20.2.72 NMAC
AIR QUALITY
PERMIT
APPLICATION

For

MCKINLEY PAPER
COMPANY

PREWITT MILL
Prewitt, NM

PREPARED BY
MONTROSE AIR QUALITY SERVICES, LLC
ALBUQUERQUE, NM
JULY 2020

Mail Application To:

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

For Department use only:

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 **X** Existing Non-permitted (or NOI) Facility
Minor Source: ☐ a NOI 20.2.73 NMAC **X** 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:

X 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.

X $500 NSR application Filing Fee enclosed OR ☐ The full permit fee associated with 10 fee points (required w/ streamline applications).

X Check No.: 00489 in the amount of $500

X 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.

☐ This facility qualifies to receive assistance from the Small Business Environmental Assistance program (SBEAP) and qualifies for 50% of the normal application and permit fees. Enclosed is a check for 50% of the normal application fee which will be verified with the Small Business Certification Form for your company.

☐ This facility qualifies to receive assistance from the Small Business Environmental Assistance Program (SBEAP) but does not qualify for 50% of the normal application and permit fees. To see if you qualify for SBEAP assistance and for the small business certification form go to https://www.env.nm.gov/aqb/sbap/small_business_criteria.html).

Citation: Please provide the **low level citation** under which this application is being submitted: **20.2.72.200.A.1 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.):	Updating Permit/NOI #: New
1	Facility Name: McKinley Paper Company – Prewitt Mill	Plant primary SIC Code (4 digits): 2621 Plant NAIC code (6 digits): 322121	
a	Facility Street Address (If no facility street address, provide directions from a prominent landmark): 295 County Road 19, Prewitt, NM		
2	Plant Operator Company Name: McKinley Paper Company	Phone/Fax: (505) 972-2100	
a	Plant Operator Address: 295 County Road 19, Prewitt NM		

b	Plant Operator's New Mexico Corporate ID or Tax ID: 85-0403462	
3	Plant Owner(s) name(s): Bio Pappel S.A.B. de C.V.	Phone/Fax: (505) 972-2146
a	Plant Owner(s) Mailing Address(s): 7850 Jefferson NE, Suite 150, Albuquerque, NM 87109	
4	Bill To (Company): McKinley Paper Company	Phone/Fax: (505) 972-2100
a	Mailing Address: County Road 19, Prewitt NM, PO Box 100	E-mail: irosas@biopappel.com
5	☐ Preparer: **X** Consultant: Paul Wade, Montrose Air Quality Services, LLC	Phone/Fax: (505) 830-9680 x6 / (505) 830-9678
a	Mailing Address: 3500G Comanche Rd NE, Albuquerque, NM 87110	E-mail: pwade@montrose-env.com
6	Plant Operator Contact: Cesar Soria	Phone/Fax: (505) 972-2110
a	Address: County Road 19, Prewitt NM, PO Box 100	E-mail:csoria@biopappel.com
7	Air Permit Contact: Michael Hooker	Title: Safety & Environmental Manager
a	E-mail: mhooker@biopappel.com	Phone/Fax: (505) 972-2126
b	Mailing Address: County Road 19, Prewitt NM, PO Box 100	
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? **X** Yes ☐ No	1.b If yes to question 1.a, is it currently operating in New Mexico? **X** Yes ☐ 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? ☐ Yes **X** 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 **X** No
3	Is the facility currently shut down? ☐ Yes **X** No	If yes, give month and year of shut down (MM/YY):
4	Was this facility constructed before 8/31/1972 and continuously operated since 1972? ☐ Yes **X** No	
5	If Yes to question 3, has this facility been modified (see 20.2.72.7.P NMAC) or the capacity increased since 8/31/1972? ☐ Yes ☐ No **X** N/A	
6	Does this facility have a Title V operating permit (20.2.70 NMAC)? ☐ Yes **X** No	If yes, the permit No. is: P-
7	Has this facility been issued a No Permit Required (NPR)? ☐ Yes **X** No	If yes, the NPR No. is:
8	Has this facility been issued a Notice of Intent (NOI)? ☐ Yes **X** No	If yes, the NOI No. is:
9	Does this facility have a construction permit (20.2.72/20.2.74 NMAC)? ☐ Yes **X** No	If yes, the permit No. is:
10	Is this facility registered under a General permit (GCP-1, GCP-2, etc.)? ☐ Yes **X** No	If yes, the register No. is:

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:	Daily: 900 tons old corrugated cardboard	Annually: 266,450 tons old corrugated cardboard
b	Proposed	Hourly:	Daily: 900 tons old corrugated cardboard	Annually: 266,450 tons old corrugated cardboard
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:	Daily: 828 tons recycled finish product	Annually: 245,134 tons recycled finish product

b	Proposed	Hourly:	Daily: 828 tons recycled finish product	Annually: 245,134 tons recycled finish product

Section 1-D: Facility Location Information

1	Section: 26, 27	Range: 12W	Township: 14N	County: McKinley		Elevation (ft): 6,900
2	UTM Zone: **X** 12 or ☐ 13			Datum: ☐ NAD 27 **X** NAD 83 ☐ WGS 84		
a	UTM E (in meters, to nearest 10 meters): 764,580			UTM N (in meters, to nearest 10 meters): 3,922,480		
b	**AND** Latitude (deg., min., sec.): 35°, 24', 38.21" N			Longitude (deg., min., sec.): 108°, 05', 10.79" W		
3	Name and zip code of nearest New Mexico town: Prewitt, 87045					
4	Detailed Driving Instructions from nearest NM town (attach a road map if necessary): From Prewitt travel north on County Road 19 for 3 miles. Turn west at the entrance to McKinley Paper Company and Prewitt Escalante Generating Station and travel to the site.					
5	The facility is 3.9 miles Northwest of Prewitt, NM.					
6	Status of land at facility (check one): **X** Private ☐ Indian/Pueblo ☐ Federal BLM ☐ Federal Forest Service ☐ Other (specify)					
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: McKinley County, Navajo Indian Reservation					
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 **X** No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers:					
9	Name nearest Class I area: San Pedro Parks Wilderness Area					
10	Shortest distance (in km) from facility boundary to the boundary of the nearest Class I area (to the nearest 10 meters): 129.66 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: NOTE 1					
12	Method(s) used to delineate the Restricted Area: Area is fenced. "**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 **X** 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?					

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	($\frac{hours}{year}$): 8760	
2	Facility's maximum daily operating schedule (if less than 24 $\frac{hours}{day}$)?	Start:	☐AM ☐PM	End:		☐AM ☐PM
3	Month and year of anticipated start of construction: NA					
4	Month and year of anticipated construction completion: NA					
5	Month and year of anticipated startup of new or modified facility: September 2020					
6	Will this facility operate at this site for more than one year? **X** 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? ☐ Yes **X** No If yes, specify:		
a	If yes, NOV date or description of issue:		NOV Tracking No:
b	Is this application in response to any issue listed in 1-F, 1 or 1a above? ☐ Yes **X** No If Yes, provide the 1c & 1d info below:		
c	Document Title:	Date:	Requirement # (or page # and paragraph #):
d	Provide the required text to be inserted in this permit:		
2	Is air quality dispersion modeling or modeling waiver being submitted with this application? **X** Yes ☐ 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? ☐ Yes **X** No		
4	Will this facility be a source of federal Hazardous Air Pollutants (HAP)? **X** Yes ☐ No		
a	If Yes, what type of source? ☐ **Major** (☐ ≥10 tpy of any single HAP **OR** ☐ ≥25 tpy of any combination of HAPS) **OR** **X** **Minor** (☐ <10 tpy of any single HAP **AND** **X** <25 tpy of any combination of HAPS)		
5	Is any unit exempt under 20.2.72.202.B.3 NMAC? ☐ Yes **X** No		
a	If yes, include the name of company providing commercial electric power to the facility: ___________________________ 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	☐ I have filled out Section 18, "Addendum for Streamline Applications."	**X** 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):	Phone:
a	R.O. Title:	R.O. e-mail:
b	R. O. Address:	
2	Alternate Responsible Official (20.2.70.300.D.2 NMAC):	Phone:
a	A. R.O. Title:	A. R.O. e-mail:
b	A. R. O. Address:	
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):	
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.):	
a	Address of Parent Company:	
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.):	
6	Telephone numbers & names of the owners' agents and site contacts familiar with plant operations:	

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:

NOTE 1:

The nearest occupied structure is approximately 290 meters east-northeast from the MPC facility boundary. The Tri-State Prewitt Escalante Generating Station office, another industrial facility, is located adjacent to the MPC facility.

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):

☐ CD/DVD attached to paper application

☐ secure electronic transfer. Air Permit Contact Name____________________________

Email______________________________

Phone number _______________________

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.

