N/A	This facility does not have new gas burning equipment having a heat input of greater than 1,000,000 million British Thermal Units per year per unit. This regulation does not apply. Note: "New gas burning equipment" means gas burning equipment, the construction or modification of which is commenced after February 17, 1972.
20.2.34 NMAC	Oil Burning Equipment: NO_2	No	N/A	This facility does not have oil burning equipment having a heat input of greater than 1,000,000 million British Thermal Units per year per unit, therefore this regulation does not apply.
20.2.35 NMAC	Natural Gas Processing Plant – Sulfur	No	N/A	This regulation could apply to existing (prior to July 1, 1974) or new (on or after July 1, 1974) natural gas processing plants that use a Sulfur Recovery Unit to reduce sulfur emissions. This facility does not operate a sulfur recovery unit. This regulation does not apply.
20.2.37 and 20.2.36 NMAC	Petroleum Processing Facilities and Petroleum Refineries	N/A	N/A	These regulations were repealed by the Environmental Improvement Board. If you had equipment subject to 20.2.37 NMAC before the repeal, your combustion emission sources are now subject to 20.2.61 NMAC.
20.2.38 NMAC	Hydrocarbon Storage Facility	No	N/A	This regulation could apply to storage tanks at petroleum production facilities, processing facilities, tanks batteries, or hydrocarbon storage facilities. This facility is not covered under this regulation. This regulation does not apply.
20.2.39 NMAC	Sulfur Recovery Plant - Sulfur	No	N/A	This regulation could apply to sulfur recovery plants that are not part of petroleum or natural gas processing facilities. This facility does not contain a sulfur recovery plant. This regulation does not apply.
20.2.61.109 NMAC	Smoke & Visible Emissions	**Yes**	**Stationary Combustion Equipment**	This regulation applies to Stationary Combustion Equipment, such as engines, boilers, heaters, and flares unless your equipment is subject to another state regulation that limits particulate matter such as 20.2.19 NMAC (see 20.2.61.109 NMAC). Facility stationary combustion equipment are subject to this regulation.
20.2.70 NMAC	Operating Permits	**Yes**	**Facility**	This regulation applies as the facility's potential to emit (PTE) is 100 tpy or more of any regulated air pollutant other than HAPs; and/or a HAPs PTE of 10 tpy or more for a single HAP or 25 or more tpy for combined HAPs. This facility is permitted under Title V Permit No. P147-R2M1.
20.2.71 NMAC	Operating Permit Fees	**Yes**	**Facility**	If subject to 20.2.70 NMAC and your permit includes numerical ton per year emission limits, you are subject to 20.2.71 NMAC and normally applies to the entire facility.
20.2.72 NMAC	Construction Permits	**Yes**	**Facility**	This applies as the facility's potential emission rate (PER) is greater than 10 pph and greater than 25 tpy for any pollutant subject to a state or federal ambient air quality standard. This facility is currently permitted under NSR Permit No. PSD2448-M5.

STATE REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION: (You may delete instructions or statements that do not apply in the justification column to shorten the document.)
20.2.73 NMAC	NOI & Emissions Inventory Requirements	**Yes**	**Facility**	All facilities that are a Title V Major Source as defined at 20.2.70.7.R NMAC, are subject to Emissions Inventory Reporting. This facility is a Title V major source. This regulation applies.
20.2.74 NMAC	Permits – Prevention of Significant Deterioration (PSD)	No	N/A	This facility is a stationary source not listed in Table 1 of this Part (20.2.74.501 NMAC) and which emits or has the potential to emit stack emissions of less than two hundred fifty (250) tons per year of any regulated pollutant. This regulation therefore does not apply.
20.2.74.302 NMAC	Prevention of Significant Deterioration (PSD) CONTROL TECHNOLOGY REQUIREMENTS	**Yes**	**PPG-1, 3, 4, 7, 8, 11-15**	Only this portion of 20.2.74 NMAC applies to the Nordberg engines at the facility (units PPG-1, 3, 4, 7, 8, 11-15) as historical BACT requirements apply to these engines.
20.2.75 NMAC	Construction Permit Fees	**Yes**	**Facility**	This regulation applies if you are submitting an application pursuant to 20.2.72, 20.2.73, 20.2.74, and/or 20.2.79 NMAC. If this is a 20.2.72, 20.2.74, and/or 20.2.79 NMAC application it is subject to 20.2.75.10, 11 permit fee, and 11.E annual fees. This regulation applies.
20.2.77 NMAC	New Source Performance	**Yes**	**Units subject to 40 CFR 60**	This is a stationary source which is subject to the requirements of 40 CFR Part 60. This regulation applies as 40 CFR 60 Subparts IIII and JJJJ apply.
20.2.78 NMAC	Emission Standards for HAPS	No	Units Subject to 40 CFR 61	This facility does not emit hazardous air pollutants which are subject to the requirements of 40 CFR Part 61. This regulation does not apply.
20.2.79 NMAC	Permits – Nonattainment Areas	No	Facility	This facility is not located within a non-attainment area. This regulation does not apply.
20.2.80 NMAC	Stack Heights	No	N/A	Stacks at this facility follow good engineering practice.
20.2.82 NMAC	MACT Standards for source categories of HAPS	**Yes**	**Units Subject to 40 CFR 63**	This regulation applies to all sources emitting hazardous air pollutants, which are subject to the requirements of 40 CFR Part 63. This regulation applies as 40 CFR 63 Subparts A, ZZZZ, and CCCCCC apply.

Table for Applicable FEDERAL REGULATIONS:

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
40 CFR 50	NAAQS	**Yes**	**Facility**	This applies if you are subject to 20.2.70, 20.2.72, 20.2.74, and/or 20.2.79 NMAC.
NSPS 40 CFR 60, Subpart A	General Provisions	**Yes**	**Units subject to 40 CFR 60**	Applies if any other Subpart in 40 CFR 60 applies. This regulation applies as 40 CFR 60 Subparts IIII and JJJJ apply.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
NSPS 40 CFR60.40a, Subpart Da	Subpart Da, Performance Standards for **Electric Utility Steam Generating Units**	No	N/A	Establishes PM, SO_2 and NOx emission limits/standards of performance for electric utility steam generating units. This facility does not contain the affected source. This regulation does not apply.
NSPS 40 CFR60.40b Subpart Db	Performance Standards for **Industrial-Commercial-Institutional Steam Generating Units**	No	N/A	(a) The affected facility to which this subpart applies is each steam generating unit that commences construction, modification, or reconstruction after June 19, 1984, and that has a heat input capacity from fuels combusted in the steam generating unit of greater than 29 MW (100 million Btu/hour). This facility does not contain the affected source. This regulation does not apply.
40 CFR 60.40c, Subpart Dc	Standards of Performance for **Small Industrial-Commercial-Institutional Steam Generating Units**	No	N/A	Applicability: facility has steam generating units for which construction, modification or reconstruction is commenced after June 9, 1989 and that have a maximum design heat input capacity of 29 MW (100 MMBtu/hr) or less, but greater than or equal to 2.9 MW (10 MMBtu/hr). This facility does not contain the affected source. This regulation does not apply.
NSPS 40 CFR 60, Subpart Ka	Standards of Performance for **Storage Vessels for Petroleum Liquids** for which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and **Prior** to July 23, 1984	No	N/A	Except as provided in paragraph (b) of this section, the affected facility to which this subpart applies is each storage vessel with a storage capacity greater than 151,416 liters (40,000 gallons) that is used to store petroleum liquids for which construction is commenced after May 18, 1978. This facility does not contain the affected source. This regulation does not apply.
NSPS 40 CFR 60, Subpart Kb	Standards of Performance for **Volatile Organic Liquid Storage Vessels** (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced **After** July 23, 1984	No	N/A	Except as provided in paragraph (b) of this section, the affected facility to which this subpart applies is each storage vessel with a capacity greater than or equal to 75 cubic meters (m3) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984. This facility does not contain the affected source. This regulation does not apply.
NSPS 40 CFR 60.330 Subpart GG	**Stationary Gas Turbines**	No	N/A	The provisions of this subpart are applicable to the following affected facilities: All stationary gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules (10 million Btu) per hour, based on the lower heating value of the fuel fired. This facility does not contain the affected source. This regulation does not apply.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
NSPS 40 CFR 60, Subpart KKK	Leaks of VOC from **Onshore Gas Plants**	No	N/A	Affected Facility with Leaks of VOC from Onshore Gas Plants. Any affected facility under paragraph (a) of this section that commences construction, reconstruction, or modification after January 20, 1984, is subject to the requirements of this subpart. The group of all equipment (each pump, pressure relief device, open-ended valve or line, valve, compressor, and flange or other connector that is in VOC service or in wet gas service, and any device or system required by this subpart) except compressors (defined in § 60.631) within a process unit is an affected facility. A compressor station, dehydration unit, sweetening unit, underground storage tank, field gas gathering system, or liquefied natural gas unit is covered by this subpart if it is located at an onshore natural gas processing plant. This facility does not contain the affected source. This regulation does not apply.
NSPS 40 CFR Part 60 Subpart LL	Standards of performance for **Metallic Mineral Processing Plants**	No	N/A	The provisions of this subpart are applicable to the following affected facilities in metallic mineral processing plants: Each crusher and screen in open-pit mines; each crusher, screen, bucket elevator, conveyor belt transfer point, thermal dryer, product packaging station, storage bin, enclosed storage area, truck loading station, truck unloading station, railcar loading station, and railcar unloading station at the mill or concentrator with the following exceptions. This facility does not operate an affected facility under this subpart. This facility does not have a crusher or screen in the open-pit mine area and does not have a concentrator, mill, or conveyor belts in its process. The portable crusher and screener (GCP-2) will only be used to process aggregate and not copper-containing ores. This regulation does not apply.
NSPS 40 Part 60 Subpart OOO	Standards of Performance for **Nonmetallic Mineral Processing Plants**	No	N/A	This regulation establishes standards for the following affected facilities in fixed or portable nonmetallic mineral processing plants: each crusher, grinding mill, screening operation, bucket elevator, belt conveyor, bagging operation, storage bin, enclosed truck or railcar loading station is an applicable unit. Tyrone has no operations subject to Subpart OOO. Portable contractor crushing and screening plants that may be on-site may be subject to Subpart OOO, but that applicability is to the Contractor's plant.
NSPS 40 CFR Part 60 Subpart LLL	Standards of Performance for **Onshore Natural Gas Processing**: SO_2 Emissions	No	N/A	The facility is not a natural gas processing plant, including a sweetening unit followed by a sulfur recovery unit. This regulation does not apply.
NSPS 40 CFR Part 60 Subpart OOOO	Standards of Performance for **Crude Oil and Natural Gas Production, Transmission, and Distribution** for which construction, modification or reconstruction commenced after August 23, 2011 and before September 18, 2015	No	N/A	The rule applies to "affected" facilities that are constructed, modified, or reconstructed after Aug 23, 2011 (40 CFR 60.5365): gas wells, including fractured and hydraulically refractured wells, centrifugal compressors, reciprocating compressors, pneumatic controllers, certain equipment at natural gas processing plants, sweetening units at natural gas processing plants, and storage vessels. This facility does not contain the affected source. This regulation does not apply.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
NSPS 40 CFR Part 60 Subpart OOOOa	Standards of Performance for **Crude Oil and Natural Gas Facilities** for which Construction, Modification or Reconstruction Commenced After September 18, 2015	No	N/A	This facility does not contain the affected source. This regulation does not apply.
NSPS 40 CFR 60 Subpart IIII	Standards of performance for **Stationary Compression Ignition Internal Combustion Engines**	**Yes**	**OP-2, OP-4, OP-7, OP-8, SD-1, SD-2, ENV-120, ENV-123, SX/EW Fire Water Pump**	The provisions of this subpart are applicable to manufacturers, owners, and operators of stationary compression ignition (CI) internal combustion engines (ICE) and other persons as specified in paragraphs (a)(1) through (4) of this section. This facility contains several CI ICE which commenced construction after July 11, 2005 and were manufactured after April 1, 2006.
NSPS 40 CFR Part 60 Subpart JJJJ	Standards of Performance for **Stationary Spark Ignition Internal Combustion Engines**	**Yes**	**Generac Emergency Generators 1-5, IPG, SX Tankhouse Emergency Generator**	The provisions of this subpart are applicable to manufacturers, owners, and operators of stationary spark ignition (SI) internal combustion engines (ICE) as specified in paragraphs (a)(1) through (6) of this section. The Generac Emergency Generators (units Generac Emergency Generator 1 through 5), unit IPG, and the SX Tankhouse Emergency Generator are subject to NSPS JJJJ.
NSPS 40 CFR 60 Subpart TTTT	Standards of Performance for Greenhouse Gas Emissions for **Electric Generating Units**	No	N/A	This subpart establishes emission standards and compliance schedules for the control of greenhouse gas (GHG) emissions from a steam generating unit, IGCC, or a stationary combustion turbine that commences construction after January 8, 2014 or commences modification or reconstruction after June 18, 2014. This facility does not contain the affected source. This regulation does not apply.
NSPS 40 CFR 60 Subpart UUUU	Emissions Guidelines for Greenhouse Gas Emissions and Compliance Times for **Electric Utility Generating Units**	No	N/A	This subpart establishes emission guidelines and approval criteria for State or multi-State plans that establish emission standards limiting greenhouse gas (GHG) emissions from an affected steam generating unit, integrated gasification combined cycle (IGCC), or stationary combustion turbine. This facility does not contain the affected source. This regulation does not apply.
NSPS 40 CFR 60, Subparts WWW, XXX, Cc, and Cf	Standards of performance for **Municipal Solid Waste (MSW) Landfills**	No	N/A	This facility is not a municipal solid waste landfill. This regulation does not apply
NESHAP 40 CFR 61 Subpart A	General Provisions	No	Units Subject to 40 CFR 61	Applies if any other Subpart in 40 CFR 61 applies. As no subparts apply, this regulation does not apply.
NESHAP 40 CFR 61 Subpart E	National Emission Standards for **Mercury**	No	N/A	The provisions of this subpart are applicable to those stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
				This facility does not contain the affected activity. This regulation does not apply.
NESHAP 40 CFR 61 Subpart V	National Emission Standards for **Equipment Leaks** (Fugitive Emission Sources)	No	N/A	The provisions of this subpart apply to each of the following sources that are intended to operate in volatile hazardous air pollutant (VHAP) service: pumps, compressors, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, and control devices or systems required by this subpart. VHAP service means a piece of equipment either contains or contacts a fluid (liquid or gas) that is at least 10 percent by weight of VHAP. VHAP means a substance regulated under this subpart for which a standard for equipment leaks of the substance has been promulgated. Benzene is a VHAP (See 40 CFR 61 Subpart J). Link to 40 CFR 61 Subpart V This facility does not contain the affected source. This regulation does not apply.
MACT 40 CFR 63, Subpart A	General Provisions	**Yes**	**Units Subject to 40 CFR 63**	This regulation applies as 40 CFR 63 Subparts A, ZZZZ, and CCCCCC apply.
MACT 40 CFR 63.760 Subpart HH	**Oil and Natural Gas Production Facilities**	No	N/A	This subpart applies to the owners and operators of the emission points, specified in paragraph (b) of this section that are located at oil and natural gas production facilities that meet the specified criteria in paragraphs (a)(1) and either (a)(2) or (a)(3) of this section. This facility is not an oil or natural gas production facility. This regulation does not apply.
MACT 40 CFR 63 Subpart HHH	National Emission Standards for Hazardous Air Pollutants From **Natural Gas Transmission and Storage Facilities**	No	N/A	This subpart applies to owners and operators of natural gas transmission and storage facilities that transport or store natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company), and that are major sources of hazardous air pollutants (HAP) emissions as defined in §63.1271. This facility does not contain the affected source. This regulation does not apply.
MACT 40 CFR 63 Subpart DDDDD	National Emission Standards for Hazardous Air Pollutants for **Major Industrial, Commercial, and Institutional Boilers & Process Heaters**	No	N/A	This subpart establishes national emission limitations and work practice standards for hazardous air pollutants (HAP) emitted from industrial, commercial, and institutional boilers and process heaters located at major sources of HAP. This facility does not contain the affected source. This regulation does not apply.
MACT 40 CFR 63 Subpart UUUUU	National Emission Standards for Hazardous Air Pollutants **Coal & Oil Fire Electric Utility Steam Generating Unit**	No	N/A	This subpart establishes national emission limitations and work practice standards for hazardous air pollutants (HAP) emitted from coal- and oil-fired electric utility steam generating units (EGUs) as defined in §63.10042 of this subpart. This facility does not contain the affected source. This regulation does not apply.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
MACT 40 CFR 63 Subpart ZZZZ	National Emissions Standards for Hazardous Air Pollutants for **Stationary Reciprocating Internal Combustion Engines (RICE MACT)**	**Yes**	**PPG-1, 3, 4, 7, 8, 11, 12, 13, 14, 15 ENV-101, ENV-111, ENV-117, ENV-122, ENV-123, Generac Emergency Generators 1-5, GO Generator Backup E1-128, SX/EW Fire Water Pump, OP-2, OP-4, OP-7, OP-8, EMP-1, EMP-2, ENV-120, SD-1, SD-2, IPG, CE-1 SX Tankhouse Emergency Generator**	You are subject to this subpart if you own or operate a stationary RICE at a major or area source of HAP emissions. This facility contains the affected RICE sources listed here.
MACT 40 CFR 63 Subpart CCCCCC	National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities	**Yes**	**SPCC-TYR-061 (GDF1) SPCC-TYR-119 (GDF2)**	This subpart establishes national emission limitations and management practices for hazardous air pollutants (HAP) emitted from the loading of gasoline storage tanks at gasoline dispensing facilities (GDF). This subpart also establishes requirements to demonstrate compliance with the emission limitations and management practices. The affected source to which this subpart applies is each GDF that is located at an area source. The affected source includes each gasoline cargo tank during the delivery of product to a GDF and also includes each storage tank. **The gasoline dispensing units at this facility are subject. Per the regulation, because each GDF has a monthly throughput of less than 10,000 gallons of gasoline, the requirements in §63.11116 apply.**
40 CFR 64	**Compliance Assurance Monitoring**	No	N/A	The facility does not operate any pollutant-specific emissions unit that uses a control device to achieve compliance with a standard and the unit has potential pre-control device emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount required for the source to be classified as a major source. As such, a CAM plan is not required.
40 CFR 68	**Chemical Accident Prevention**	No	N/A	This regulation applies to an owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process, as determined under §68.115. This facility is not subject.
Title IV – Acid Rain 40 CFR 72	**Acid Rain**	No	N/A	See 40 CFR 72.6. This may apply if your facility generates commercial electric power or electric power for sale. The facility does not engage in the regulated activities. This regulation does not apply.
Title IV – Acid Rain 40 CFR 73	**Sulfur Dioxide** Allowance Emissions	No	N/A	See 40 CFR 73.2. This may apply if your facility generates commercial electric power or electric power for sale. The facility does not engage in the regulated activities. This regulation does not apply.
Title IV-Acid Rain 40 CFR 75	**Continuous Emissions Monitoring**	No	N/A	See 40 CFR 75.2. This may apply if your facility generates commercial electric power or electric power for sale. The facility does not engage in the regulated activities. This regulation does not apply.
Title IV –	**Acid Rain**	No	N/A	See 40 CFR 76.1. This may apply if your facility generates commercial

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
Acid Rain 40 CFR 76	Nitrogen Oxides **Emission Reduction Program**			electric power or electric power for sale. The facility does not engage in the regulated activities. This regulation does not apply.
Title VI – 40 CFR 82	Protection of **Stratospheric Ozone**	**Yes**	**N/A**	This regulation applies under the following citation: **(82.150)** if you service, maintain, or repair appliances, dispose of appliances, refrigerant reclaimers, **if you are an owner or operator of an appliance**, if you are a manufacturer of appliances or of recycling and recovery equipment, if you are an approved recycling and recovery equipment testing organization, and/or if you sell or offer for sell or purchase class I or class I refrigerants.

Section 14

Operational Plan to Mitigate Emissions

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

☑ **Title V Sources** (20.2.70 NMAC)**:** By checking this box and certifying this application the permittee certifies that it has developed an **Operational Plan to Mitigate Emissions During Startups, Shutdowns, and Emergencies** defining the measures to be taken to mitigate source emissions during startups, shutdowns, and emergencies as required by 20.2.70.300.D.5(f) and (g) NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.

☑ **NSR** (20.2.72 NMAC)**, PSD** (20.2.74 NMAC) **& Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has developed an **Operational Plan to Mitigate Source Emissions During Malfunction, Startup, or Shutdown** defining the measures to be taken to mitigate source emissions during malfunction, startup, or shutdown as required by 20.2.72.203.A.5 NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.

☑ **Title V** (20.2.70 NMAC)**, NSR** (20.2.72 NMAC)**, PSD** (20.2.74 NMAC) **& Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has established and implemented a Plan to Minimize Emissions During Routine or Predictable Startup, Shutdown, and Scheduled Maintenance through work practice standards and good air pollution control practices as required by 20.2.7.14.A and B NMAC. This plan shall be kept on site or at the nearest field office to be made available to the Department upon request. This plan should not be submitted with this application.

Freeport-McMoRan Tyrone Inc. maintains the required operational plans to mitigate emissions.

Section 15

Alternative Operating Scenarios

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

Alternative Operating Scenarios: Provide all information required by the department to define alternative operating scenarios. This includes process, material and product changes; facility emissions information; air pollution control equipment requirements; any applicable requirements; monitoring, recordkeeping, and reporting requirements; and compliance certification requirements. Please ensure applicable Tables in this application are clearly marked to show alternative operating scenario.

Construction Scenarios: When a permit is modified authorizing new construction to an existing facility, NMED includes a condition to clearly address which permit condition(s) (from the previous permit and the new permit) govern during the interval between the date of issuance of the modification permit and the completion of construction of the modification(s). There are many possible variables that need to be addressed such as: Is simultaneous operation of the old and new units permitted and, if so for example, for how long and under what restraints? In general, these types of requirements will be addressed in Section A100 of the permit, but additional requirements may be added elsewhere. Look in A100 of our NSR and/or TV permit template for sample language dealing with these requirements. Find these permit templates at: https://www.env.nm.gov/aqb/permit/aqb_pol.html. Compliance with standards must be maintained during construction, which should not usually be a problem unless simultaneous operation of old and new equipment is requested.

In this section, under the bolded title "Construction Scenarios", specify any information necessary to write these conditions, such as: conservative-realistic estimated time for completion of construction of the various units, whether simultaneous operation of old and new units is being requested (and, if so, modeled), whether the old units will be removed or decommissioned, any PSD ramifications, any temporary limits requested during phased construction, whether any increase in emissions is being requested as SSM emissions or will instead be handled as a separate Construction Scenario (with corresponding emission limits and conditions, etc.

Tyrone Mine is requesting to operate under three (3) new scenarios in this permit application in addition to the six (6) existing operating scenarios approved in M6 and the one (1) existing operating scenario approved in M5. In total, Tyrone would like to operate under ten (10) different operating scenarios. The table on the next page is proposed to replace Table 108.A.1 in the permit. Note that Tyrone is not requesting any changes to the reclamation activities or crushing and screening plant activities that were detailed in the M6 permit application so those proposed tables are not being repeated here.

Table 108.A.1: Allowable Mining Operating and Throughput Limits (Fugitives)

Mining Operating Scenario[1]	Pit Name[2]	Maximum Blasting Agent Usage per Blast (lbs/blast)	Maximum No. of Blasts per Day[3]	Maximum Daily Blasting Agent Usage (lbs/day)	Maximum Blast Area per Blast (ft^2/blast)	Maximum Mining Rates[4] (tons/day)
Scenario 1	Gettysburg	160,000	2	200,000	85,000	200,000
	Mohawk	160,000	2	200,000	125,000	200,000
Scenario 2	Mohawk	150,000	2	300,000	125,000	200,000
	Copper Mountain	100,000	1	100,000	125,000	200,000
Scenario 3	Mohawk	150,000	2	300,000	125,000	200,000
	Little Rock 6	100,000	1	100,000	125,000	90,000
Scenario 4	Mohawk	150,000	2	300,000	125,000	200,000
	Copper Leach	50,000	1	50,000	125,000	90,000
Scenario 5	Burro Chief	200,000	2	400,000	125,000	200,000
	Little Rock 6	100,000	1	100,000	125,000	90,000
Scenario 6	Burro Chief	200,000	2	400,000	125,000	200,000
	Copper Leach	50,000	1	50,000	125,000	90,000
Scenario 7	Mohawk	150,000	2	300,000	125,000	200,000
	Burro Chief	200,000	2	400,000	125,000	200,000
Scenario 8	Emma	200,000	2	400,000	125,000	200,000
	Burro Chief	200,000	2	400,000	125,000	200,000
Scenario 9	Emma	200,000	2	400,000	125,000	200,000
	Little Rock 6	100,000	1	100,000	125,000	90,000
Scenario 10	Emma	200,000	2	400,000	125,000	200,000
	Mohawk	150,000	2	300,000	125,000	200,000

Footnotes:

[1] Only one scenario can be operated during a given day.
[2] Both pits within a scenario can be blasted in a day but only one blast can occur in an hour.
[3] Blasting can only occur during daylight hours.
[4] The movement of material (waste rock, overburden, and ore) from the pits to the waste or leach piles (handling and hauling) can occur 24 hours/day.

Section 16

Air Dispersion Modeling

1) Minor Source Construction (20.2.72 NMAC) and Prevention of Significant Deterioration (PSD) (20.2.74 NMAC) ambient impact analysis (modeling): Provide an ambient impact analysis as required at 20.2.72.203.A(4) and/or 20.2.74.303 NMAC and as outlined in the Air Quality Bureau's Dispersion Modeling Guidelines found on the Planning Section's modeling website. If air dispersion modeling has been waived for one or more pollutants, attach the AQB Modeling Section modeling waiver approval documentation.
2) SSM Modeling: Applicants must conduct dispersion modeling for the total short term emissions during routine or predictable startup, shutdown, or maintenance (SSM) using realistic worst case scenarios following guidance from the Air Quality Bureau's dispersion modeling section. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on SSM emissions modeling requirements.
3) Title V (20.2.70 NMAC) ambient impact analysis: Title V applications must specify the construction permit and/or Title V Permit number(s) for which air quality dispersion modeling was last approved. Facilities that have only a Title V permit, such as landfills and air curtain incinerators, are subject to the same modeling required for preconstruction permits required by 20.2.72 and 20.2.74 NMAC.

What is the purpose of this application?	Enter an X for each purpose that applies
New PSD major source or PSD major modification (20.2.74 NMAC). See #1 above.	
New Minor Source or significant permit revision under 20.2.72 NMAC (20.2.72.219.D NMAC). See #1 above. **Note:** Neither modeling nor a modeling waiver is required for VOC emissions.	**X**
Reporting existing pollutants that were not previously reported.	
Reporting existing pollutants where the ambient impact is being addressed for the first time.	
Title V application (new, renewal, significant, or minor modification. 20.2.70 NMAC). See #3 above.	
Relocation (20.2.72.202.B.4 or 72.202.D.3.c NMAC)	
Minor Source Technical Permit Revision 20.2.72.219.B.1.d.vi NMAC for like-kind unit replacements.	
Other: i.e. SSM modeling. See #2 above.	
This application does not require modeling since this is a No Permit Required (NPR) application.	
This application does not require modeling since this is a Notice of Intent (NOI) application (20.2.73 NMAC).	
This application does not require modeling according to 20.2.70.7.E(11), 20.2.72.203.A(4), 20.2.74.303, 20.2.79.109.D NMAC and in accordance with the Air Quality Bureau's Modeling Guidelines.	

Check each box that applies:

☐ See attached, approved modeling **waiver for all** pollutants from the facility.
☐ See attached, approved modeling **waiver for some** pollutants from the facility.
☑ Attached in Universal Application Form 4 (UA4) is a **modeling report for all** pollutants from the facility.
☐ Attached in UA4 is a **modeling report for some** pollutants from the facility.
☐ No modeling is required.

Section 17

Compliance Test History

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

Compliance Test History Table

Unit No.	Test Description	Test Date
ENV-123	Tested in accordance with EPA test methods for NOx and CO as required by NSR Permit No. PSD2448-M1R6.	9/16/2013
PPG-1, 3, 7, 8, 11, 12, 13, 15	Tested in accordance with EPA test methods for NOx and CO as required by Title V Permit No. P147-R1M3.	3/10/2014

Section 20

Other Relevant Information

Other relevant information. Use this attachment to clarify any part in the application that you think needs explaining. Reference the section, table, column, and/or field. Include any additional text, tables, calculations or clarifying information.