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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 #	Manufact-urer'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.
1	Paved Roads	N/A	N/A	N/A	N/A	17,544 Trips/Year	6/1/1994 6/1/1994	NA NA	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
2	OCC Pulping Process	Various	Various	Various	N/A	900 tons/day	6/1/1994 6/1/1994	NA NA	30700404	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
3	Finish Paper Machine	Various	Various	Various	N/A	828 tons/day	6/1/1994 6/1/1994	NA NA	30700409	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
4	Plant Water Treatment Chemicals	N/A	N/A	N/A	N/A	Varies	6/1/1994 6/1/1994	NA NA	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
5	Water Recovery Cooling Tower	Marley	NC9221BS	111007001-NC92218S-97	1,360 gpm	1,360 gpm	6/1/1994 6/1/1994	NA S1	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
6	Vacuum Pump Cooling Tower	Marley	369-102	369-102-35005	1,300 gpm	1,300 gpm	6/1/1994 6/1/1994	NA S2	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
7	Alley Cooling Tower	Marley	Primus	243501-P15F0 -2004	850 gpm	850 gpm	6/1/1994 6/1/1994	NA S3	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
8	Soda Ash Silo	NA	NA	NA	25 TPH	3,203 TPY	1984 1984	C1 S4	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
9	Soda Ash Silo Unloading	NA	NA	NA	3,203 TPY	3,203 TPY	1984 1984	C2 NA	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
10	Lime Silo	NA	NA	NA	25 TPH	2,212 TPY	1984 1984	C3 S5	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
11	Lime Silo Unloading	NA	NA	NA	2,212 TPY	2,212 TPY	1984 1984	C4 NA	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
12	Main Steam Boiler	TBD	TBD	TBD	166.8 MMBtu/hr	166.8 MMBtu/hr	TBD TBD	NA S6	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
13	Auxiliary Steam Boiler	ABCO	Fired D-Type	NA	190 MMBtu/hr	190 MMBtu/hr	1993 1993	NA S7	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
14	Fire Pump Engine	John Deere	6081HF001	RG6081H178072	375 BHP	375 BHP	6/1/1994 6/1/1994	NA S8	30700499	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	

[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. / 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
T1	Diesel Tank	Hughes Tank Co.	NA NA	500 Gallon	20.2.72.202.B(2)	1994 1994	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

[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.

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
C1	Soda Ash Silo Dust Collector	1984	PM	8	99.5%	PEGS Permit Limit
C2	Soda Ash Silo Unloading Building Enclosure	1984	PM	9	80.0%	PEGS Permit Limit
C3	Lime Silo Dust Collector	1984	PM	10	99.5%	PEGS Permit Limit
C4	Lime Silo Unloading Building Enclosure	1984	PM	11	80.0%	PEGS Permit Limit

[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]		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
1	-	-	-	-	-	-	-	-	0.22	0.91	0.043	0.18	0.011	0.045	-	-	-	-
2	-	-	-	-	0.45	1.97	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	2.02	8.86	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	0.011	0.047	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	0.13	0.59	0.11	0.49	0.00031	0.0013	-	-	-	-
6	-	-	-	-	-	-	-	-	0.026	0.11	0.023	0.10	0.00013	0.00059	-	-	-	-
7	-	-	-	-	-	-	-	-	0.096	0.42	0.080	0.35	0.00022	0.0010	-	-	-	-
8	-	-	-	-	-	-	-	-	18.25	1.17	11.75	0.75	1.18	0.075	-	-	-	-
9	-	-	-	-	-	-	-	-	0.0037	0.016	0.0017	0.0076	0.00026	0.0012	-	-	-	-
10	-	-	-	-	-	-	-	-	18.25	0.81	11.75	0.52	1.18	0.052	-	-	-	-
11	-	-	-	-	-	-	-	-	0.0025	0.011	0.0012	0.0053	0.00018	0.00080	-	-	-	-
12	16.7	73.1	6.17	27.0	0.93	4.09	0.24	1.06	1.29	5.65	1.29	5.65	1.29	5.65	-	-	8.5E-05	0.00037
13	19.0	83.2	17.4	76.2	1.06	4.66	0.28	1.21	1.47	6.43	1.47	6.43	1.47	6.43	-	-	9.7E-05	0.00042
14	11.63	2.91	2.51	0.63	0.93	0.23	0.14	0.034	0.83	0.21	0.83	0.21	0.83	0.21	-	-	2.2E-05	0.00006
	Note: Total emission rate for facility is based on only one steam boiler operating at any one time. Since Unit 13 has the highest emission rate, Unit 13 was used in all totals.																	
Totals	30.6	86.1	19.9	76.8	4.46	15.73	0.41	1.24	39.3	10.68	26.1	9.05	4.66	6.82	-	-	0.00020	0.00080

[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).

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]		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
1	-	-	-	-	-	-	-	-	0.22	0.91	0.043	0.18	0.011	0.045	-	-	-	-
2	-	-	-	-	0.45	1.97	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	2.02	8.86	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	0.011	0.047	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	0.13	0.59	0.11	0.49	0.00031	0.0013	-	-	-	-
6	-	-	-	-	-	-	-	-	0.026	0.11	0.023	0.10	0.00013	0.00059	-	-	-	-
7	-	-	-	-	-	-	-	-	0.096	0.42	0.080	0.35	0.00022	0.0010	-	-	-	-
8	-	-	-	-	-	-	-	-	0.091	0.0058	0.059	0.0038	0.014	0.00092	-	-	-	-
9	-	-	-	-	-	-	-	-	0.00074	0.0032	0.00035	0.0015	5.3E-05	0.00023	-	-	-	-
10	-	-	-	-	-	-	-	-	0.091	0.0040	0.059	0.0026	0.014	0.00064	-	-	-	-
11	-	-	-	-	-	-	-	-	0.00051	0.0022	0.00024	0.0011	3.6E-05	0.00016	-	-	-	-
12	16.7	73.1	6.17	27.0	0.93	4.09	0.24	1.06	1.29	5.65	1.29	5.65	1.29	5.65	-	-	8.5E-05	0.00037
13	19.0	83.2	17.4	76.2	1.06	4.66	0.28	1.21	1.47	6.43	1.47	6.43	1.47	6.43	-	-	9.7E-05	0.00042
14	11.63	2.91	2.51	0.63	0.93	0.23	0.14	0.034	0.83	0.21	0.83	0.21	0.83	0.21	-	-	2.2E-05	0.00006
	Note: Total emission rate for facility is based on only one steam boiler operating at any one time. Since Unit 13 has the highest emission rate, Unit 13 was used in all totals.																	
Totals	30.6	86.1	19.9	76.8	4.46	15.73	0.41	1.24	2.95	8.69	2.67	7.81	2.33	6.70	-	-	0.00020	0.00080

[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 it is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

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

X 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
NA																		
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

X 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		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
NA																	
Totals:																	

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)			
S1	5	V	N	14	72	3393	NA	NA	30	12.00
S2	6 (2 Cells)	V	N	14	72	1508	NA	NA	30	8.00
S3	7	V	N	14	72	3116	NA	NA	30	11.50
S4	8	H	N	40	ambient	28.2	NA	NA	28	1.13
S5	10	H	N	40	ambient	28.2	NA	NA	28	1.13
S6	12	V	N	50	330	1237	565	10.5	63	5.00
S7	13	V	N	50	330	1237	565	10.5	63	5.00
S8	14	H	N	12	1184	26.1	NA	NA	133	0.5

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		Sulfuric Acid □ HAP or X TAP		Acetaldehyde x HAP or □ TAP		Formaldehyde x HAP or □ TAP		Hexane x HAP or □ TAP		Methanol x HAP or □ TAP		Provide Pollutant Name Here □ HAP or □ TAP		Provide Pollutant Name Here □ 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	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
	2	0.46	1.62			0.044	0.15	0.0052	0.018			0.095	0.34						
	3	2.16	7.67			0.42	1.48	0.36	1.27			0.75	2.66						
	4			0.0861	0.377														
S6	12	0.32	1.40					0.013	0.056	0.31	1.34								
S7	13	0.36	1.60					0.014	0.063	0.35	1.52								
S8	14	0.016	0.0040			0.0019	0.00047	0.0029	0.00073										
Totals:		3.32	12.29	0.861	0.377	0.46	1.64	0.39	1.41	0.65	2.86	0.84	3.00						

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
12	Natural Gas	pipeline natural gas	983 Btu/scf	169,685 scf	1486.4 MMscf	0.5 grains/100 scf	Negligible
13	Natural Gas	pipeline natural gas	983 Btu/scf	193,286 scf	1693.2 MMscf	0.5 grains/100 scf	Negligible
14	Diesel	purchased commercial	128,000 Btu/gal	19.3 gal/hr	9650 gal/yr	0.05	Negligible

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 Storage Conditions		Max Storage Conditions	
						Temperature (°F)	True Vapor Pressure (psia)	Temperature (°F)	True Vapor Pressure (psia)
T1		Diesel	Diesel	7.05	130	58	0.0072	66	0.0092

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			
T1	1994	Diesel	FX	NA	11.9	0.045	1.22	0.1	WH	WH	Good	9,650	19

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
	Mechanical Shoe Seal	**Liquid-mounted resilient seal**	**Vapor-mounted resilient seal**	**Seal Type**		
FX: Fixed Roof					**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)**	**Description**	**Chemical Composition**	**Phase**	**Quantity (specify units)**
OCC "Old Corrugated Carboard"	Recycled Cardboard	Solid	900 tons/day 266,450 tons/yr	Finished Paper	Refurbished Cardboard Stock	Solid	828 tons/day 245,134 tons/yr
				Waste	Waste	Solid	72 tons/day 21,316 tons/yr

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
12	NO_X	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	CO_2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
13	NO_X	Monitor Labs	ML9841A	4016.4006	Continuous	1 to 10 sec.	0 - 500ppm	< 30 sec to 95%	<1 ppb
	CO_2	California Analytical	ZRH	N3L6050T	Continuous	3 sec.	0 -20 %	1 % of full scale 25 hr	1% of full scale

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

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	N_2O ton/yr	CH_4 ton/yr	SF_6 ton/yr	PFC/HFC ton/yr[2]									Total GHG Mass Basis ton/yr[4]	Total CO_2e ton/yr[5]
Unit No.	**GWPs [1]**	**1**	**298**	**25**	**22,800**	**footnote 3**										
12	**mass GHG**	85,397	0.16	1.61											85,399	
	CO_2e	85,397	48	40												85,485
13	**mass GHG**	97,275	0.18	1.83											97,277	
	CO_2e	97,275	55	46												97,376
14	**mass GHG**	239.3	0.01	0.000002											239	
	CO_2e	239.3	0.24	0.0007												239
	Note: Total GHG for facility is based on only one steam boiler operating at any one time. Since Unit 13 has the highest emission rate, Unit 13 was used in all totals.															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO2e															
Total	**mass GHG**	97,514.30	0.19	1.83											97,516	
	CO_2e	97,514.30	55.2	46												97,615

[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.