Additionally, the applicant may propose specific permit language for AQB consideration. In the case of a revision to an existing permit, the applicant should provide the old language and the new language in track changes format to highlight the proposed changes. If proposing language for a new facility or language for a new unit, submit the proposed operating condition(s), along with the associated monitoring, recordkeeping, and reporting conditions. In either case, please limit the proposed language to the affected portion of the permit.

Freeport-McMoRan Tyrone Inc. requests confidentiality on behalf of our diluent suppliers for the materials used in the SX/EW process. Specifically, Freeport-McMoRan Tyrone Inc. wishes to maintain confidentiality regarding the constituency of the diluents and extractants. Section 6 is the only location in this application that contains this information.

Section 22: Certification

Company Name: Freeport-McMoRan Tyrone Inc.

I, Erich J. Bower, hereby certify that the information and data submitted in this application are true and as accurate as possible, to the best of my knowledge and professional expertise and experience.

Signed this 6 day of May, 2021, upon my oath or affirmation, before a notary of the State of

New Mexico.

*Signature

5/6/2021
Date

Erich J. Bower
Printed Name

President; General Manager
Title

Scribed and sworn before me on this 6 day of May, 2021.

My authorization as a notary of the State of New Mexico expires on the

12 day of December, 2021.

Notary's Signature

5/6/2021
Date

Official Seal
JEANIE B GUTIERREZ
Notary Public
State of New Mexico
My Comm. Expires 12/12/21

Jeanie B. Gutierrez
Notary's Printed Name

*For Title V applications, the signature must be of the Responsible Official as defined in 20.2.70.7.AE NMAC.

Universal Application 4

Air Dispersion Modeling Report

Refer to and complete Section 16 of the Universal Application form (UA3) to assist your determination as to whether modeling is required. If, after filling out Section 16, you are still unsure if modeling is required, e-mail the completed Section 16 to the AQB Modeling Manager for assistance in making this determination. If modeling is required, a modeling protocol would be submitted and approved prior to an application submittal. The protocol should be emailed to the modeling manager. A protocol is recommended but optional for minor sources and is required for new PSD sources or PSD major modifications. Fill out and submit this portion of the Universal Application form (UA4), the "Air Dispersion Modeling Report", only if air dispersion modeling is required for this application submittal. This serves as your modeling report submittal and should contain all the information needed to describe the modeling. No other modeling report or modeling protocol should be submitted with this permit application.

16-A: Identification		
1	Name of facility:	**Tyrone Mine**
2	Name of company:	**Freeport-McMoRan Tyrone Inc.**
3	Current Permit number:	**PSD2448-M6**
4	Name of applicant's modeler:	**Miriam Hacker, Aspen Outlook LLC**
5	Phone number of modeler:	**720-839-5461**
6	E-mail of modeler:	**miriamhacker@aspenoutlook.com**

16-B: Brief			
1	Was a modeling protocol submitted and approved?	**Yes**☒	No☐
2	Why is the modeling being done? **To show compliance with the NAAQS, NMAAQS, and PSD Increment associated with new alternate operating scenarios.**	Other (describe below)	
3	Describe the permit changes relevant to the modeling.		
3	**The proposed action in this permit application will allow for mining and hauling activities in three (3) new operating scenarios that encompass the following pits in various combinations: Emma, Mohawk, Burro Chief, and Little Rock 6. Each scenario contains two pits in operation at a time.** **The existing operating scenarios as approved in NSR Permit Numbers PSD2448-M5 and PSD2448-M6 will continue to be utilized, so the new scenarios in this permit application will be in addition to the existing scenarios. No other operating scenarios are currently needed by the Tyrone Mine, including the previously permitted scenarios in NSR Permit Nos. PSD2448-M2 and -M3.**		

<table>
<tr><td></td><td colspan="3">Reclamation hauling and material handling activities are also represented in this permit application, which are the same as those allowed by NSR Permit No. PSD2448-M6 and supersede the reclamation activities allowed by NSR Permit Nos. PSD2448-M5, -M3, and -M2.

For all of the other existing equipment and activities, no changes are being requested from what is allowed in NSR Permit No. PSD2448-M6.

The facility will remain a Title V major and PSD minor source with the proposed changes.</td></tr>
<tr><td>4</td><td colspan="2">What geodetic datum was used in the modeling?</td><td>WGS84</td></tr>
<tr><td>5</td><td colspan="2">How long will the facility be at this location?</td><td>Greater than one year</td></tr>
<tr><td>6</td><td colspan="2">Is the facility a major source with respect to Prevention of Significant Deterioration (PSD)?</td><td>Yes☐ No☒</td></tr>
<tr><td>7</td><td colspan="2">Identify the Air Quality Control Region (AQCR) in which the facility is located</td><td>012</td></tr>
<tr><td rowspan="5">8</td><td colspan="3">List the PSD baseline dates for this region (minor or major, as appropriate).</td></tr>
<tr><td>NO_2</td><td colspan="2">Minor - 8/10/1995</td></tr>
<tr><td>SO_2</td><td colspan="2">Minor - 8/10/1995</td></tr>
<tr><td>PM_{10}</td><td colspan="2">Minor - 8/10/1995</td></tr>
<tr><td>$PM_{2.5}$</td><td colspan="2">Minor - Not Applicable</td></tr>
<tr><td rowspan="2">9</td><td colspan="3">Provide the name and distance to Class I areas within 50 km of the facility (300 km for PSD permits).</td></tr>
<tr><td colspan="3">Gila Wilderness; 37 km</td></tr>
<tr><td rowspan="2">10</td><td colspan="2">Is the facility located in a non-attainment area? If so describe below</td><td>Yes☐ No☒</td></tr>
<tr><td colspan="3">Not Applicable</td></tr>
<tr><td rowspan="2">11</td><td colspan="3">Describe any special modeling requirements, such as streamline permit requirements.</td></tr>
<tr><td colspan="3">Not Applicable – no special modeling requirements have been applied.</td></tr>
</table>

16-C: Modeling History of Facility

1 Describe the modeling history of the facility, including the air permit numbers, the pollutants modeled, the National Ambient Air Quality Standards (NAAQS), New Mexico AAQS (NMAAQS), and PSD increments modeled. (Do not include modeling waivers).

Pollutant	Latest permit and modification number that modeled the pollutant facility-wide.	Date of Permit	Comments
CO	**NSR Permit No. PSD2448-M6**	**March 9 2021**	**NAAQS/NMAAQS**
NO_2	**NSR Permit No. PSD2448-M6**	**March 9 2021**	**NAAQS/NMAAQS/PSD Class I and II Increment**
SO_2	**NSR Permit No. PSD2448-M6**	**March 9 2021**	**SIL**
H_2S	**Not applicable**		
PM2.5	**NSR Permit No. PSD2448-M6**	**March 9 2021**	**NAAQS**
PM10	**NSR Permit No. PSD2448-M6**	**March 9 2021**	**NAAQS /PSD Class I and II Increment**
Lead	**Not applicable**		
Ozone (PSD only)	**Not applicable**		
NM Toxic Air Pollutants (20.2.72.402 NMAC)	**Not applicable**		

16-D: Modeling performed for this application

1 For each pollutant, indicate the modeling performed and submitted with this application.
Choose the most complicated modeling applicable for that pollutant, i.e., culpability analysis assumes ROI and cumulative analysis were also performed.

Pollutant	ROI	Cumulative analysis	Culpability analysis	Waiver approved	Pollutant not emitted or not changed.
CO	☐	☒	☐	☐	☐
NO_2	☐	☒	☐	☐	☐
SO_2	☒	☐	☐	☐	☐
H_2S	☐	☐	☐	☐	☒
PM2.5	☐	☒	☐	☐	☐
PM10	☐	☒	☐	☐	☐
Lead	☐	☐	☐	☐	☒
Ozone	☐	☐	☐	☐	☒
State air toxic(s) (20.2.72.402 NMAC)	☐	☐	☐	☐	☒

16-E: New Mexico toxic air pollutants modeling

1 List any New Mexico toxic air pollutants (NMTAPs) from Tables A and B in 20.2.72.502 NMAC that are modeled for this application.
Not Applicable

2 List any NMTAPs that are emitted but not modeled because stack height correction factor. Add additional rows to the table below, if required. **Not Applicable**

Pollutant	Emission Rate (pounds/hour)	Emission Rate Screening Level (pounds/hour)	Stack Height (meters)	Correction Factor	Emission Rate/ Correction Factor

16-F: Modeling options

1	Was the latest version of AERMOD used with regulatory default options? If not explain below.	**Yes☒**	No☐
	AERMOD Version 19191, with dry deposition		

16-G: Surrounding source modeling

1	Date of surrounding source retrieval	**January 8, 2020 – confirmed by Eric Peters August 25, 2020**
2	If the surrounding source inventory provided by the Air Quality Bureau was believed to be inaccurate, describe how the sources modeled differ from the inventory provided. If changes to the surrounding source inventory were made, use the table below to describe them. Add rows as needed.	
	AQB Source ID	Description of Corrections
	N/A	**N/A**

16-H: Building and structure downwash

1	How many buildings are present at the facility?	**There are several buildings located at the facility.**	
2	How many above ground storage tanks are present at the facility?	**There are several above ground storage tanks located at the facility**.	
3	Was building downwash modeled for all buildings and tanks? If not explain why below.	Yes☐	**No☒**
	Due to the expansive size of the facility and the location of the point sources relative to boundary receptors, any building downwash that may occur would have sufficient space to disperse prior to reaching the boundary.		
4	Building comments	**No comments**	

16-I: Receptors and modeled property boundary

1	"Restricted Area" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with a steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area. A Restricted Area is required in order to exclude receptors from the facility property. If the facility does not have a Restricted Area, then receptors shall be placed within the property boundaries of the facility. Describe the fence or other physical barrier at the facility that defines the restricted area.		
	The restricted area is defined by fencing, gates, signs, and rugged terrain. The current Burro Mountain Road will be rerouted south of the Emma pit to allow mine operations in the area where the current road is located.		
2	Receptors must be placed along publicly accessible roads in the restricted area. Are there public roads passing through the restricted area?	**Yes☒**	No☐

3	Are restricted area boundary coordinates included in the modeling files?	**Yes☒**	No☐

4 Describe the receptor grids and their spacing. The table below may be used, adding rows as needed.

Grid Type	Shape	Spacing	Start distance from restricted area or center of facility	End distance from restricted area or center of facility	Comments
Boundary	**Boundary**	**100 m**			**Around fenceline**
Tight	**Boundary**	**100 m**		**500 m**	**From fenceline boundary**
Fine	**Square**	**500 m**	**500 m**	**5,000 m**	
Course	**Square**	**1,000 m**	**5,000 m**	**25,000 m**	
Sensitive/road	**Road**	**100 m**			**Along all on-site roads, the rerouted Burro Mountain Road, and a section of Hwy 90 adjacent to the site.**

5	Describe receptor spacing along the fence line.
	100-meter spacing
6	Describe the PSD Class I area receptors.
	PSD class I area receptors were obtained from the 2018 MergeMaster database provided by NMED for the Gila Wilderness, as modeled in the M5 model assessment. PSD Class I modeling was completed using the model receptors on the near side of the Class I area, as approved by NMED.

16-J: Sensitive areas

1	Are there schools or hospitals or other sensitive areas near the facility? If so describe below. This information is optional (and purposely undefined) but may help determine issues related to public notice.	Yes☐	**No☒**
3	The modeling review process may need to be accelerated if there is a public hearing. Are there likely to be public comments opposing the permit application?	Yes☐	**No☒**

16-K: Modeling Scenarios

1 Identify, define, and describe all modeling scenarios. Examples of modeling scenarios include using different production rates, times of day, times of year, simultaneous or alternate operation of old and new equipment during transition periods, etc. Alternative operating scenarios should correspond to all parts of the Universal Application and should be fully described in Section 15 of the Universal Application (UA3).

Blasting scenarios:

- **Scenario 8: Emma (200,000 lbs/blast & 2 blasts/day) + Burro Chief (200,000 lbs/blast & 2 blasts/day)**
- **Scenario 9: Emma (200,000 lbs/blast & 2 blasts/day) + Little Rock 6 (100,000 lbs/blast & 1 blast/day)**
- **Scenario 10: Emma (200,000 lbs/blast & 2 blasts/day) + Mohawk (150,000 lbs/blast & 2 blasts/day)**

Hours of blasting are limited to start up and shut down times. Blasting will start no earlier than 10am in December, 9am in the other winter months (November, January, and February), and 8am in the remaining months. Blasting will only occur during daylight hours, according to NOAA sunset time.

Material handling throughputs associated with the blasting operations are included in the model at the following rates:

- **Emma – 200,000 tons/day**
- **Mohawk – 200,000 tons/day**
- **Little Rock 6 – 90,000 tons/day**
- **Burro Chief – 200,000 tons/day**

Reclamation scenarios associated with the worst-case small and large truck projects operating simultaneously within each mining scenario were assessed at the following rates:

- **Launder Line – 5,000 tons/day**
- **Thickener – 15,000 tons/day**
- **P-Plant – 15,000 tons/day**
- **1A/1B Stockpile – 20,000 tons/day**
- **2A/2B Stockpile – 20,000 tons/day**
- **CLW Stockpile – 15,000 tons/day**

Crushing and Screening operations are limited to 600 tph and may only occur between the hours of 8am to 8pm.