McKinley Paper Company (MPC) Prewitt Mill is a paper mill located north of Prewitt, New Mexico and has been in commercial production since June 1, 1994. MPC's parent company is Bio Pappel S.A.B. de C.V. MPC's physical location is latitude 35°, 24', 38.21" N and longitude 108°, 05', 10.79" W, NAD83, which is approximately 3.9 miles northwest of Prewitt, NM in McKinley County (see Figure 8-1). Since initial startup, estimation of facility potential emission rate of any regulated air contaminant for which there is a National or New Mexico Ambient Air Quality Standard was below thresholds requiring an air quality permit per New Mexico regulation 20.2.72 NMAC. Presently, MPC conserves energy resources by purchasing steam from the nearby Tri-State's Prewitt Escalante Generating Station (PEGS) and using the steam's heat from the coal-fired boiler in the mill's paper drying process. If the coal-fired boiler is offline, steam is then provided to MPC by PEGS natural gas-fired auxiliary boiler. For reference, Tri-State's PEGS presently operates the auxiliary boiler (Unit E80) under major NSR air quality permit PSD-285-M4R1 and Operating Permit P012R3-AR3.

With the planned shutdown of PEGS coal-fired boiler, scheduled for mid-September 2020, steam will be provided to MPC by the auxiliary boiler. Ownership and operation of the auxiliary boiler will eventually both be transferred to MPC from Tri-State. However, there will be a period of time where Tri-State is operating the auxiliary boiler while MPC transitions to taking over the asset. To ensure continued coverage under Tri-State's air permit, Tri-State will separately apply for modification of its PEGS air permit. This modification will seek NMED's approval of an amendment of the PEGS major NSR permit to transfer ownership of the auxiliary boiler and related equipment to MPC and identify Tri-State as the operator. The permit would remain in Tri-State's name until finally transferred to MPC (see the agreement letter between Tri-State and MPC at the end of this section). In additional to acquiring the auxiliary boiler from Tri-State, MPC will be obtaining the water treatment plant (Unit 75 – Soda Ash Silo & Unit 76 – Lime Silo), presently operating at PEGS by Tri-State. With the addition of acquiring ownership of the existing auxiliary boiler and water treatment facility, MPC is proposing to installation of a new 166.8 MMBtu per hour natural gas-fired steam boiler. With the addition of these sources, the projected facility emissions will exceed the emission limits requiring a minor source 20.2.72 NMAC air quality permit. Montrose Air Quality Services has been contracted to prepare this 20.2.72.200.A.(2) NMAC permit application. The two (2) natural gas-fired steam boilers will be applicable to EPA regulation 40 CFR 60 Subpart Db.

Process Summary

The MPC Prewitt Mill is different from most paper mills, because it uses and recycles existing cardboard to make paper. The MPC Prewitt Mill site overview is shown in the of Figure 5-3. MPC Prewitt Mill is a 100% recycle mill that uses waste paper (material that would otherwise go into landfills) as its raw material source. The primary source of waste paper is old corrugated container (OCC), old boxes. Other sources of waste paper include mixed office waste (MOW) and box plant clippings (BPC). With this application, MPC is requesting an OCC input capacity of 900 tons of OCC daily and 266,450 tons of OCC annually. From this material, the mill is capable of producing 820 tons daily and 245,134 tons annually of high-quality, lightweight linerboard, which is a brown paper used to make new corrugated boxes.

The MPC mill recycles its process water and reuses waste steam from the nearby Tri-State PEGS power generating plant. This will change with the shutdown of PEGS coal-fired boiler and MPC acquiring ownership and operation of the existing PEGS auxiliary boiler. MPC is a zero-discharge facility. All of the process water is recycled, resulting in zero discharge from the site. In comparison, other paper mills discharge an average of one million gallons of treated water a day.

The MPC Prewitt Mill has four major components: a warehouse/receiving area, a stock preparation area, a paper production area, and a water reclamation plant. The mill receives OCC and shipping linerboard product by either delivery trucks on paved roads or railroad siding from the Santa Fe main line. The siding was extended to the mill's loading dock for receipt of OCC and for shipping of the linerboard, which is produced as rolls weighing two to four tons each.

OCC waste, unusable by-products, is removed from the process at the hydrapulper, the waste is then loaded into the waste storage bin until the waste material is loaded into trucks and removed from the site to a nearby landfill.

Startup, Shutdown, and Maintenance (SSM)

No SSM emissions are proposed for this application. Emission rates from SSM for the two (2) natural gas-fired steam boilers and diesel-fired fire pump engine will be less than or equal to requested permit emission rates. For the two (2) natural gas-fired steam boilers, per requirements of 40 CFR 60.48b(b), NOx emission rate will be monitored and recorded using continuous emission monitoring (CEM) systems.

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
1100 W. 116TH AVENUE • P.O. BOX 33695 • DENVER, COLORADO 80233 • 303-452-6111

McKinley

July 10, 2020

Joe Kimbrell, Permit Engineer
Melinda Owens, Title V Supervisor
Rhonda Romero, NSR Minor Source Manager
New Mexico Environment Department
Air Quality Bureau
525 Camino de los Marquez, Suite 1
Santa Fe, NM 87505-1816

Dear Ms. Owens, Ms. Romero and Mr. Kimbrell:

On behalf of McKinley Paper Company (MPC) and Tri-State Generation and Transmission Association, Inc. (Tri-State), we are writing jointly to follow up on our conversation with you on July 7th regarding MPC's forthcoming application for a new 20.2.72 air quality permit for its paper recycling and mill facility in Prewitt, New Mexico.

As you know, MPC currently receives all process steam for its facility from Tri-State's Prewitt Escalante Generating Station (PEGS) existing coal-fired boiler. However, PEGS is scheduled for a permanent shut down in mid-September 2020, when the coal-fired boiler will permanently be taken offline. As a result of the PEGS decommissioning, MPC will need to supply its own process steam with an existing auxiliary boiler that MPC will purchase from Tri-State and a new natural-gas fired boiler, both units that will be included in MPC's permit application.

This letter is to confirm our commitment to NMED of our intention to reach an agreement on transferring ownership of the auxiliary boiler and water treatment plant at the PEGS facility from Tri-State to MPC.

Using the identifying numbers from Tri-State's permit, the permitted units in question are Unit E80 (auxiliary boiler), Unit E75 (soda ash silo), and Unit E76 (lime silo). All three units are located at the current PEGS water treatment facility. To ensure continued coverage under Tri-State's air permit, Tri-State will apply for modification of its PEGS air permit. This modification will seek NMED's approval of an amendment of the Escalante Title V permit to transfer ownership of the auxiliary boiler and related equipment to MPC and identify Tri-State as the operator. The permit would remain in Tri-State's name. Our request is that NMED provide this amendment to the permit to be effective no earlier than October 1, 2020.

It is estimated that on September 30, 2020, the transfer of ownership of these units will be completed. Tri-State will continue to operate these units under its air permit until NMED issues an air permit to MPC, after which ownership and operating responsibility under the air permit will transfer to MPC.

MPC and Tri-State appreciate NMED's flexibility on this issue.

Sincerely,

Isaac Rosas
Isaac Rosas (Jul 10, 2020 15:28 MDT)

Isaac Rosas
General Manager
Bio-PAPPEL International
McKinley Paper Company

Barbara A. Walz
Barbara A. Walz (Jul 10, 2020 15:55 MDT)

Barbara A. Walz
Senior Vice President, Policy & Compliance / Chief Compliance Officer
Tri-State Generation and Transmission Association, Inc.

BW/BI/fw

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.

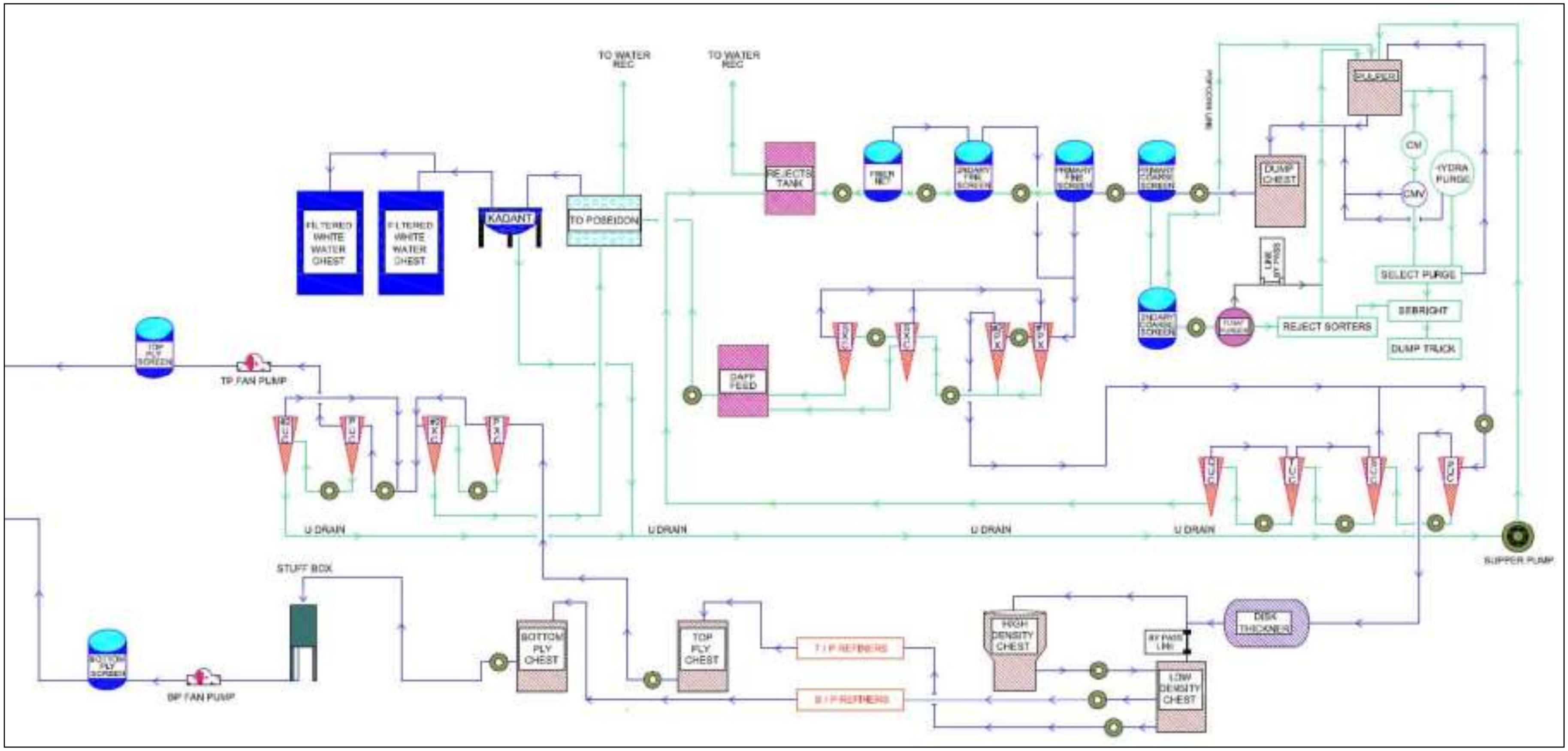

Figure 4-1: Stock Preparation Process Flow (Unit 2)

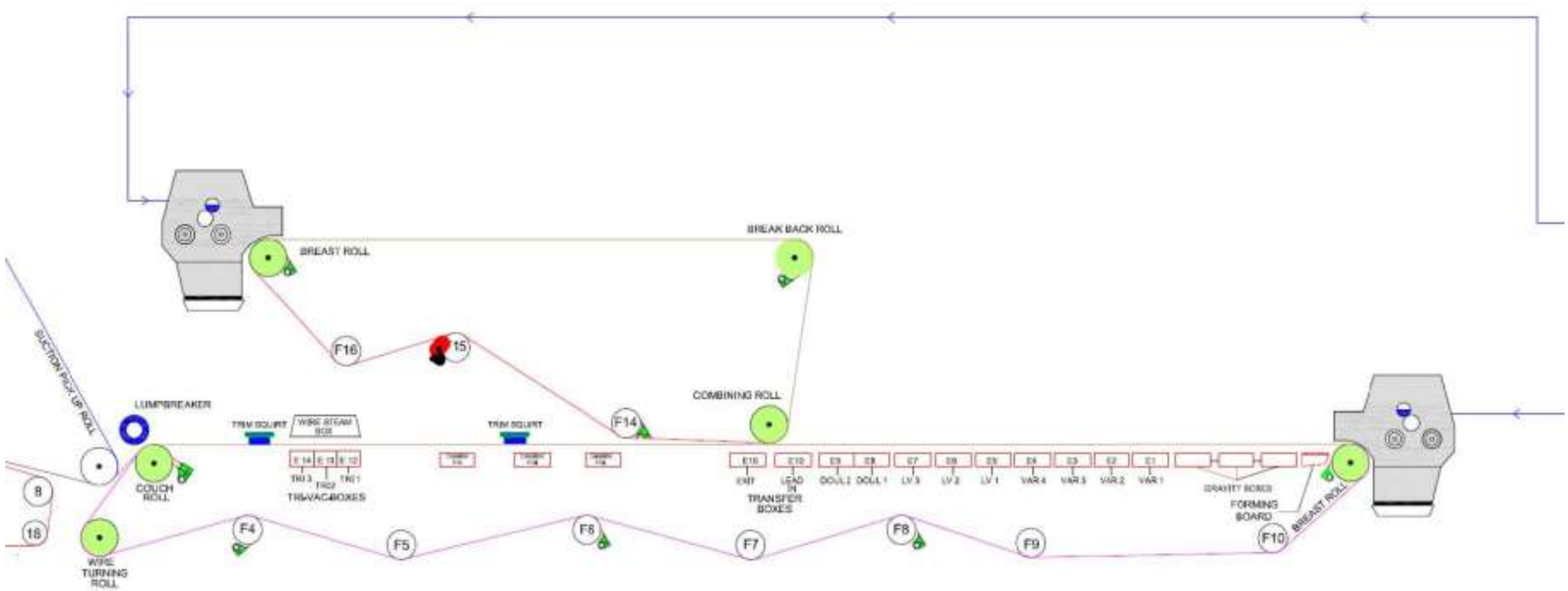

Figure 4-2: Forming Section Process Flow (Unit 3)

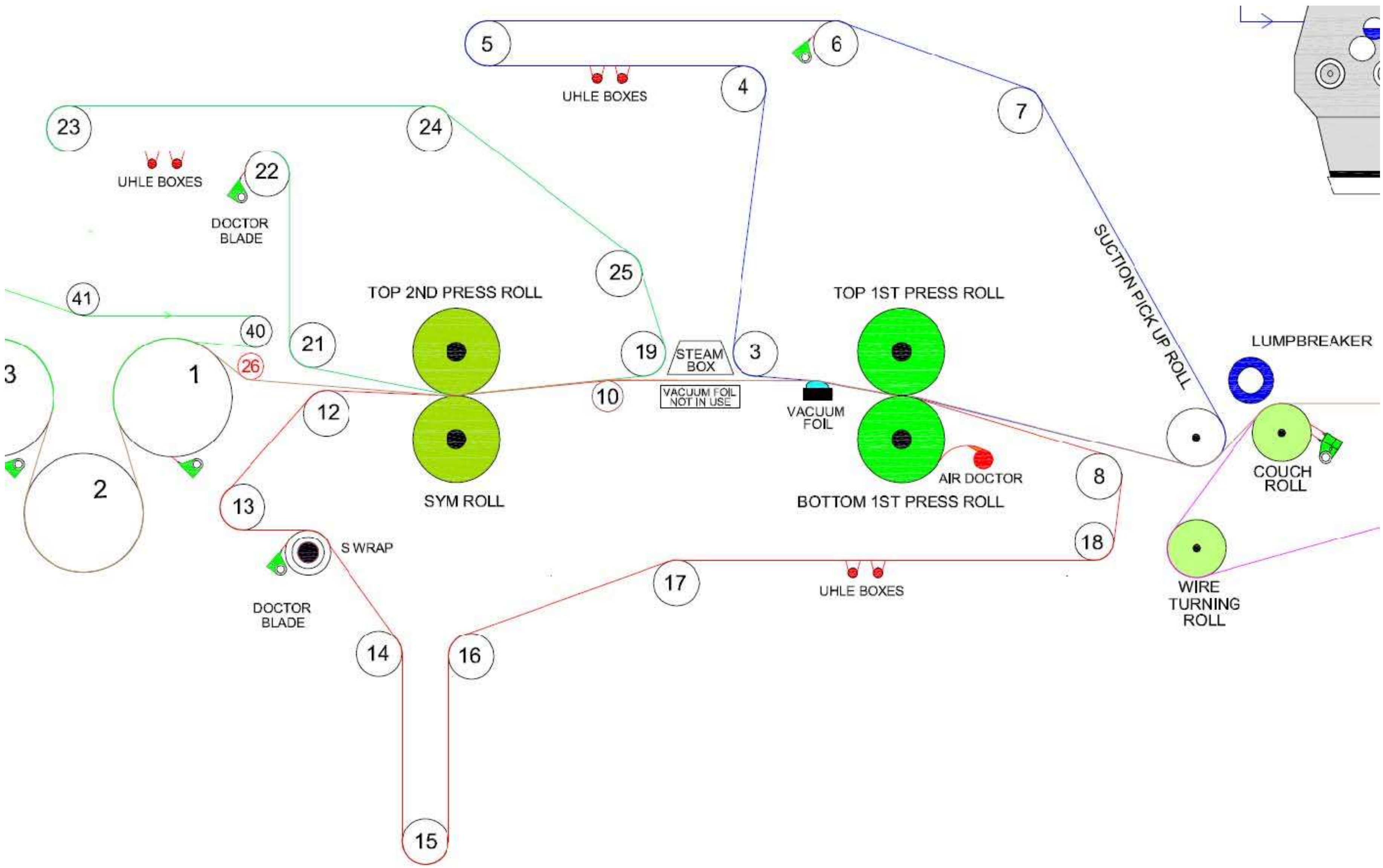

Figure 4-3: Press Section Process Flow (Unit 3)