2	Which scenario produces the highest concentrations? Why? **A summary of worst case scenario determinations is provided in Attachment A.**		
	Active Mining (Gaseous Pollutants): Scenario 8 (Emma + Burro Chief) – proximity of operations to boundary **(Particulate Pollutants) Scenario 8 (Emma + Burro Chief)– proximity of operations to boundary** **Reclamation: PPlant – proximity of operations to boundary and other operations**		
3	Were emission factor sets used to limit emission rates or hours of operation? (This question pertains to the "SEASON", "MONTH", "HROFDY" and related factor sets, not to the factors used for calculating the maximum emission rate.)	**Yes**☒	No☐
4	If so, describe factors for each group of sources. List the sources in each group before the factor table for that group. (Modify or duplicate table as necessary. It's ok to put the table below section 16-K if it makes formatting easier.) Sources: **Pit Blasting Sources: BCBL, EM5BL, LR6BL, MOHBL**		

	Pit Blasting Sources - January				Pit Blasting Sources - February				Pit Blasting Sources - March			
5	Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor
	1	0	13	1	1	0	13	1	1	0	13	1
	2	0	14	1	2	0	14	1	2	0	14	1
	3	0	15	1	3	0	15	1	3	0	15	1
	4	0	16	1	4	0	16	1	4	0	16	1
	5	0	17	0	5	0	17	1	5	0	17	1
	6	0	18	0	6	0	18	0	6	0	18	1
	7	0	19	0	7	0	19	0	7	0	19	0
	8	0	20	0	8	0	20	0	8	0	20	0
	9	0	21	0	9	0	21	0	9	1	21	0
	10	1	22	0	10	1	22	0	10	1	22	0
	11	1	23	0	11	1	23	0	11	1	23	0
	12	1	24	0	12	1	24	0	12	1	24	0

Pit Blasting Sources – April-August				Pit Blasting Sources - September				Pit Blasting Sources - October			
Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor
1	0	13	1	1	0	13	1	1	0	13	1
2	0	14	1	2	0	14	1	2	0	14	1
3	0	15	1	3	0	15	1	3	0	15	1
4	0	16	1	4	0	16	1	4	0	16	1
5	0	17	1	5	0	17	1	5	0	17	1
6	0	18	1	6	0	18	1	6	0	18	0
7	0	19	1	7	0	19	0	7	0	19	0
8	0	20	0	8	0	20	0	8	0	20	0
9	1	21	0	9	1	21	0	9	1	21	0
10	1	22	0	10	1	22	0	10	1	22	0
11	1	23	0	11	1	23	0	11	1	23	0
12	1	24	0	12	1	24	0	12	1	24	0

Pit Blasting Sources – November				Pit Blasting Sources - December							
Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor	Hour of Day	Factor
1	0	13	1	1	0	13	1				
2	0	14	1	2	0	14	1				
3	0	15	1	3	0	15	1				
4	0	16	1	4	0	16	1				
5	0	17	0	5	0	17	0				
6	0	18	0	6	0	18	0				
7	0	19	0	7	0	19	0				
8	0	20	0	8	0	20	0				
9	1	21	0	9	0	21	0				
10	1	22	0	10	0	22	0				
11	1	23	0	11	1	23	0				
12	1	24	0	12	1	24	0				

If hourly, variable emission rates were used that were not described above, describe them below.

Not Applicable

6	Were different emission rates used for short-term and annual modeling? If so describe below.	Yes☐	**No**☒

16-L: NO_2 Modeling

1	Which types of NO_2 modeling were used? Check all that apply.	
	☒	**ARM2**
	☐	100% NO_X to NO_2 conversion

	☐	PVMRM
	☐	OLM
	☐	Other:

2	Describe the NO_2 modeling.		
	NO_2 was modeled using default ARM2 parameters.		
3	Were default NO_2/NO_X ratios (0.5 minimum, 0.9 maximum or equilibrium) used? If not describe and justify the ratios used below.	**Yes☒**	No☐
	Not applicable		
4	Describe the design value used for each averaging period modeled.		
	1-hour: High eighth high **Annual: One Year Annual Average**		

16-M: Particulate Matter Modeling

1	Select the pollutants for which plume depletion modeling was used.			
	☒	**PM2.5**		
	☒	**PM10**		
	☐	None		
2	Describe the particle size distributions used. Include the source of information.			
	The particle size information used in the M6 model assessment was maintained in this assessment.			
3	Does the facility emit at least 40 tons per year of NO_X or at least 40 tons per year of SO_2? Sources that emit at least 40 tons per year of NO_X or at least 40 tons per year of SO_2 are considered to emit significant amounts of precursors and must account for secondary formation of PM2.5.	**Yes☒**	No☐	
4	Was secondary PM modeled for PM2.5?	Yes☐	**No☒**	
5	If MERPs were used to account for secondary PM2.5 fill out the information below. If another method was used describe below.			
	NO_X (ton/yr)	SO_2 (ton/yr)	$[PM2.5]_{annual}$	$[PM2.5]_{24\text{-hour}}$
	A secondary $PM_{2.5}$ analysis is only required for modifications that increase emissions of NOx and/or SO_2 by more than 40 tpy. This proposed modification does not increase emissions of NOx or SO_2 by more than 40 tpy, therefore a secondary $PM_{2.5}$ analysis is not required.			

16-N: Setback Distances

1	Portable sources or sources that need flexibility in their site configuration requires that setback distances be determined between the emission sources and the restricted area boundary (e.g. fence line) for both the initial location and future locations. Describe the setback distances for the initial location.

	Not Applicable – No setback distance was applied.
2	Describe the requested, modeled, setback distances for future locations, if this permit is for a portable stationary source. Include a haul road in the relocation modeling.
	Not Applicable

16-O: PSD Increment and Source IDs

1	The unit numbers in the Tables 2-A, 2-B, 2-C, 2-E, 2-F, and 2-I should match the ones in the modeling files. Do these match? If not, provide a cross-reference table between unit numbers if they do not match below.		Yes☐	**No☒**
	Unit Number in UA-2	Unit Number in Modeling Files		
	Mine Fugitives (Blasting)	**EMBL, MHBL, LR6BL, BCBL**		
	Mine Fugitives (Handling)	**EMMH, Mohawk, LR6MH, BCMH**		
	Mine Fugitives (Hauling, includes Stockpile handling)	**See Attached Table O-1 and Table O-2**		
	Reclamation Fugitives (Handling)	**See Attached Table O-2**		
	Reclamation Fugitives (Hauling)	**See Attached Table O-1**		
	C&S Plant Fugitives (C&S Plant - Handling)	**CRUSH, SCREEN, CONTRN, AggHand**		
	C&S Plant Fugitives (C&S Plant - Hauling)	**CSROADS, CSROADN**		
2	The emission rates in the Tables 2-E and 2-F should match the ones in the modeling files. Do these match? If not, explain why below.		Yes☐	**No☒**
	Fugitive sources are separated depending on source, as indicated above.			
3	Have the minor NSR exempt sources or Title V Insignificant Activities" (Table 2-B) sources been modeled?		Yes☐	**No☒**

4	Which units consume increment for which pollutants? **All current and proposed engines will consume increment, as well as the changes made to blasting, material handling, and hauling since August 1995. Long term (more than one year of operation) reclamation activities will also consume increment**.				
	Unit ID	NO_2	SO_2	PM10	PM2.5
	See above	**Blasting; engines**	**Blasting; engines**	**All sources described above**	**Not Applicable**

5	PSD increment description for sources. (for unusual cases, i.e., baseline unit expanded emissions after baseline date).	**The baseline PM_{10} emissions used in this analysis are the same as those used in the modeling analysis submitted in 2020 as part of the applications for NSR Permit Nos. PSD2448-M5 and -M6. To account for the difference in proposed operation compared to the operation in August 1995, the proposed operation was modeled at the full emission rate and the baseline sources were included with their negative emission rates.**		
6	Are all the actual installation dates included in Table 2A of the application form, as required? This is necessary to verify the accuracy of PSD increment modeling. If not please explain how increment consumption status is determined for the missing installation dates below.		**Yes☒**	No☐

16-P: Flare Modeling

1	For each flare or flaring scenario, complete the following – **Not Applicable – there are no flares at this facility**			
	Flare ID (and scenario)	Average Molecular Weight	Gross Heat Release (cal/s)	Effective Flare Diameter (m)

16-Q: Volume and Related Sources

1	Were the dimensions of volume sources different from standard dimensions in the Air Quality Bureau (AQB) Modeling Guidelines? If not please explain how increment consumption status is determined for the missing installation dates below.	Yes☐	**No☒**
	Dimensions of volume sources were determined according to the truck sizes at the facility and guidance in Section 5.3.3 of the modeling guidelines.		
2	Describe the determination of sigma-Y and sigma-Z for fugitive sources.		
	Fugitive volume source parameters were determined according to guidance in Sections 5.3.1 and 5.3.2 of the modeling guidelines.		
3	Describe how the volume sources are related to unit numbers. Or say they are the same.		
	Screening plant sources were modeled as volume sources per Section 5.3.1. Haul roads were modeled as line volume sources, with release parameters determined per Section 5.3.3. Haul road unit numbers are described in Table O-1.		
4	Describe any open pits.		
	Four proposed pits at the facility were modeled. Blasting operations were modeled with a 6 m release height as modeled with past permit applications, while material handling operations in the pit were modeled with a 0 m release height.		
5	Describe emission units included in each open pit.		
	All pits were represented as blasting and material handling sources in the model.		

A summary of model input parameters is provided in Attachment B.

16-R: Background Concentrations

1	Were NMED provided background concentrations used? Identify the background station used below. If non-NMED provided background concentrations were used describe the data that was used.	**Yes☒**	No☐
	CO: N/A		
	NO_2: N/A		
	PM2.5: **Las Cruces Distric Office (350130025)**		
	PM10: **Deming (350029001)**		
	SO_2: N/A		
	Other:		
	Comments:		
2	Were background concentrations refined to monthly or hourly values? If so describe below.	Yes☐	**No☒**

16-S: Meteorological Data

1	Was NMED provided meteorological data used? If so select the station used. **Deming** **Processed Deming 2019, provided by Angela Raso, June 11, 2020**	**Yes☒**	No☐
2	If NMED provided meteorological data was not used describe the data set(s) used below. Discuss how missing data were handled, how stability class was determined, and how the data were processed.		
	Not Applicable		

16-T: Terrain

1	Was complex terrain used in the modeling? If not, describe why below.	**Yes☒**	No☐
2	What was the source of the terrain data?		
	NED 10 m data from: NED_n33w109_13.tif, NED_n34w109_13.tif, NED_n33w108_13.tif, NED_n34w108_13.tif		

16-U: Modeling Files

1	Describe the modeling files: **See below**		
	File name (or folder and file name)	Pollutant(s)	Purpose (ROI/SIA, cumulative, culpability analysis, other)
	Tyrone Mine CO M7	**CO**	**ROI/SIA/Cumulative/AAQS**
	Tyrone Mine NO2 M7	**NO_2**	**ROI/SIA/Cumulative/AAQS**
	Tyrone Mine NO2 PSD Class II M7	**NO_2**	**Annual Cumulative Class II PSD**
	Tyrone Mine NO2 PSD Class I M7	**NO_2**	**Annual- Cumulative/Class I PSD**
	Tyrone Mine PM2.5 M7	**$PM_{2.5}$**	**ROI/SIA – worst case scenario determination**
	Tyrone Mine PM2.5 AAQS M7	**$PM_{2.5}$**	**Cumulative/AAQS**
	Tyrone Mine PM10 M7	**PM_{10}**	**ROI/SIA/Cumulative/AAQS**
	Tyrone Mine PM10 PSD Class II M7	**PM_{10}**	**Cumulative/Class II PSD**
	Tyrone Mine PM10 PSD Class I M7	**PM_{10}**	**Cumulative/Class I PSD**
	Tyrone Mine SO2 SIL M7	**SO_2**	**ROI/SIA 1-hr, annual**
	Tyrone Mine SO2 SIL 3,24 hr M7	**SO_2**	**ROI/SIA 3-hr, 24-hr**

16-V: PSD New or Major Modification Applications – Not Applicable

1	A new PSD major source or a major modification to an existing PSD major source requires additional analysis. Was preconstruction monitoring done (see 20.2.74.306 NMAC and PSD Preapplication Guidance on the AQB website)?	Yes☐	No☐
2	If not, did AQB approve an exemption from preconstruction monitoring?	Yes☐	No☐
3	Describe how preconstruction monitoring has been addressed or attach the approved preconstruction monitoring or monitoring exemption.		
4	Describe the additional impacts analysis required at 20.2.74.304 NMAC.		
5	If required, have ozone and secondary PM2.5 ambient impacts analyses been completed? If so describe below.	Yes☐	No☐

16-W: Modeling Results

1	If ambient standards are exceeded because of surrounding sources, a culpability analysis is required for the source to show that the contribution from this source is less than the significance levels for the specific pollutant. Was culpability analysis performed? If so describe below.	Yes☐	**No☒**
2	Identify the maximum concentrations from the modeling analysis. Rows may be modified, added and removed from the table below as necessary. **A summary of maximum concentrations per scenario is provided in Attachment C.**		

Pollutant, Time Period and Standard	Modeled Facility Concentration (µg/m3)	Modeled Concentration with Surrounding Sources (µg/m3)	Secondary PM (µg/m3)	Background Concentration (µg/m3)	Cumulative Concentration (µg/m3)	Value of Standard (µg/m3)	Percent of Standard	Location		
								UTM E (m)	UTM N (m)	Elevation (ft)
CO, 8-hr, NAAQS	1,369.9	1,369.9	NA	NA	1,369.9	10303.60	13.30%	747282.21	3612014.81	1876.91
CO, 8-hr, NMAAQS	1,369.9	1,369.9	NA	NA	1,369.9	9960.10	13.75%	747282.21	3612014.81	1876.91
CO, 1-hr, NAAQS	10,161.5	10,161.5	NA	NA	10,161.5	40069.6	25.36%	747282.21	3612014.81	1876.91
CO, 1-hr, NMAAQS	10,161.5	10,161.5	NA	NA	10,161.5	14997.5	67.75%	747282.21	3612014.81	1876.91
NO_2, Annual, NAAQS	3.46	3.46	NA	NA	3.46	99.66	3.47%	748936.64	3611601.12	1848.51
NO_2, Annual, NMAAQS	3.46	3.46	NA	NA	3.46	94	3.68%	748936.64	3611601.12	1848.51
NO_2, Annual, PSD Class I	0.042	0.042	NA	NA	0.04	2.5	1.69%	769833.00	3657396.00	1944.64
NO_2, Annual, PSD Class II	3.46	3.46	NA	NA	3.46	25	13.83%	748936.64	3611601.12	1848.51
NO_2, 24-hr, NMAAQS	17.04	17.04	NA	NA	17.04	188.03	9.06%	748936.64	3611601.12	1848.51
NO_2, 1-hr, NAAQS	141.41	141.41	NA	NA	141.41	188.03	75.21%	749117.67	3613095.20	1826.54

Pollutant, Time Period and Standard	Modeled Facility Concentration (µg/m3)	Modeled Concentration with Surrounding Sources (µg/m3)	Secondary PM (µg/m3)	Background Concentration (µg/m3)	Cumulative Concentration (µg/m3)	Value of Standard (µg/m3)	Percent of Standard	Location		
								UTM E (m)	UTM N (m)	Elevation (ft)
$PM_{2.5}$, Annual, NAAQS	2.45	2.45	NA	5.1	7.55	12	62.92%	749333.34	3615495.99	1841.63
$PM_{2.5}$, 24-hr, NAAQS	7.73	7.73	NA	14.9	22.63	35	64.65%	749319.10	3614989.27	1819.85
PM_{10}, Annual, PSD Class I	0.10	0.00	NA	NA	0.00	4	0.00%	NA	NA	NA
PM_{10}, Annual, PSD Class II	24.06	0.00	NA	NA	0.00	17	0.00%	NA	NA	NA
PM_{10}, 24-hr, NAAQS	91.2	91.2	NA	56.5	147.66	150	98.44%	749333.3	3615496.0	1841.6
PM_{10}, 24-hr, PSD Class I	1.06	0.06	NA	NA	0.06	8	0.78%	761755.00	3663791.00	2046.02
PM_{10}, 24-hr, PSD Class II	91.16	29.01	NA	NA	29.01	30	96.69%	749295.8	3614891.1	1817.5
SO_2, Annual, Significance	0.44	0.44	NA	NA	-	1	44.17%	745359.10	3612063.95	1969.90
SO_2, 24-hr, Significance	4.81	4.81	NA	NA	-	5	96.14%	745427.89	3612052.16	1961.92
SO_2, 3-hr, Significance	14.28	14.28	NA	NA	-	25	57.11%	745587.09	3612065.91	1958.74
SO_2, 1-hr, NAAQS	17.40	17.40	NA	1.75	19.15	196.4	9.75%	745359.10	3612063.95	1969.90

16-X: Summary/conclusions

1	A statement that modeling requirements have been satisfied and that the permit can be issued.
	This modeling analysis has shown that the facility meets all applicable modeling standards. The permit can be issued.