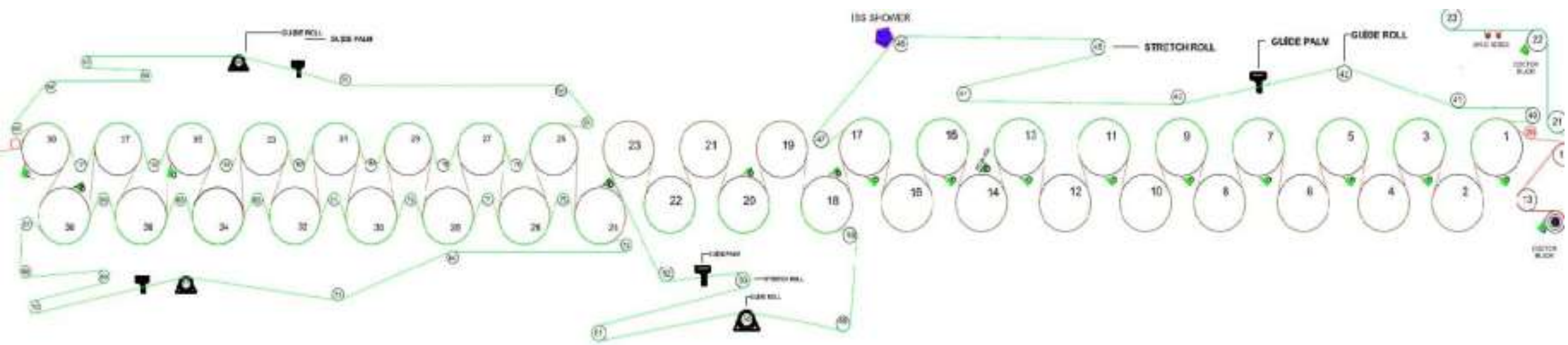

Figure 4-4: Dry End Process Flow (Unit 3)

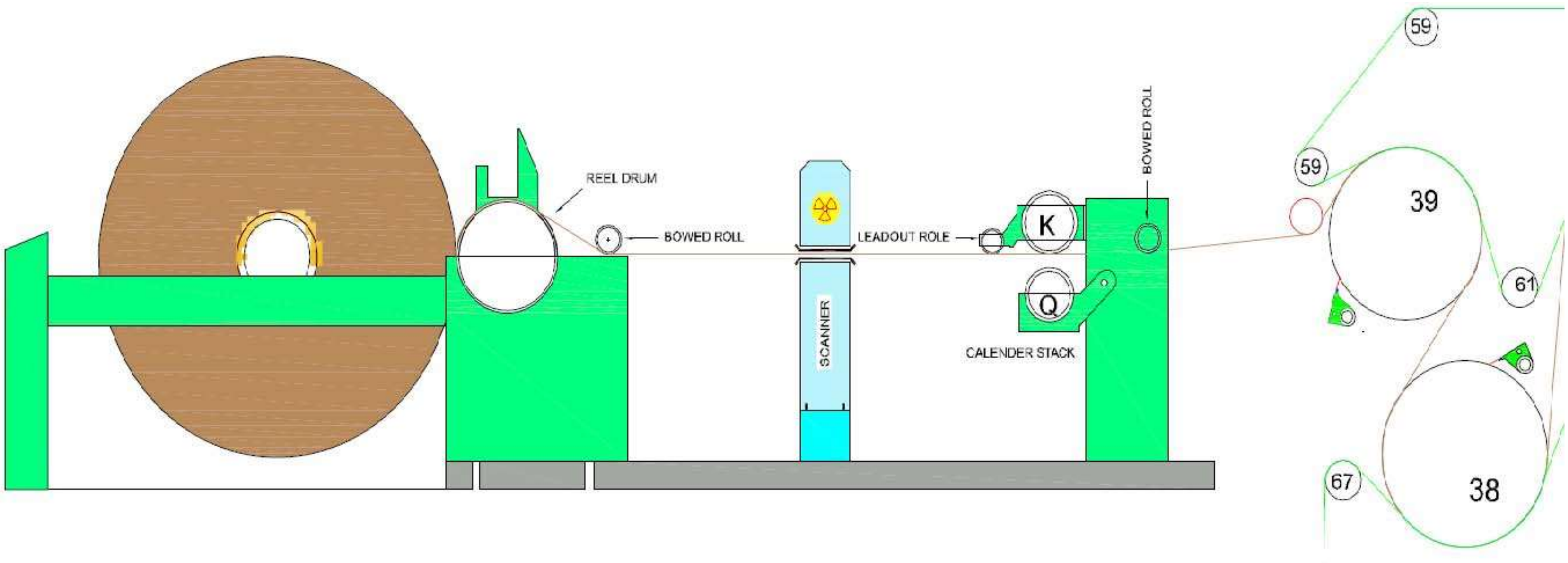

Figure 4-5: Reel Section Process Flow

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.