Attachment A

Operating Scenario	Pit Name	Maximum Blasting Agent Usage per Blast (lbs/blast)	Maximum No. of Blasts per Day	Maximum Daily Blasting Agent Usage (lbs/day)	Maximum Blast Area per Blast (ft2/blast)	Maximum Mining Rates (tons/day)
Scenario 8	Burro Chief	200,000	2	400,000	125,000	200,000
	Emma	200,000	2	400,000	125,000	200,000
Scenario 9	Little Rock 6	100,000	1	100,000	125,000	90,000
	Emma	200,000	2	400,000	125,000	200,000
Scenario10	Mohawk	150,000	2	300,000	125,000	200,000
	Emma	200,000	2	400,000	125,000	200,000

SIL results were based on each scenario sources, and all other on-site operational sources (C&S operation, engines, boilers).

AAQS results were based on each scenario sources, all other on-site operational sources (C&S operation, engines, boilers, reclamation), and any nearby sources provided by NMED.

PSD Incrment results were based on each scenario sources, all other on-site operational sources (C&S operation, engines, boilers), only long-term reclamation, any nearby sources provided by NMED, and any baseline sources provided by NMED.

worst case
next worst case

Results of runs prior to limitations imposed to reduce impacts.

The below concentration comparisons are based on preliminary runs, before modifications were imposed.

Scenario 8 - BCEM4 in worst-case tab (5AW, 6DO)

Option No.	Burro Chief	Emma	Burro Chief	Emma
1	2AO (100%)	4FO (100%)	7	7
2	4CO (100%)	GEO (100%)	6	4
3	4AE (100%)	1BO (100%)	4	5
4	5AW (100%)	6DO (100%)	3	13
5	6HW (100%)	EMW (100%)	2	1
6	2BW (100%)	6HW (100%)	1	2
7	5AW (100%)	6HW(50%) EMW(50%)	3	3
8	5AW (100%)	4FO (100%)	3	7

Scenario 8 had comparative higher overall concentrations than other scenarios

Options 4, 7 and 8 had similar maximums

Scenario 9 - LR6EM2 in worst-case tab (4CO, GEO)

Option No.	Little Rock 6	Emma	Little Rock 6	Emma
1	CLW (100%)	4FO (100%)	3	7
2	4CO (100%)	GEO (100%)	4	4
3	NRW (100%)	1BO (100%)	2	5
4	CLW (100%)	4CO (100%)	3	8
5	CLW (100%)	EMW (100%)	3	1

Scenario 9 had comparative lower overall concentrations than other scenarios

Scenario 10 - MWEM3 in worst-case tab (6AO, 1BO)

Option No.	Mohawk	Emma	Mohawk	Emma
1	VAO (100%)	4FO (100%)	1	7
2	6DO (100%)	GEO (100%)	3	4
3	6AO (100%)	1BO (100%)	4	5
4	VAO (100%)	4CO (100%)	1	8
5	VAO (100%)	EMW (100%)	1	1

Options 2 and 3 had similar maximums.

worst case
next worst case

Reclamation Area	Road Number	Total Length of Road (ft, one-way)	Vehicle Type on Reclamation Route	Scenario Representation
Launder Line	RECLLR1	15,967	Small	ALWAYS
	RECLLR2,1	7,294		WORST-CASE
	RECLLR3,1	36,101		
Thickener	RECTHR1,2	14,271	Small	WORST-CASE
	RECTHR1,4	18,150		
	RECTHR1,3	3,691		
P Plant	RECPPR1,2,3	3,947	Small	WORST-CASE
	RECPPR1,6,4,3	5,350		
	RECPPR1,6,5	11,185		
1A/1B Stockpile	REC1ALR1	12,877	Large	ALWAYS
	REC1ASR1	7,849	Small (in-pit)	ALWAYS
2A/2B Stockpile	REC2ALR1,3	8,099	Large	WORST-CASE
	REC2ALR1,2	18,191		
	REC2ASR1,2	8,779	Small	WORST-CASE
	REC2ASR1,3	22,299		
CLW Stockpile	RECCLWR1	1,583	Small	WORST-CASE
	RECCLWR2,4	22,310		
	RECCLWR3,4	12,839		
	RECCLWR2,5	21,613		
	RECCLWR3,5	12,142		
	RECCLWR2,6	35,830		
	RECCLWR3,6	26,359		

Resulting worst case scenarios run to show compliance

SIL results were based on each scenario sources, and all other on-site operational sources (C&S operation, engines, boilers).
AAQS results were based on each scenario sources, all other on-site operational sources (C&S operation, engines, boilers, reclamation), and any nearby sources provided by NMED.

PSD Incrment results were based on each scenario sources, all other on-site operational sources (C&S operation, engines, boilers), only long-term reclamation, any nearby sources provided by NMED, and any baseline sources provided by NMED.

Scenario 8[1] - BCEM4 - Run with RER2AL2 and RECPP1	**Scenario 9[1] - LR6EM2 - Run with RER2AL2 and RECPP1**	**Scenario 10[1] - MWEM3 - Run with RER2AL2 and RECPP1**
Sources included:	Sources included:	Sources included:
BCBL	LR6BL	MOHAWK
BCMH	LR6MH	MOHBL
5AW	4CO	6AO
ROAD6	ROAD16A	ROAD8
ROAD7	ROAD18	ROAD11C
ROAD11E	ROAD18C	ROAD11E
ROAD11F	ROAD18D	ROAD11F
ROAD12B	ROAD18E	ROAD12B
ROAD30A	ROAD18G	EM5BL
ROAD30B	ROAD18I	EM5MH
EM5BL	ROAD18J	1BO
EM5MH	EM5BL	ROAD25A
6DO	EM5MH	ROAD25B
ROAD27	GEO	ROAD27
ROAD27A	ROAD25A	ROAD27B
ROAD27B	ROAD25C	REC2ALR1
REC2ALR1	ROAD27	REC2ALR2
REC2ALR2	ROAD27B	2A2B
2A2B	REC2ALR1	5AW
RECPPR1	REC2ALR2	RECPPR1
RECPPR2	2A2B	RECPPR2
RECPPR3	5AW	RECPPR3
PPLANT	RECPPR1	PPLANT
	RECPPR2	
	RECPPR3	
	PPLANT	

1- Small truck reclemation activities (RECPP1, RECTHR3, RECLL1, and RECCLW6) were not included in PSD Increment runs because they are temporary (less than one year) operations.

Attachment B

Operating Scenario	Pit Name	Maximum Blasting Agent Usage per Blast (lbs/blast)	Maximum No. of Blasts per Day	Maximum Daily Blasting Agent Usage (lbs/day)	Maximum Blast Area per Blast (ft2/blast)	Maximum Mining Rates (tons/day)
Scenario 8	Burro Chief	200,000	2	400,000	125,000	200,000
	Emma	200,000	2	400,000	125,000	200,000
Scenario 9	Little Rock 6	100,000	1	100,000	125,000	90,000
	Emma	200,000	2	400,000	125,000	200,000
Scenario10	Mohawk	150,000	2	300,000	125,000	200,000
	Emma	200,000	2	400,000	125,000	200,000

SIL results were based on each scenario sources, and all other on-site operational sources (C&S operation, engines, boilers).

AAQS results were based on each scenario sources, all other on-site operational sources (C&S operation, engines, boilers, reclamation), and any nearby sources provided by NMED.

PSD Incrment results were based on each scenario sources, all other on-site operational sources (C&S operation, engines, boilers), only long-term reclamation, any nearby sources provided by NMED, and any baseline sources provided by NMED.

For PM runs
Resulting worst case scenarios run to show compliance

Scenario 8[1] - BCEM4 - Run with RER2AL2 and RECPP1

Sources included:
BCBL
BCMH
5AW
ROAD6
ROAD7
ROAD11E
ROAD11F
ROAD12B
ROAD30A
ROAD30B
EM5BL
EM5MH
6DO
ROAD27
ROAD27A
ROAD27B
REC2ALR1
REC2ALR2
2A2B
RECPPR1
RECPPR2
RECPPR3
PPLANT

Scenario 9[1] - LR6EM2 - Run with RER2AL2 and RECPP1

Sources included:
LR6BL
LR6MH
4CO
ROAD16A
ROAD18
ROAD18C
ROAD18D
ROAD18E
ROAD18G
ROAD18I
ROAD18J
EM5BL
EM5MH
GEO
ROAD25A
ROAD25C
ROAD27
ROAD27B
REC2ALR1
REC2ALR2
2A2B
5AW
RECPPR1
RECPPR2
RECPPR3
PPLANT

Scenario 10[1] - MWEM3 - Run with RER2AL2 and RECPP1

Sources included:
MOHAWK
MOHBL
6AO
ROAD8
ROAD11C
ROAD11E
ROAD11F
ROAD12B
EM5BL
EM5MH
1BO
ROAD25A
ROAD25B
ROAD27
ROAD27B
REC2ALR1
REC2ALR2
2A2B
5AW
RECPPR1
RECPPR2
RECPPR3
PPLANT

C & S Plant[1] (formerly SP-7A)

Activity	Source	Release Height (m)	Sigma-y (m)	Sigma-z (m)	UTM X (m)	UTM Y (m)	Elevation (m)	Height of Volume Source (m)	Width of Volume Source (m)	Maximum Hourly Emission Rates (lb/hr)			Maximum Daily Emission Rates (lb/day)			Maximum Annual Emission Rates (ton/yr)			Scenarios
										TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	
Crushing[2]	CRUSH	6	1.16	2.33	744422	3616117	1902	5	5	1.44	0.648	0.120	17.28	7.78	1.44	3.15	1.42	0.26	all
Screening[3]	SCREEN	4	1.16	2.33	744424	3616119	1902	5	5	1.32	0.444	0.030	15.84	5.33	0.36	2.89	0.97	0.07	all
Conveyor Transfers	CONTRN	2	0.47	0.93	744426	3616121	1902	2	2	0.672	0.221	0.062	8.06	2.65	0.75	1.47	0.48	0.14	all
Aggregate Handling	AggHand	2	0.47	0.93	744428	3616123	1902	2	2	5.01	2.37	0.359	60.17	28.46	4.31	10.98	5.19	0.79	all

1 - Operations for this source occur during the daylight hours for 12 hr/day and 4,380 hr/yr.

2 - Tertiary crushing since there are is "ND" listed in the AP-42 table for Primary Crushing and Secondary Crushing.

3 - Not Fines Screening.

Stockpiles

M7 Operational Stockpiles	Descrpition	Throughput Assumption (tpd)	Initial Vertice Location		Release Height	Vertical Dimension	Sigma-z	Area (m^2)	PM10 Emission Rate			PM2.5 Emission Rate		
			UTM x	UTM y	m	m	m		lb/hr	lb/day	ton/yr	lb/hr	lb/day	ton/yr
5AW	Waste and Reclamation 5A Stockpile	200,000	747716.69	3616206.36	1.524	3.048	1.4177	680481.3	0.133	3.200	0.584	0.020	0.48	0.0876
6DO	Leach	200,000	746548.09	3613732.64	1.524	3.048	1.4177	484672.9	0.133	3.200	0.584	0.020	0.48	0.0876
4FO	Leach	200,000	745063.26	3612507.59	1.524	3.048	1.4177	801998.5	0.133	3.200	0.584	0.020	0.48	0.0876
4AW	Leach	200,000	745596.02	3613926.60	1.524	3.048	1.4177	440726.5	0.133	3.200	0.584	0.020	0.48	0.0876
4AE	Leach	200,000	746144.79	3613647.79	1.524	3.048	1.4177	569503.2	0.133	3.200	0.584	0.020	0.48	0.0876
4DO	Leach	200,000	744916.33	3613131.77	1.524	3.048	1.4177	319593.1	0.133	3.200	0.584	0.020	0.48	0.0876
4CO	Leach	200,000	744645.81	3612930.33	1.524	3.048	1.4177	209082	0.133	3.200	0.584	0.020	0.48	0.0876
2AO	Leach	200,000	744611.55	3615838.07	1.524	3.048	1.4177	695617.1	0.133	3.200	0.584	0.020	0.48	0.0876
6AO	Leach	200,000	747163.78	3614567.00	1.524	3.048	1.4177	197352.5	0.133	3.200	0.584	0.020	0.48	0.0876
1BO	Leach	200,000	748510.30	3614037.00	1.524	3.048	1.4177	424030.4	0.133	3.200	0.584	0.020	0.48	0.0876
6HW	Waste	200,000	746907.15	3612939.09	1.524	3.048	1.4177	220254.4	0.133	3.200	0.584	0.020	0.48	0.0876
GEO	Leach	200,000	747390.4	3613459.04	1.524	3.048	1.4177	1064065.8	0.133	3.200	0.584	0.020	0.48	0.0876
EMW	Waste	200,000	748313.15	3612511.39	1.524	3.048	1.4177	121161.9	0.133	3.200	0.584	0.020	0.48	0.0876
L6R	Waste	90,000	743576.12	3616172.93	1.524	3.048	1.4177	28923.1	0.0600	1.440	0.263	0.00900	0.216	0.0394
VAO	Leach	200,000	745934.8	3614802.86	1.524	3.048	1.4177	397371.9	0.133	3.200	0.584	0.020	0.48	0.0876
VAW	Waste	200,000	746450.91	3614798.67	1.524	3.048	1.4177	79487.8	0.133	3.200	0.584	0.020	0.48	0.0876
BCPILE	Burrow Chief Stockpile - MBR, MB1, MB2	200,000	746018.52	3615066.25	1.524	3.048	1.4177	218080.9	0.133	3.200	0.584	0.020	0.48	0.0876
NRW	NR Waste Pile	200,000	742439.85	3616248.97	1.524	3.048	1.4177	561754.2	0.133	3.200	0.584	0.020	0.48	0.0876
2BW	2B Waste Pile	200,000	744641.24	3615127.38	1.524	3.048	1.4177	412034.3	0.133	3.200	0.584	0.020	0.48	0.0876
CLW	Copper Leach Push Back	80,000	742381.39	3615203.11	1.524	3.048	1.4177	153237.9	0.0533	1.280	0.234	0.00800	0.192	0.0350
CLW	Reclamation CLW Stockpile	15,000	742381.39	3615203.11	1.524	3.048	1.4177	153237.9	0.0100	0.2400	0.0438	0.0015	0.036	0.0066
LAUNDER2	Reclamation Launder2 Stockpile	5,000	743483.52	3620091.23	1.524	3.048	1.4177	56568.5	0.0033	0.0800	0.0146	0.00050	0.012	0.00219
9A9AX	Reclamation 9A/9AX Stockpile	20,000	743909.41	3616377.03	1.524	3.048	1.4177	745387.2	0.0133	0.3200	0.0584	0.002	0.048	0.00876
THICKENER	Reclamation Thickener Stockpile	15,000	746853.89	3617755.78	1.524	3.048	1.4177	194934	0.0100	0.2400	0.0438	0.0015	0.036	0.0066
RIPRAP	Reclamation Rip Rap Production Area	20,000	743843.71	3617117.57	1.524	3.048	1.4177	390509.3	0.0133	0.3200	0.0584	0.002	0.048	0.00876
9AREC	Reclamation Area East of Thickener	15,000	744036.69	3616364.67	1.524	3.048	1.4177	277696.5	0.0100	0.2400	0.0438	0.0015	0.036	0.0066
PPLANT	Reclamation P-Plant Stockpile	15,000	748991.28	3615077.2	1.524	3.048	1.4177	6308.8	0.0100	0.2400	0.0438	0.0015	0.036	0.0066
1A1B	Reclamation 1A/1B Stockpile	20,000	748377.62	3615025.94	1.524	3.048	1.4177	1178884.1	0.0133	0.3200	0.0584	0.002	0.048	0.00876
2A2B	Reclamation 2A/2B Stockpile	20,000	744295.43	3614909.2	1.524	3.048	1.4177	524490.4	0.0133	0.3200	0.0584	0.002	0.048	0.00876

Note that Tyrone will not be moving the max of 200,000 tpd to all of these stockpiles at the same time.

Haul Roads

Road Name	Road No.	ID	Desc	Max Haulage Rates (tons/day)	Calculated in AERMOD (m)	Road Length (ft)	PM10 Emissions Short Term lb/hr	PM10 Emissions lb/day	PM10 Emissions ton/yr	PM2.5 Emissions Short Term lb/hr	PM2.5 Emissions lb/day	PM2.5 Emissions ton/yr	Line Volume (Plume) Height (m)	Plume Width (m)	Number of Coords	Release Height (m)	Vehicle Height (m)	Vehicle Width (m)
Wagner	4	ROAD4	Wagner	200,000	856.2	2809	17.96	430.95	63.57	1.796	43.10	6.36	11.22	14.3	60	5.61	6.6	8.3
Wagner Spur A	4A	ROAD4A	Wagner Spur A	200,000	269.6	885	5.65	135.70	20.02	0.565	13.57	2.00	11.22	14.3	19	5.61	6.6	8.3
Mohawk	5A	ROAD5A	Mohawk	200,000	1926.7	6321	40.41	969.77	143.04	4.041	96.98	14.30	11.22	14.3	135	5.61	6.6	8.3
Mohawk	5B	ROAD5B	Mohawk	200,000	1067	3501	22.38	537.06	79.22	2.238	53.71	7.92	11.22	14.3	75	5.61	6.6	8.3
Mohawk	5C	ROAD5C	Mohawk	200,000	1011.9	3320	21.22	509.32	75.13	2.122	50.93	7.51	11.22	14.3	71	5.61	6.6	8.3
5A Stockpile	6	ROAD6	5A Stockpile	200,000	892.1	2927	18.71	449.02	66.23	1.871	44.90	6.62	11.22	14.3	62	5.61	6.6	8.3
8C Stockpile	7	ROAD7	8C Stockpile	200,000	1136.7	3729	23.84	572.14	84.39	2.384	57.21	8.44	11.22	14.3	79	5.61	6.6	8.3
6A Stockpile	8	ROAD8	6A Stockpile	200,000	382.5	1255	8.02	192.52	28.40	0.802	19.25	2.84	11.22	14.3	27	5.61	6.6	8.3
6D Stockpile	9	ROAD9	6D Stockpile	200,000	1253.4	4112	26.29	630.88	93.05	2.629	63.09	9.31	11.22	14.3	88	5.61	6.6	8.3
Copper Mountain Waste	10	ROAD10	Copper Mountain Waste	200,000	2104.6	6905	44.14	1059.32	156.25	4.414	105.93	15.62	11.22	14.3	147	5.61	6.6	8.3
Main Pit/Mohawk 2	11	ROAD11	Main Pit/Mohawk 2	200,000	1104.9	3625	23.17	556.13	82.03	2.317	55.61	8.20	11.22	14.3	77	5.61	6.6	8.3
Spur off of 11 to 8CW	11A	ROAD11A	Spur off of 11 to 8CW	200,000	217.5	714	4.56	109.47	16.15	0.456	10.95	1.61	11.22	14.3	15	5.61	6.6	8.3
Spur off of 11 to NRW	11B2	ROAD11B2	Spur off of 11 to NRW	200,000	398.2	1306	8.35	200.43	29.56	0.835	20.04	2.96	11.22	14.3	28	5.61	6.6	8.3
Spur off of 11B to 8CW	11C	ROAD11C	Spur off of 11B to 8CW	200,000	917.6	3010	19.24	461.86	68.12	1.924	46.19	6.81	11.22	14.3	64	5.61	6.6	8.3
Spur off of 11B to ValDump	11D	ROAD11D	Spur off of 11B to ValDump	200,000	513.1	1683	10.76	258.26	38.09	1.076	25.83	3.81	11.22	14.3	36	5.61	6.6	8.3
Main Pit	11E	ROAD11E	Main Pit	200,000	363	1191	7.61	182.71	26.95	0.761	18.27	2.69	11.22	14.3	25	5.61	6.6	8.3
Main Pit	11F	ROAD11F	Main Pit	200,000	352.9	1158	7.40	177.63	26.20	0.740	17.76	2.62	11.22	14.3	25	5.61	6.6	8.3
Main Pit	11G	ROAD11G	Main Pit	200,000	563	1847	11.81	283.38	41.80	1.181	28.34	4.18	11.22	14.3	39	5.61	6.6	8.3
Valencia B	12B	ROAD12B	Valencia B	200,000	751.5	2466	15.76	378.25	55.79	1.576	37.83	5.58	11.22	14.3	53	5.61	6.6	8.3
4AE and 4FO	13	ROAD13	4AE and 4FO	200,000	885.5	2905	18.57	445.70	65.74	1.857	44.57	6.57	11.22	14.3	62	5.61	6.6	8.3
4 series	13A	ROAD13A	4 series	200,000	1313.9	4311	27.56	661.33	97.55	2.756	66.13	9.75	11.22	14.3	92	5.61	6.6	8.3
4 series	13B	ROAD13B	4 series	200,000	467.2	1533	9.80	235.16	34.69	0.980	23.52	3.47	11.22	14.3	33	5.61	6.6	8.3
4AW Stockpile	15	ROAD15	4AW Stockpile	200,000	819.7	2689	17.19	412.58	60.86	1.719	41.26	6.09	11.22	14.3	57	5.61	6.6	8.3
4D Stockpile	16A	ROAD16A	4D Stockpile	200,000	1949.7	6397	40.89	981.35	144.75	4.089	98.13	14.47	11.22	14.3	136	5.61	6.6	8.3
4D Stockpile	16B	ROAD16B	4D Stockpile	200,000	483.6	1587	10.14	243.41	35.90	1.014	24.34	3.59	11.22	14.3	34	5.61	6.6	8.3
2A Stockpile	17	ROAD17	2A Stockpile	200,000	1066.3	3498	22.36	536.70	79.16	2.236	53.67	7.92	11.22	14.3	126	5.61	6.6	8.3
West Main Road	18	ROAD18	West Main Road	200,000	2497.3	8193	52.37	1256.97	185.40	5.237	125.70	18.54	11.22	14.3	296	5.61	6.6	8.3
West Main Road series	18C	ROAD18C	West Main Road series	200,000	330.1	1083	6.92	166.15	24.51	0.692	16.62	2.45	11.22	14.3	39	5.61	6.6	8.3
West Main Road series	18D	ROAD18D	West Main Road series	90,000	1002.8	3290	9.46	227.13	33.50	0.946	22.713	3.350	11.22	14.3	119	5.61	6.6	8.3
West Main Road series	18E	ROAD18E	West Main Road series	90,000	1571.6	5156	14.83	355.97	52.51	1.483	35.597	5.251	11.22	14.3	186	5.61	6.6	8.3
West Main Road series	18F	ROAD18F	West Main Road series	200,000	279.6	917	5.86	140.73	20.76	0.586	14.07	2.08	11.22	14.3	33	5.61	6.6	8.3
West Main Road series	18G	ROAD18G	West Main Road series	90,000	314	1030	2.96	71.12	10.49	0.296	7.112	1.049	11.22	14.3	37	5.61	6.6	8.3
West Main Road series	18H	ROAD18H	West Main Road series	80,000	1235	4052	10.36	248.65	36.68	1.036	24.865	3.668	11.22	14.3	146	5.61	6.6	8.3
West Main Road series	18I	ROAD18I	West Main Road series	200,000	156.1	512	3.27	78.57	11.59	0.327	7.86	1.16	11.22	14.3	18	5.61	6.6	8.3
West Main Road series	18J	ROAD18J	West Main Road series	200,000	456.3	1497	9.57	229.67	33.88	0.957	22.97	3.39	11.22	14.3	54	5.61	6.6	8.3
2B Stockpile	19	ROAD19	2B Stockpile	200,000	1907.3	6258	40.00	960.01	141.60	4.000	96.00	14.16	11.22	14.3	226	5.61	6.6	8.3
2B Stockpile	19B	ROAD19B	2B Stockpile	200,000	1744.7	5724	36.59	878.17	129.53	3.659	87.82	12.95	11.22	14.3	207	5.61	6.6	8.3
Copper Mountain	20	ROAD20	Copper Mountain	200,000	1748.5	5737	36.67	880.08	129.81	3.667	88.01	12.98	11.22	14.3	207	5.61	6.6	8.3
Copper Mountain New	20A	ROAD20A	Copper Mountain	200,000	337.4	1107	7.08	169.82	25.05	0.708	16.98	2.50	11.22	14.3	40	5.61	6.6	8.3
9A Stockpile	21	ROAD21	9A Stockpile	200,000	1865.8	6121	39.13	939.12	138.52	3.913	93.91	13.85	11.22	14.3	221	5.61	6.6	8.3
9AX Stockpile	22	ROAD22	9AX Stockpile	200,000	914.7	3001	19.18	460.40	67.91	1.918	46.04	6.79	11.22	14.3	108	5.61	6.6	8.3
Emma Waste	23	ROAD23	Emma Waste	200,000	582.2	1910	12.21	293.04	43.22	1.221	29.30	4.32	11.22	14.3	41	5.61	6.6	8.3
Emma to 1BO Spur Road	25A	ROAD25A	Emma to 1BO Spur Road	200,000	923	3028	19.357	464.58	68.53	1.936	46.46	6.85	11.22	14.3	65	5.61	6.6	8.3
Spur Road to 1BO	25B	ROAD25B	Spur Road to 1BO	200,000	435.6	1429	9.135	219.25	32.34	0.914	21.93	3.23	11.22	14.3	30	5.61	6.6	8.3
1BO Spur Road to GettyB	25C	ROAD25C	1BO Spur Road to GettyB	20 empty trucks/day	1222.6	4011	0.574	13.79	2.03	0.057	1.38	0.20	11.22	14.3	85	5.61	6.6	8.3
Emma to 4FO	26	ROAD26	Emma to 4FO	200,000	608.1	1995	12.753	306.08	45.15	1.275	30.61	4.51	11.22	14.3	43	5.61	6.6	8.3
Emma to 4FO	26A	ROAD26A	Emma to 4FO	200,000	1687.2	5535	35.384	849.22	125.26	3.538	84.92	12.53	11.22	14.3	118	5.61	6.6	8.3
Emma to 6Waste	26B	ROAD26B	Emma to 6Waste	200,000	701.2	2301	14.706	352.94	52.06	1.471	35.29	5.21	11.22	14.3	49	5.61	6.6	8.3
Emma Route Option 2	26C	ROAD26C	Emma Route Option 2	200,000	475.5	1560	9.972	239.33	35.30	0.997	23.93	3.53	11.22	14.3	33	5.61	6.6	8.3
Emma to 4CO	26D	ROAD26D	Emma to 4CO	200,000	579.7	1902	12.158	291.78	43.04	1.216	29.18	4.30	11.22	14.3	41	5.61	6.6	8.3
Emma to 6Waste	27	ROAD27	Emma to 6Waste	200,000	803.9	2637	16.860	404.63	59.68	1.686	40.46	5.97	11.22	14.3	56	5.61	6.6	8.3
Emma to 6Waste	27A	ROAD27A	Emma to 6Waste	200,000	1684.6	5527	35.33	847.92	125.07	3.533	84.79	12.51	11.22	14.3	118	5.61	6.6	8.3
Emma to 6Waste	27B	ROAD27B	Emma to 6Waste	200,000	372.5	1222	7.81	187.49	27.66	0.781	18.75	2.77	11.22	14.3	26	5.61	6.6	8.3
Emma to 6Waste	27C	ROAD27C	Emma to 6Waste	200,000	477	1565	10.00	240.09	35.41	1.000	24.01	3.54	11.22	14.3	33	5.61	6.6	8.3
Emma to 4 series	28	ROAD28	Emma to 4 series	200,000	2291.4	7518	48.06	1153.34	170.12	4.806	115.33	17.01	11.22	14.3	160	5.61	6.6	8.3
Main Pit series	30	ROAD30	Main Pit series	200,000	1674.3	5493	35.11	842.73	124.30	3.511	84.27	12.43	11.22	14.3	117	5.61	6.6	8.3
Main Pit series	30A	ROAD30A	Main Pit series	200,000	577.5	1895	12.11	290.67	42.87	1.211	29.07	4.29	11.22	14.3	40	5.61	6.6	8.3
Main Pit series	30B	ROAD30B	Main Pit series	200,000	821.3	2695	17.22	413.39	60.97	1.722	41.34	6.10	11.22	14.3	57	5.61	6.6	8.3
Main Pit series	30C	ROAD30C	Main Pit series	200,000	158	518	3.31	79.53	11.73	0.331	7.95	1.17	11.22	14.3	11	5.61	6.6	8.3
Launder Line	RECLLR1	RECLLR1	Reclamation Launder Line Route 1	5,000	4866.7	15967	8.81	211.48	31.19	0.881	21.15	3.12	5.865	9.7	502	2.93	3.45	3.70
	RECLLR2	RECLLR2	Reclamation Launder Line Route 2	5,000	1349.8	4428	2.44	58.65	8.65	0.244	5.87	0.87	5.865	9.7	139	2.93	3.45	3.70
	RECLLR3	RECLLR3	Reclamation Launder Line Route 3	5,000	10966.6	35980	19.86	476.54	70.29	1.986	47.65	7.03	5.865	9.7	1131	2.93	3.45	3.70
Thickener	RECTHR1	RECTHR1	Reclamation Thickener Route1 - not a standalone route	15,000	503.6	1652	2.74	65.65	9.68	0.274	6.56	0.97	5.865	9.7	52	2.93	3.45	3.70
	RECTHR2	RECTHR2	Reclamation Thickener Route2 - route 1,2 emissions	15,000	3846.3	12619	20.89	501.41	73.96	2.089	50.14	7.40	5.865	9.7	397	2.93	3.45	3.70
	RECTHR3	RECTHR3	Reclamation Thickener Route3 - route 1,3 emissions	15,000	337.4	1107	1.83	43.98	6.49	0.183	4.40	0.65	5.865	9.7	35	2.93	3.45	3.70
	RECTHR4	RECTHR4	Reclamation Thickener Route4 - route 1,4 emissions	15,000	5028.6	16498	27.31	655.53	96.69	2.731	65.55	9.67	5.865	9.7	518	2.93	3.45	3.70
P Plant	RECPPR1	RECPPR1	Reclamation P Plant Route1 - route 1, 5, 6 emissions	15,000	236.9	777	1.29	30.88	4.56	0.129	3.09	0.46	5.865	9.7	24	2.93	3.45	3.70
	RECPPR2	RECPPR2	Reclamation P Plant Route2 - route 1, 2, 3 emissions	15,000	674	2211	3.66	87.86	12.96	0.366	8.79	1.30	5.865	9.7	69	2.93	3.45	3.70
	RECPPR3	RECPPR3	Reclamation P Plant Route3 - route 1, 6, 4, 3 emissions	15,000	292.2	959	1.59	38.09	5.62	0.159	3.81	0.56	5.865	9.7	30	2.93	3.45	3.70
	RECPPR4	RECPPR4	Reclamation P Plant Route4 - route 1, 6, 4, 3 emissions	15,000	446.7	1466	2.43	58.23	8.59	0.243	5.82	0.86	5.865	9.7	46	2.93	3.45	3.70
	RECPPR5	RECPPR5	Reclamation P Plant Route5 - route 1, 5, 6 emissions	15,000	2517.2	8259	13.67	328.14	48.40	1.367	32.81	4.84	5.865	9.7	260	2.93	3.45	3.70
	RECPPR6	RECPPR6	Reclamation P Plant Route6 - route 1, 5, 6 emissions	15,000	655	2149	3.56	85.39	12.59	0.356	8.54	1.26	5.865	9.7	68	2.93	3.45	3.70
1A/1B Stockpile	REC1ALR1	REC1ALR1	1A/1B Stockpile - large trucks only - Route1	20,000	3924.9	12877	8.23	197.55	29.14	0.823	19.76	2.91	11.22	14.3	274	5.61	6.6	8.3
	REC1ASR1	REC1ASR1	1A/1B Stockpile - small trucks only - Route1	15,000	2392.5	7849	13.00	311.89	46.00	1.300	31.19	4.60	5.865	9.7	247	2.93	3.45	3.70
2A/2B Stockpile	REC2ALR1	REC2ALR1	2A/2B Stockpile - large trucks only - Route1 - route 1, 2 emissions	20,000	112.3	368	0.236	5.65	0.83	0.024	0.57	0.08	11.22	14.3	8	5.61	6.6	8.3
	REC2ALR2	REC2ALR2	2A/2B Stockpile - large trucks only - Route1 - route 1, 2 emissions	20,000	5432.3	17823	11.39	273.43	40.33	1.139	27.34	4.03	11.22	14.3	380	5.61	6.6	8.3
	REC2ALR3	REC2ALR3	2A/2B Stockpile - large trucks only - Route3 - route 1, 3 emissions	20,000	2356.4	7731	4.94	118.61	17.49	0.494	11.86	1.75	11.22	14.3	165	5.61	6.6	8.3
	REC2ASR1	REC2ASR1	2A/2B Stockpile - small trucks only - Route1 - route 1, 3 emissions	15,000	1862	6109	10.11	242.73	35.80	1.011	24.27	3.58	5.865	9.7	192	2.93	3.45	3.70
	REC2ASR2	REC2ASR2	2A/2B Stockpile - small trucks only - Route2 - route 1, 2 emissio; also used as C&S route	15,000	813.7	2670	4.42	106.07	15.65	0.442	10.61	1.56	5.865	9.7	84	2.93	3.45	3.70
	REC2ASR3	REC2ASR3	2A/2B Stockpile - small trucks only - Route2 - route 1, 3 emissions	15,000	4934.7	16190	26.80	643.29	94.89	2.680	64.33	9.49	5.865	9.7	509	2.93	3.45	3.70
CLW Stockpile	RECCLWR1	RECCLWR1	CLW Stockpile - small trucks only - Route1	15,000	482.6	1583	2.62	62.91	9.28	0.262	6.29	0.93	5.865	9.7	50	2.93	3.45	3.70
	RECCLWR2	RECCLWR2	CLW Stockpile - small trucks only - Route2 - route 2, 6 emissions	15,000	5986.3	19640	32.52	780.38	115.11	3.252	78.04	11.51	5.865	9.7	617	2.93	3.45	3.70
	RECCLWR3	RECCLWR3	CLW Stockpile - small trucks only - Route3 - route 3, 6 emissions	15,000	3099.5	10169	16.84	404.05	59.60	1.684	40.41	5.96	5.865	9.7	320	2.93	3.45	3.70
	RECCLWR4	RECCLWR4	CLW Stockpile - small trucks only - Route4 - route 2, 4 emissions	15,000	813.7	2670	4.42	106.07	15.65	0.442	10.61	1.56	5.865	9.7	84	2.93	3.45	3.70
	RECCLWR5	RECCLWR5	CLW Stockpile - small trucks only - Route5 - route 2, 5 emissions	15,000	601.4	1973	3.27	78.40	11.56	0.327	7.84	1.16	5.865	9.7	62	2.93	3.45	3.70
	RECCLWR6	RECCLWR6	CLW Stockpile - small trucks only - Route6 - route 2, 6 emissions	15,000	4934.7	16190	26.80	643.29	94.89	2.680	64.33	9.49	5.865	9.7	509	2.93	3.45	3.70
C&S Plant South[1]	CSROADS	CSROADS	C&S route to southern area	7,200	813.7	2670	1.73	20.7	3.789	0.173	2.07	0.379	5.865	9.7	84	2.93	3.45	3.70
C&S Plant North[1]	CSROADN	CSROADN	C&S route to northern area	7,200	1124.8	3690	2.37	28.5	4.201	0.237	2.85	0.420	5.865	9.7	116	2.93	3.45	3.70