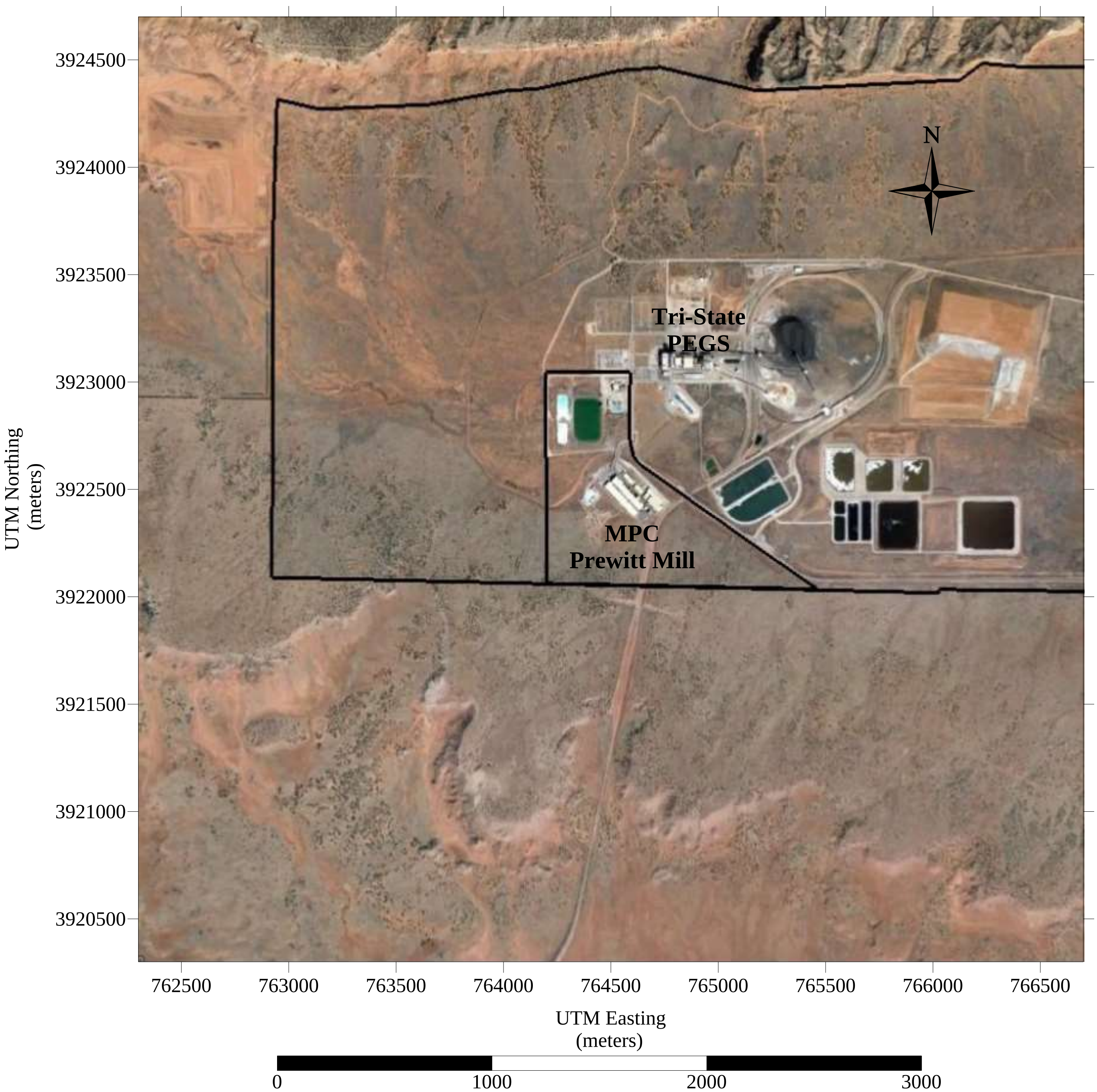

Figure 5-1: Aerial Showing MPC Prewitt Mill in Relation to Tri-State PEGS

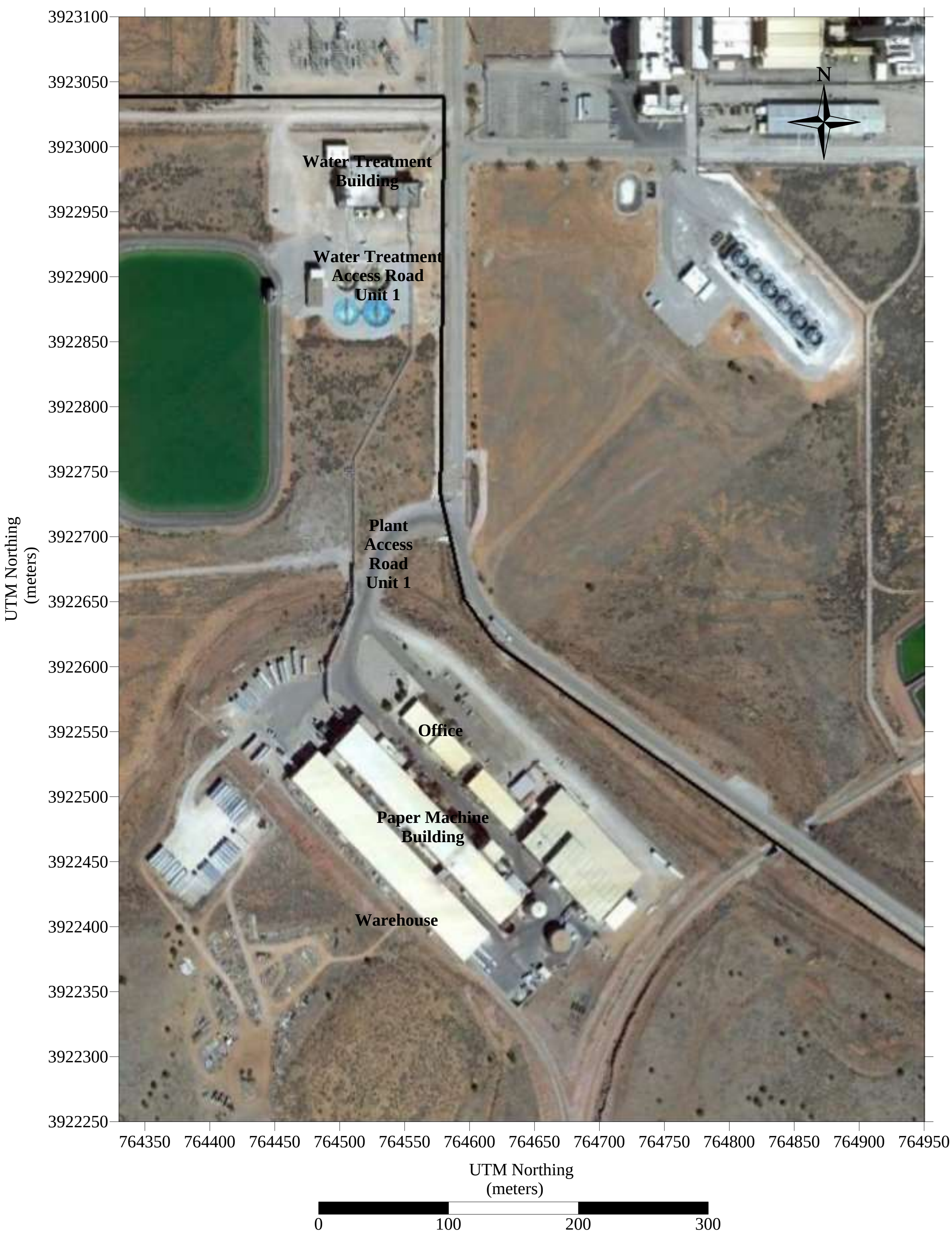

Figure 5-2: Aerial Showing MPC Prewitt Mill Overview

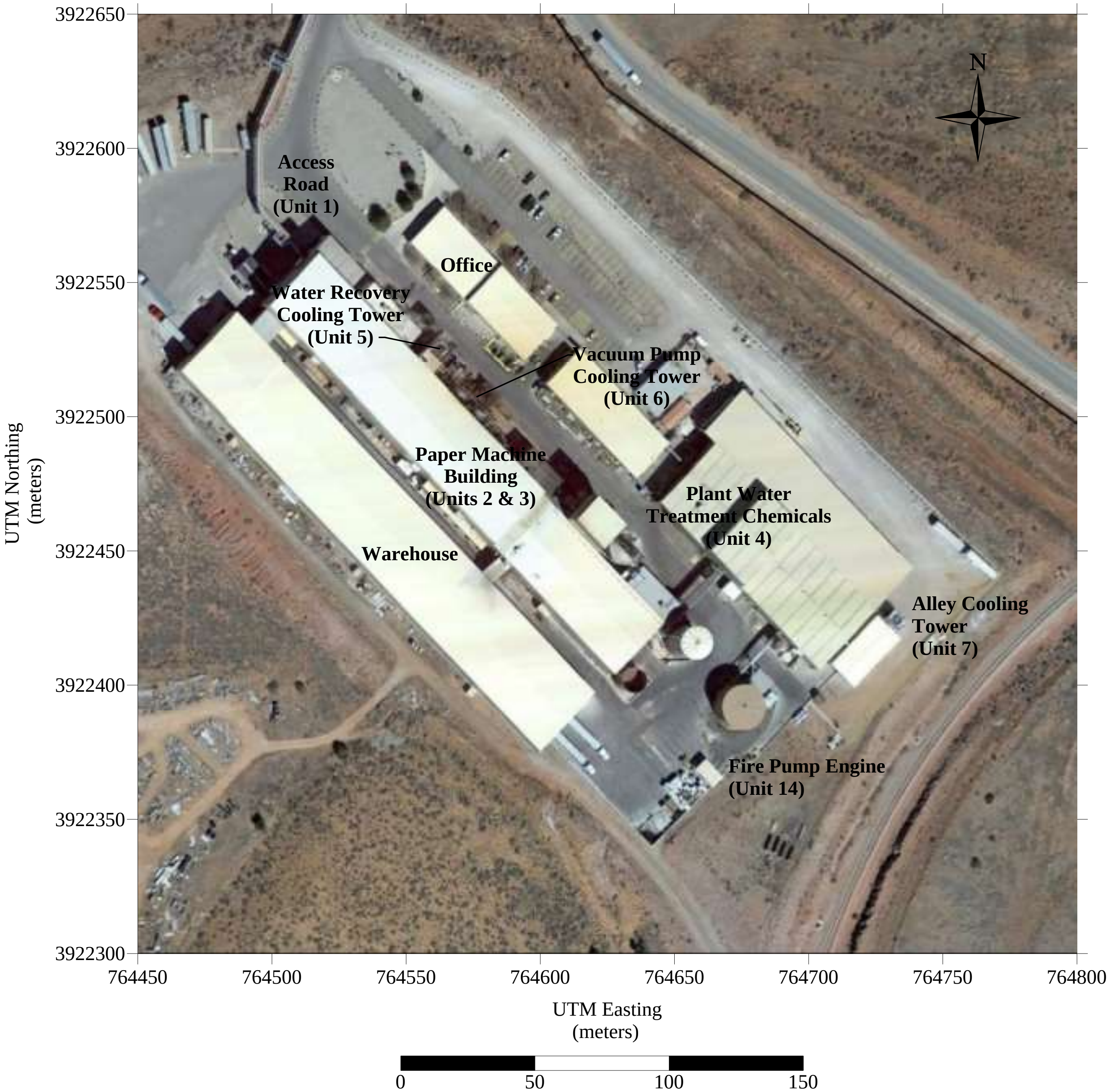

Figure 5-3: Aerial Showing MPC Prewitt Mill Emission Source Locations

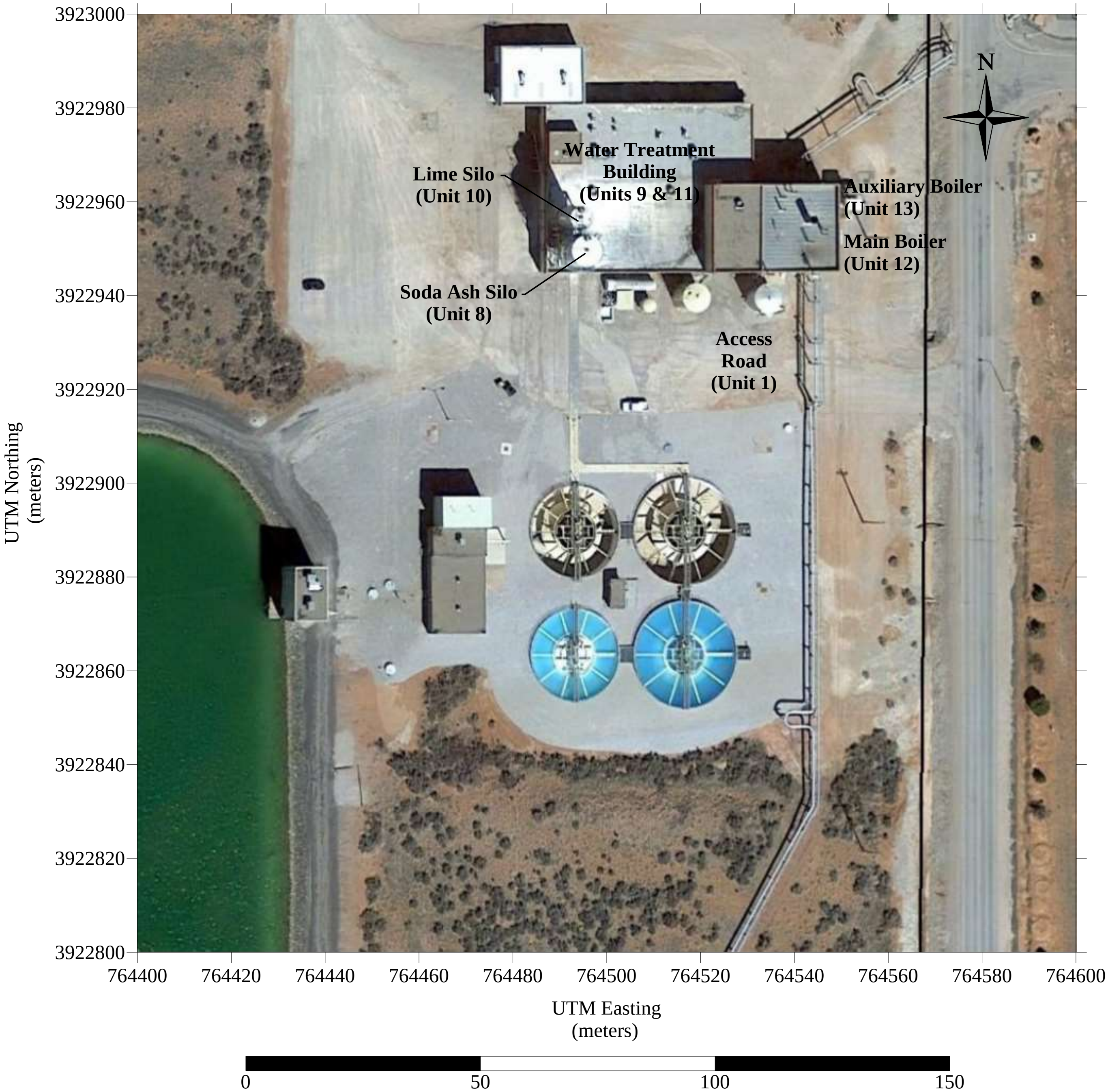

Figure 5-4: Aerial Showing MPC Water Treatment Building Emission Source Locations

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.

MPC's Prewitt Mill is a paper mill physically located in Prewitt, New Mexico which recycles old corrugated cardboard (OCC) to new paper stock and has been in commercial production since June 1, 1994. Since commercial production began, estimation of facility potential emission rate of any regulated air contaminant for which there is a National or New Mexico Ambient Air Quality Standard was below thresholds requiring an air quality permit per New Mexico regulation 20.2.72 NMAC. Presently, steam required for drying in the paper process is provided by Tri-State's PEGS coal-fired boiler or auxiliary boiler. Treated water is provided by PEGS water treatment facility.

With the proposed shut down of PEGS coal-fired boiler, scheduled for September 2020, steam will be provided to MPC by the auxiliary boiler. Ownership and operation of the auxiliary boiler will be transferred to MPC from Tri-State. In additional to acquiring the auxiliary boiler from Tri-State, MPC will be obtaining the water treatment plant, presently operating at PEGS by Tri-State. With the addition of acquiring ownership of the existing auxiliary boiler and water treatment facility, MPC is proposing to installation of a new 166.8 MMBtu per hour natural gas-fired steam boiler. With the addition of these sources, the projected facility emissions will exceed the emission limits requiring a minor source 20.2.72 NMAC air quality permit. Montrose Air Quality Services has been contracted to prepare this 20.2.72.200.A.(2) NMAC permit application.

Potential emission sources for MPC, with the addition of the existing PEGS 190 MMBtu/hr natural gas fired auxiliary steam boiler, existing PEGS water treatment facility (2 storage silos loading and unloading), new 166.8 MMBtu/hr natural gas fired steam boiler facility will exceed 10 pounds per hour and 25 tons per year. The facility will consist of the following emission sources:

1. Paved Road – soda ash delivery, lime delivery, OCC delivery, waste removal, and warehouse deliveries
2. OCC Pulping Process Fugitive Emissions
3. Finish Paper Machine Fugitive Emissions
4. Plant Water Treatment Chemicals
5. Water Recovery Cooling Tower
6. Vacuum Pump Cooling Tower (2 cells)
7. Alley Cooling Tower
8. Soda Ash Storage Silo Loading (transferred PEGS source)
9. Soda Ash Storage Silo Unloading (transferred PEGS source)
10. Lime Storage Silo Loading (transferred PEGS source)
11. Lime Storage Silo Unloading (transferred PEGS source)
12. Main Boiler
13. Auxiliary Boiler (transferred PEGS source)
14. Fire Pump Engine

Unit 1: Paved Road

Haul truck travel emissions were estimated using AP-42, Section 13.2.1 (ver.01/11) “Paved Roads” emission. The mill receives OCC and shipping linerboard product by either delivery trucks on paved roads or railroad siding. To determine worst-case emission rate calculations, all receives OCC and shipping linerboard will be by haul truck on paved roads. Since the facility will permit to operate at the maximum capacity of the facility and the hours of operation are 8760 hours per year, both potential emission rate (PER) and potential to emit (PTE) are the same.

AP-42, Section 13.2.1 (ver.01/11) “Paved Roads”

E = k(sL)^0.91*(W)^1.02*[1-P/4N]

k PM	0.011	
k PM10	0.0022	
k PM25	0.00054	
sL	0.6	Ubiquitous Baseline g/m^2 <500
P = days with precipitation over 0.01 inches	60	
N = number of days in averaging period	365	

Truck Routes	Average Weight (W) (tons)	VMT/Year	Normalize Weight	Fleet Average Weight (tons)
Soda Ash Delivery to Plant	26.5	7.3	192.9	