1 - Only C&S Plant North route was included in the model to represent worst case operations. Operations for this source occur during the daylight hours for 12 hr/day and 4,380 hr/yr

Road Input Assumption

		Large Trucks	Small Trucks		Small Trucks
		793	730		769
Vehicle Height	ft	21.65	11.33		13.22
	m	6.6	3.45		4.03
Vehicle Width	ft	27.23	12.15		16.63
	m	8.3	3.70		5.07
Plume Height	m	11.22	5.87		6.85
Release Height	m	5.61	2.94		3.43
Initial sigma z	m	5.22	2.73		3.19
Plume Width	m	14.3	9.7		11.1
Initial sigma y	m	6.65	4.51		5.15

Plume Height = truck height * 1.7
Release Height = Plume Height * 0.5
Initial Sigma z = Plume Height/2.15
Haul road width = actual vehicle width + 6m
Initial Sigma y = (road width/2.15)

Point sources (stack emission points - engines/pumps)

ID	Description	M6 Modeled General Location	Stack Height	Stack Temp.	Stack Velocity	Stack Diameter	Location		Rain Cap?	NOx Maximum Emissions			CO Maximum Emissions		SO_2 Maximum Emissions			PM_{10} Maximum Emissions			$PM_{2.5}$ Maximum Emissions (same as PM_{10})			Scenarios
			ft	F	ft/s	ft	UTM x	UTM y		lb/hr	lb/day	tpy	lb/hr	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	
SXWBOIL	Cathode Washing Hot Water Boilers (B-951 and B-748; common stack)	SX/EW Area	35.1	400.7	31.17	0.328	745560	3616120	Y	0.357	8.57	1.56	0.206	0.90	0.044	1.05	0.19	0.0192	0.461	0.0842	0.0192	0.461	0.0842	all
B-3891	Heat Exchanger Hot Water Boiler (T3600; SO# 963891)	SX/EW Area	15	450.0	0.45	1.67	745562	3616122	Y	0.511	12.28	2.24	0.295	1.29	0.063	1.50	0.27	0.0275	0.661	0.121	0.0275	0.661	0.1206	all
B-1454	Heat Exchanger Hot Water Boiler (T3600; SO# 961454)	SX/EW Area	15	450.0	0.45	1.50	745564	3616124	Y	0.511	12.28	2.24	0.295	1.29	0.063	1.50	0.27	0.0275	0.661	0.121	0.0275	0.661	0.1206	all
SD1	Cat C9 300 hp	San Salvador	8	900	138.6	0.344	745622	3612371	Y	1.77	42.55	7.77	1.633	7.15	0.58	13.96	2.55	0.0933	2.24	0.41	0.0933	2.239	0.4087	all
SD2	Cat C9 300 hp	San Salvador	8	900	138.6	0.344	745620	3612369	Y	1.77	42.55	7.77	1.633	7.15	0.58	13.96	2.55	0.0933	2.24	0.41	0.0933	2.239	0.4087	all
ENV-101	John Deere 125 hp	5E/Dead Man's Pond	9.84	923	136.4	0.338	744041	3614823	Y	3.88	93.00	16.97	0.838	3.67	0.26	6.15	1.12	0.2750	6.60	1.20	0.2750	6.600	1.2045	all
ENV-111	John Deere 125 hp	5E/Dead Man's Pond	9.84	923	136.4	0.338	744039	3614821	Y	3.88	93.00	16.97	0.838	3.67	0.26	6.15	1.12	0.2750	6.60	1.20	0.2750	6.600	1.2045	all
ENV-117	John Deere115 hp	South Rim Pit	8	900	129.4	0.351	746616	3612585	Y	1.01	24.24	4.40	0.220	0.94	0.22	5.28	0.98	0.0520	1.25	0.23	0.052	1.25	0.23	all
ENV-122	Cat 3054C 125 hp	South Rim Pit	9.84	900	128.9	0.341	746618	3612587	Y	1.29	30.95	5.65	1.028	4.50	0.26	6.15	1.12	0.0617	1.48	0.27	0.0617	1.481	0.2702	all
ENV-123	Cat 3126B 225 hp	South Rim Pit	8	833	87.5	0.495	746620	3612589	Y	2.19	52.65	9.61	1.225	5.36	0.44	10.47	1.91	0.0700	1.68	0.31	0.0700	1.680	0.3065	all
OP-2	Perkins 403C-15 32.5 hp	Little Rock Pit	8	833	114.6	0.372	742963	3615654	Y	0.360	8.64	1.58	0.278	1.22	0.063	1.51	0.28	0.0305	0.73	0.13	0.0305	0.732	0.1336	all
OP-4	Cat 6.6 225 hp	Little Rock Pit	8	833	162.4	0.347	742967	3615657	Y	1.33	31.91	5.82	1.225	5.36	0.44	10.47	1.91	0.0700	1.68	0.31	0.0700	1.680	0.3065	all
OP-7	Cat C7 225 hp	Mohawk	8	833	87.5	0.495	746506	3615394	Y	1.33	31.91	5.82	1.225	5.36	0.44	10.47	1.91	0.0700	1.68	0.31	0.0700	1.680	0.3065	all
OP-8	Cat C7 225 hp	Mohawk	8	833	87.5	0.495	746558	3615373	Y	1.33	31.91	5.82	1.225	5.36	0.44	10.47	1.91	0.0700	1.68	0.31	0.0700	1.680	0.3065	all
ENV-120	Cat C6.6 225 hp	Little Rock Pit	8	833	162.4	0.347	742968	3615651	Y	1.33	31.91	5.82	1.225	5.36	0.44	10.47	1.91	0.0700	1.68	0.31	0.0700	1.680	0.3065	all
EMP-1	Cat 3126 190 hp	Little Rock Pit	8	833	87.5	0.495	742972	3615654	Y	2.72	65.24	11.91	3.368	14.75	0.37	8.84	1.61	0.1596	3.83	0.70	0.1596	3.829	0.6989	all
EMP-2	Cat 3126B 200 hp	Little Rock Pit	8	833	87.5	0.495	742966	3615649	Y	1.95	46.80	8.54	1.089	4.77	0.39	9.31	1.70	0.0622	1.49	0.27	0.0622	1.493	0.2725	all