Lime Delivery to Plant	26.5	5.0	133.2	
OCC Delivery Vehicles on Paved Roads	25	7933.0	198325.0	
Waste Removal	25	634.6	15866.0	
Warehouse Deliveries to Plant	25	1738.7	43468.5	
Total		**10318.7**	**257985.5**	**25.00**

Reduction in emissions due to precipitation was only accounted for in the annual emission rate. Particulate emission rate per vehicle mile traveled for each particle size category is:

Hourly Emission Rate Factor

PM = 0.18426 lbs/VMT
PM10 = 0.03685 lbs/VMT
PM2.5 = 0.00905 lbs/VMT

Annual Emission Rate Factor

PM = 0.17669 lbs/VMT
PM10 = 0.03534 lbs/VMT
PM2.5 = 0.00867 lbs/VMT

Table 6-1: PER and PTE Paved Road Fugitive Dust Emission Rates

Process Unit Description	Process Rate	PM Emission Rate (lbs/hr)	PM Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
Paved Road	1.18 miles/hr; 10,318.7 miles/yr	0.22	1.09	0.043	0.22	0.011	0.053

Unit 2: OCC Processing

The mill receives the old corrugated cardboard (OCC) either by truck or railcar in the form of bales. At the receiving area of the warehouse, the baling wire is cut off the bales and the bales of OCC are placed on an inclined conveyor. The conveyor carries the bales from the warehouse to the hydrapulper, which is located in the paper machine building. The hydrapulper is an 18-foot diameter tub filled with water, much like a giant washing machine with an agitator. In addition to water, steam is also added to the pulper. The pulper reduces the OCC to a fiber slurry, also known as stock. Most of the contaminants found in the OCC, such as plastic, strings, and strands of tape, come out of the stock at this point as waste which is loaded in to trucks and disposed at a landfill. As the OCC is reduced to a fiber slurry and processed through the screens and cleaned, off-gassing occurs due to the chemicals contained in the OCC. Based on actual testing done at similar facilities, the emissions from the off-gassing occurs in the form of VOCs and HAPS. Emission factors for OCC processing were obtained from a study by the National Council for Air and Steam Improvement (NCASI) “Compilation of ‘Air Toxics’ and Total Hydrocarbon Emissions Data for Pulp and Paper Mill Sources – A Second Update (TB973)” for fugitive emissions found in Section 7. In this reference document I have used the emission factors for VOCs and HAPS found in Table 10.4 “Air Toxic Emissions from OCC and Recycled Paperboard Stock Preparation”. These emission factors are based on the input of OCC into the hydrapulper per day of 900 “air dried tons of recycled pulp” (ADTP). The hourly input is derived from 900 tons per day of ADTP divided by 24 hours per day. Annual emissions are based on 266,450 tons per year of ADTP. The following are the pollutants found in OCC processing:

Pollutant	CAS No.	Emission Factor	Units	Reference
1,2-Dimethoxyethane	110-71-4	3.93E-05	lb/ADTP	Table 10.4 - Medium
3-Carene	13466-78-9	7.70E-04	lb/ADTP	Table 10.4 - Maximum
Acetaldehyde	75-07-0	1.16E-03	lb/ADTP	Table 10.4 - Medium
alpha-Pinene	80-56-8	5.70E-04	lb/ADTP	Table 10.4 - Maximum
beta-Pinene	127-91-3	6.70E-04	lb/ADTP	Table 10.4 - Maximum
Carbon Disulfide	75-15-0	1.58E-03	lb/ADTP	Table 10.4 - Medium
Chloroform	67-66-3	4.98E-05	lb/ADTP	Table 10.4 - Medium
Cumene	98-82-8	5.80E-04	lb/ADTP	Table 10.4 - Maximum
Formaldehyde	50-00-0	1.38E-04	lb/ADTP	Table 10.4 - Medium
Methanol	67-56-1	2.53E-03	lb/ADTP	Table 10.4 - Medium
Methyl Ethyl Ketone	78-93-3	2.50E-04	lb/ADTP	Table 10.4 - Maximum
Methylene Chloride	75-09-2	1.68E-04	lb/ADTP	Table 10.4 - Medium
Naphthalene	91-20-3	7.40E-04	lb/ADTP	Table 10.4 - Maximum
p-Cymene	99-87-6	6.20E-04	lb/ADTP	Table 10.4 - Maximum
Phenol	108-95-2	3.07E-04	lb/ADTP	Table 10.4 - Medium
Propionaldehyde	123-38-6	3.05E-03	lb/ADTP	Table 10.4 - Medium
Toluene	108-88-3	1.60E-03	lb/ADTP	Table 10.4 - Medium

Note:

ADTP: ton of air-dried pulp

Reference: Emission factors from Table 10.4 (OCC and Recycled Paperboard Stock Preparation) from NCASI TB 973 (2010)

Emissions of Biphenyl is not expected to be present per discussion found in Section 10.2.1 of the reference document.