Open Pit sources

ID	Description	Release Height	X Length	Y Length	Pit Volume	Angle	Area	Area	Pit Depth	Elevation	Actual Pit Depth	Actual Pit Depth	SW Corner Location		PM10 Emissions			PM2.5 Emissions			Applicable Scenario	Notes
		m	m	m	m3	%	m2	ft2	ft	ft	ft	m	UTM x	UTM y	lb/hr	lb/day	ton/yr	lb/hr	lb/day	ton/yr		
MOHBL	Mohawk Blasting	6	1200	750	216,000,000	25	900000.0	9687519.375	5118	5905.512	787.402	240	746320.39	3615628.85	321.734	643.467	117.433	18.562	37.123	6.775	10	Blasting at 2 blasts/day and 125,000 ft^2/blast
MOHAWK	Mohawk Material Handling	0	1200	750	252,000,000	25	900000.0	9687519.375	4331	5249.344	918.635	280	746320.39	3615628.85	0.133	3.2	0.584	0.020	0.48	0.0876	10	Material Handling (i.e., truck loading) inside the pit at 200,000 tons/day.
CMBL	Copper Mountain Blasting	6	1121	566	95,172,900	-40	634486.0	6829550.465	5853	6345.571	492.126	150	744296.55	3613000.42	321.734	321.734	58.716	18.562	18.562	3.387	---	Blasting at 1 blast/day and 125,000 ft^2/blast
CMMH	Copper Mountain Material Handling	0	1121	566	95,172,900	-40	634486.0	6829550.465	5853	6345.571	492.126	150	744296.55	3613000.42	0.133	3.2	0.584	0.020	0.48	0.0876	---	Material Handling (i.e., truck loading) inside the pit at 200,000 tons/day.
LR6BL	Little Rock6 Blasting	6	875	604	75,047,000	-30	528500.0	5688726.655	5594	6059.711	465.879	142	743293.96	3615235.98	321.734	321.734	58.716	18.562	18.562	3.387	9	Blasting at 1 blast/day and 125,000 ft^2/blast
LR6MH	Little Rock6 Material Handling	0	875	604	75,047,000	-30	528500.0	5688726.655	5594	6059.711	465.879	142	743293.96	3615235.98	0.0600	1.440	0.263	0.00900	0.216	0.0394	9	Material Handling (i.e., truck loading) inside the pit at 90,000 tons/day.
BCBL	Burrow Chief Blasting	6	1114	1256	426,751,120	-40	1399184.0	15060691.23	5223	6223.753	1000.656	305	745739.45	3614493.17	321.734	643.467	117.433	18.562	37.123	6.775	8	Blasting at 2 blasts/day and 125,000 ft^2/blast
BCMH	Burrow Chief Material Handling	0	1114	1256	426,751,120	-40	1399184.0	15060691.23	5223	6223.753	1000.656	305	745739.45	3614493.17	0.133	3.2	0.584	0.020	0.48	0.0876	8	Material Handling (i.e., truck loading) inside the pit at 200,000 tons/day.
EMMA5BL	Emma $5 Blasting	6	1114	938	156,739,800	-34	1044932.0	11247554.44	5732	6223.753	492.126	150	748083.13	3611102.19	321.73	643.467	117.433	18.562	37.123	6.775	8, 9, 10	Blasting at 2 blasts/day and 125,000 ft^2/blast
	Emma $5Material Handling	0	1114	938	156,739,800	-34	1044932.0	11247554.44	5732	6223.753	492.126	150	748083.13	3611102.19	0.133	3.2	0.584	0.020	0.48	0.0876	8, 9, 10	Material Handling (i.e., truck loading) inside the pit at 200,000 tons/day.
CLBL	Copper Leach Blasting	6	740	310	32,574,800	-25	229400.0	2469241.05	5594	6059.711	465.879	142	742217.16	3614850.75	321.734	321.734	58.716	18.562	18.562	3.387	---	Blasting at 1 blast/day and 125,000 ft^2/blast
CLMH	Copper Leach Material Handling	0	740	310	32,574,800	-25	229400.0	2469241.05	5594	6059.711	465.879	142	742217.16	3614850.75	0.0600	1.440	0.263	0.00900	0.216	0.0394	---	Material Handling (i.e., truck loading) inside the pit at 90,000 tons/day.

Pit Blasting	Blasting Agent Usage (lbs/blast) & Blast Area (ft^2/blast) & No. Blasts/Day	NOx					CO		SO_2				PM_{10}			$PM_{2.5}$		
		lb/hr	tpy	lb/day	Daily[1] (lb/hr)	Annual[2] (lb/hr)	lb/hr	tpy	lb/hr	lb/day	Daily[1] (lb/hr)	tpy	lb/hr	lb/day	Daily[1] (lb/hr)	lb/hr	lb/day	Daily[1] (lb/hr)
Mohawk	150,000 lbs & 125,000 ft^2 & 2	135.0	49.3	270.0	27.00	11.25	3,048	1,112.5	0.27	0.54	0.05	0.10	321.73	643.47	64.35	18.56	37.12	3.71
Copper Mountain	100,000 lbs & 125,000 ft^2 & 1	90.0	16.4	90.0	9.00	3.75	2,032	370.8	0.18	0.18	0.02	0.03	321.73	321.73	32.17	18.56	18.56	1.86
Little Rock 6	100,000 lbs & 125,000 ft^2 & 1	90.0	16.4	90.0	9.00	3.75	2,032	370.8	0.18	0.18	0.02	0.03	321.73	321.73	32.17	18.56	18.56	1.86
Copper Leach	50,000 lbs & 125,000 ft^2 & 1	45.0	8.2	45.0	4.50	1.87	1,016	185.4	0.090	0.090	0.01	0.016	321.73	321.73	32.17	18.56	18.56	1.86
Burro Chief	200,000 lbs & 125,000 ft^2 & 2	180.0	65.7	360.0	36.00	15.00	4,064	1,483.4	0.36	0.72	0.07	0.13	321.73	643.47	64.35	18.56	37.12	3.71
Emma	200,000 lbs & 125,000 ft^2 & 2	180.0	65.7	360.0	36.00	15.00	4,064	1,483.4	0.36	0.72	0.07	0.13	321.73	643.47	64.35	18.56	37.12	3.71

1 - Daily short term calculations based on 10 hour/day operation.
2 - Calculated based on annual tons per year emission rate.

Area source

ID	Description	Release Height	X Length	Y Length	Angle	Initial Vertical Dim.	Location		Applicable Scenario	TSP	PM10	PM10	Scenarios
		m	m	m	degree	m	UTM x	UTM y		(lb/hr-ft2)	(lb/hr)	(lb/hr-ft2)	
SXEW2	Acid Tank House	6	34	34	0	0	745498	3615908	all	1.47E-04	1.82	1.47E-04	all

Attachment C

Table O-1

Road Name	Road No.	ID	Desc
Wagner	4	ROAD4	Wagner
Wagner Spur A	4A	ROAD4A	Wagner Spur A
Mohawk	5A	ROAD5A	Mohawk
Mohawk	5B	ROAD5B	Mohawk
Mohawk	5C	ROAD5C	Mohawk
5A Stockpile	6	ROAD6	5A Stockpile
8C Stockpile	7	ROAD7	8C Stockpile
6A Stockpile	8	ROAD8	6A Stockpile
6D Stockpile	9	ROAD9	6D Stockpile
Copper Mountain Waste	10	ROAD10	Copper Mountain Waste
Main Pit/Mohawk 2	11	ROAD11	Main Pit/Mohawk 2
Spur off of 11 to 8CW	11A	ROAD11A	Spur off of 11 to 8CW
Spur off of 11 to NRW	11B2	ROAD11B2	Spur off of 11 to NRW
Spur off of 11B to 8CW	11C	ROAD11C	Spur off of 11B to 8CW
Spur off of 11B to ValDump	11D	ROAD11D	Spur off of 11B to ValDump
Main Pit	11E	ROAD11E	Main Pit
Main Pit	11F	ROAD11F	Main Pit
Main Pit	11G	ROAD11G	Main Pit
Valencia B	12B	ROAD12B	Valencia B
4AE and 4FO	13	ROAD13	4AE and 4FO
4 series	13A	ROAD13A	4 series
4 series	13B	ROAD13B	4 series
4AW Stockpile	15	ROAD15	4AW Stockpile
4D Stockpile	16A	ROAD16A	4D Stockpile
4D Stockpile	16B	ROAD16B	4D Stockpile
2A Stockpile	17	ROAD17	2A Stockpile
West Main Road	18	ROAD18	West Main Road
West Main Road series	18C	ROAD18C	West Main Road series
West Main Road series	18D	ROAD18D	West Main Road series
West Main Road series	18E	ROAD18E	West Main Road series
West Main Road series	18F	ROAD18F	West Main Road series
West Main Road series	18G	ROAD18G	West Main Road series
West Main Road series	18H	ROAD18H	West Main Road series
West Main Road series	18I	ROAD18I	West Main Road series
West Main Road series	18J	ROAD18J	West Main Road series
2B Stockpile	19	ROAD19	2B Stockpile
2B Stockpile	19B	ROAD19B	2B Stockpile
Copper Mountain	20	ROAD20	Copper Mountain
Copper Mountain New	20A	ROAD20A	Copper Mountain
9A Stockpile	21	ROAD21	9A Stockpile
9AX Stockpile	22	ROAD22	9AX Stockpile
Emma Waste	23	ROAD23	Emma Waste
Emma to 1BO Spur Road	25A	ROAD25A	Emma to 1BO Spur Road
Spur Road to 1BO	25B	ROAD25B	Spur Road to 1BO
1BO Spur Road to GettyB	25C	ROAD25C	1BO Spur Road to GettyB
Emma to 4FO	26	ROAD26	Emma to 4FO
Emma to 4FO	26A	ROAD26A	Emma to 4FO
Emma to 6Waste	26B	ROAD26B	Emma to 6Waste
Emma Route Option 2	26C	ROAD26C	Emma Route Option 2
Emma to 4CO	26D	ROAD26D	Emma to 4CO
Emma to 6Waste	27	ROAD27	Emma to 6Waste
Emma to 6Waste	27A	ROAD27A	Emma to 6Waste
Emma to 6Waste	27B	ROAD27B	Emma to 6Waste
Emma to 6Waste	27C	ROAD27C	Emma to 6Waste
Emma to 4 series	28	ROAD28	Emma to 4 series
Main Pit series	30	ROAD30	Main Pit series
Main Pit series	30A	ROAD30A	Main Pit series
Main Pit series	30B	ROAD30B	Main Pit series
Main Pit series	30C	ROAD30C	Main Pit series
Launder Line	RECLLR1	RECLLR1	Reclamation Launder Line Route 1
	RECLLR2	RECLLR2	Reclamation Launder Line Route 2
	RECLLR3	RECLLR3	Reclamation Launder Line Route 3
Thickener	RECTHR1	RECTHR1	Reclamation Thickener Route1 - not a standalone route
	RECTHR2	RECTHR2	Reclamation Thickener Route2 - route 1,2 emissions
	RECTHR3	RECTHR3	Reclamation Thickener Route3 - route 1,3 emissions
	RECTHR4	RECTHR4	Reclamation Thickener Route4 - route 1,4 emissions
P Plant	RECPPR1	RECPPR1	Reclamation P Plant Route1 - route 1, 5, 6 emissions
	RECPPR2	RECPPR2	Reclamation P Plant Route2 - route 1, 2, 3 emissions
	RECPPR3	RECPPR3	Reclamation P Plant Route3 - route 1, 6, 4, 3 emissions
	RECPPR4	RECPPR4	Reclamation P Plant Route4 - route 1, 6, 4, 3 emissions
	RECPPR5	RECPPR5	Reclamation P Plant Route5 - route 1, 5, 6 emissions
	RECPPR6	RECPPR6	Reclamation P Plant Route6 - route 1, 5, 6 emissions
1A/1B Stockpile	REC1ALR1	REC1ALR1	1A/1B Stockpile - large trucks only - Route1
	REC1ASR1	REC1ASR1	1A/1B Stockpile - small trucks only - Route1
2A/2B Stockpile	REC2ALR1	REC2ALR1	2A/2B Stockpile - large trucks only - Route1 - route 1, 2 emissions
	REC2ALR2	REC2ALR2	2A/2B Stockpile - large trucks only - Route1 - route 1, 2 emissions
	REC2ALR3	REC2ALR3	2A/2B Stockpile - large trucks only - Route3 - route 1, 3 emissions
	REC2ASR1	REC2ASR1	2A/2B Stockpile - small trucks only - Route1 - route 1, 3 emissions
	REC2ASR2	REC2ASR2	2A/2B Stockpile - small trucks only - Route2 - route 1, 2 emissio; also used as C&S route
	REC2ASR3	REC2ASR3	2A/2B Stockpile - small trucks only - Route2 - route 1, 3 emissions
CLW Stockpile	RECCLWR1	RECCLWR1	CLW Stockpile - small trucks only - Route1
	RECCLWR2	RECCLWR2	CLW Stockpile - small trucks only - Route2 - route 2, 6 emissions
	RECCLWR3	RECCLWR3	CLW Stockpile - small trucks only - Route3 - route 3, 6 emissions
	RECCLWR4	RECCLWR4	CLW Stockpile - small trucks only - Route4 - route 2, 4 emissions
	RECCLWR5	RECCLWR5	CLW Stockpile - small trucks only - Route5 - route 2, 5 emissions
	RECCLWR6	RECCLWR6	CLW Stockpile - small trucks only - Route6 - route 2, 6 emissions
C&S Plant South	CSROADS	CSROADS	C&S route to southern area
C&S Plant North	CSROADN	CSROADN	C&S route to northern area

Table O-2

M7 Operational Stockpiles	Descrpition
5AW	Waste and Reclamation 5A Stockpile
6DO	Leach
4FO	Leach
4AW	Leach
4AE	Leach
4DO	Leach
4CO	Leach
2AO	Leach
6AO	Leach
1BO	Leach
6HW	Waste
GEO	Leach
EMW	Waste
L6R	Waste
VAO	Leach
VAW	Waste
BCPILE	Burrow Chief Stockpile - MBR, MB1, MB2
NRW	NR Waste Pile
2BW	2B Waste Pile
CLW	Copper Leach Push Back
CLW	Reclamation CLW Stockpile
LAUNDER2	Reclamation Launder2 Stockpile
9A9AX	Reclamation 9A/9AX Stockpile
THICKENER	Reclamation Thickener Stockpile
RIPRAP	Reclamation Rip Rap Production Area
9AREC	Reclamation Area East of Thickener
PPLANT	Reclamation P-Plant Stockpile
1A1B	Reclamation 1A/1B Stockpile
2A2B	Reclamation 2A/2B Stockpile