The following table lists the emissions rates using the above emission factors and the proposed OCC throughput.

Table 6-2: PER and PTE OCC Processing Fugitive Emission Rates

OCC ADTP 37.50 tons/hr 900 tons/day 266450 tons/year

Pollutant	CAS No.	Emission Factor	Units	VOC	lbs/hr	tons/yr	HAP	lbs/hr	tons/yr
1,2-Dimethoxyethane	110-71-4	3.93E-05	lb/ADTP	Yes	1.47E-03	5.24E-03	No		
3-Carene	13466-78-9	7.70E-04	lb/ADTP	Yes	2.89E-02	1.03E-01	No		
Acetaldehyde	75-07-0	1.16E-03	lb/ADTP	Yes	4.35E-02	1.55E-01	Yes	4.35E-02	1.55E-01
alpha-Pinene	80-56-8	5.70E-04	lb/ADTP	Yes	2.14E-02	7.59E-02	No		
beta-Pinene	127-91-3	6.70E-04	lb/ADTP	Yes	2.51E-02	8.93E-02	No		
Carbon Disulfide	75-15-0	1.58E-03	lb/ADTP	Yes	5.93E-02	2.10E-01	Yes	5.93E-02	2.10E-01
Chloroform	67-66-3	4.98E-05	lb/ADTP	Yes	1.87E-03	6.63E-03	Yes	1.87E-03	6.63E-03
Cumene	98-82-8	5.80E-04	lb/ADTP	Yes	2.18E-02	7.73E-02	Yes	2.18E-02	7.73E-02
Formaldehyde	50-00-0	1.38E-04	lb/ADTP	Yes	5.18E-03	1.84E-02	Yes	5.18E-03	1.84E-02
Methanol	67-56-1	2.53E-03	lb/ADTP	Yes	9.49E-02	3.37E-01	Yes	9.49E-02	3.37E-01
Methyl Ethyl Ketone	78-93-3	2.50E-04	lb/ADTP	Yes	9.38E-03	3.33E-02	Yes	9.38E-03	3.33E-02
Methylene Chloride	75-09-2	1.68E-04	lb/ADTP	Yes	6.30E-03	2.24E-02	Yes	6.30E-03	2.24E-02
Naphthalene	91-20-3	7.40E-04	lb/ADTP	Yes	2.78E-02	9.86E-02	Yes	2.78E-02	9.86E-02
p-Cymene	99-87-6	6.20E-04	lb/ADTP	Yes	2.33E-02	8.26E-02	No		
Phenol	108-95-2	3.07E-04	lb/ADTP	Yes	1.15E-02	4.09E-02	Yes	1.15E-02	4.09E-02
Propionaldehyde	123-38-6	3.05E-03	lb/ADTP	Yes	1.14E-01	4.06E-01	Yes	1.14E-01	4.06E-01
Toluene	108-88-3	1.60E-03	lb/ADTP	Yes	6.00E-02	2.13E-01	Yes	6.00E-02	2.13E-01
				Total	0.56	1.97		**Total**	1.62

Note:

ADTP: ton of air-dried pulp

Reference: Emission factors from Table 10.4 (OCC and Recycled Paperboard Stock Preparation) from NCASI TB 973 (2010)

Unit 3: Furnish Paper Machines

After the OCC has been turned to a pulp, then cleaned and screened, the cleaned pulp is sent to the Paper Machine, Press, Dryers, Reel, and Winder. Emission factors for Furnish Paper Machines were obtained from an updated study by the National Council for Air and Steam Improvement (NCASI) "Table B.1 Air Toxic Emissions From 100% Secondary Fiber Furnish Paper Machines (December 2009)" on fugitive emissions found in Section 7. In this reference document I have used the emission factors for VOCs and HAPS found in Table B.1 for Mill Code KK. These emission factors are based on the output of finish product per day of 820 "air dried tons of finished product" (ADTFP). The hourly input is derived from 820 tons per day of ADTFP divided by 24 hours per day or 34.5 tons per hour of ADTFP. Annual emissions are based on 245,134 tons per year of ADTFP. The following are the pollutants found in Furnish Paper Machines processing:

Pollutant	CAS No.	Emission Factor	Units	Reference
1,2-Dimethoxyethane (1)	110-71-4	1.27E-03	lb/ADTFP	Table B1 - Medium
3-Carene (1)	13466-78-9	1.23E-04	lb/ADTFP	Table B1 - Medium
Acetaldehyde (2)	75-07-0	1.21E-02	lb/ADTFP	Table B1 - Mill KK
alpha-Pinene (1)	80-56-8	5.38E-04	lb/ADTFP	Table B1 - Medium
beta-Pinene (1)	127-91-3	2.70E-03	lb/ADTFP	Table B1 - Medium
Carbon Disulfide (2)	75-15-0	1.93E-03	lb/ADTFP	Table B1 - Mill KK
Chloroform (1)	67-66-3	2.29E-03	lb/ADTFP	Table B1 - Medium
Cumene (1)	98-82-8	2.21E-03	lb/ADTFP	Table B1 - Medium
Formaldehyde (2)	50-00-0	1.04E-02	lb/ADTFP	Table B1 - Mill KK
Limonene (2)	5989-27-5	2.45E-05	lb/ADTFP	Table B1 - Mill KK
Methanol (2)	67-56-1	2.17E-02	lb/ADTFP	Table B1 - Mill KK
Methyl Ethyl Ketone (2)	78-93-3	3.49E-05	lb/ADTFP	Table B1 - Mill KK
Methylene Chloride (2)	75-09-2	3.09E-03	lb/ADTFP	Table B1 - Mill KK
Naphthalene (2)	91-20-3	1.09E-05	lb/ADTFP	Table B1 - Mill KK
p-Cymene (1)	99-87-6	5.07E-03	lb/ADTFP	Table B1 - Medium
Phenol (2)	108-95-2	3.18E-03	lb/ADTFP	Table B1 - Mill KK
Propionaldehyde (2)	123-38-6	3.05E-03	lb/ADTFP	Table B1 - Mill KK
Toluene (1)	108-88-3	2.59E-03	lb/ADTFP	Table B1 - Medium

Note:

ADTFP: ton of air-dried finish product

Reference: Emission factors from 100% secondary fiber furnish (referencing 2009 Update Table B.1 for Mill KK)) from NCASI

(1) Mill Code KK test results were below detection levels, so emission factors for 1,2-Dimethoxyethane, 3-Carene, alpha-Pinene, Chloroform, Cumene, p-Cymene, and Toluene are equal to the medium of the valid test results.

(2) Emission factors are equal to Mill Code KK test results for Acetaldehyde, Carbon Disulfide, Formaldehyde, Limonene, Methanol, Methyl Ethyl Ketone, Methylene Chloride, Naphthalene, Phenol, and Propionaldehyde.

Emissions of Biphenyl is not expected to be present per discussion found in Section 10.2.1 of the reference document.

The following table lists the emissions rates using the above emission factors and the proposed finished product.

Table 6-3: PER and PTE Furnish Paper Machines Fugitive Emission Rates

ADTFP	34.50	tons/hr	828.00	tons/day	245134.00	tons/year

Pollutant	CAS No.	Emission Factor	Units	VOC	lbs/hr	tons/yr	HAP	lbs/hr	tons/yr
1,2-Dimethoxyethane	110-71-4	1.27E-03	lb/ADTFP	Yes	4.38E-02	1.56E-01	No		
3-Carene	13466-78-9	1.23E-04	lb/ADTFP	Yes	4.24E-03	1.51E-02	No		
Acetaldehyde	75-07-0	1.21E-02	lb/ADTFP	Yes	4.17E-01	1.48E+00	Yes	4.17E-01	1.48E+00
alpha-Pinene	80-56-8	5.38E-04	lb/ADTFP	Yes	1.86E-02	6.59E-02	No		
beta-Pinene	127-91-3	2.70E-03	lb/ADTFP	Yes	9.32E-02	3.31E-01	No		
Carbon Disulfide	75-15-0	1.93E-03	lb/ADTFP	Yes	6.66E-02	2.37E-01	Yes	6.66E-02	2.37E-01
Chloroform	67-66-3	2.29E-03	lb/ADTFP	Yes	7.90E-02	2.81E-01	Yes	7.90E-02	2.81E-01
Cumene	98-82-8	2.21E-03	lb/ADTFP	Yes	7.62E-02	2.71E-01	Yes	7.62E-02	2.71E-01
Formaldehyde	50-00-0	1.04E-02	lb/ADTFP	Yes	3.59E-01	1.27E+00	Yes	3.59E-01	1.27E+00
Limonene	5989-27-5	2.45E-05	lb/ADTFP	Yes	8.45E-04	3.00E-03	No		
Methanol	67-56-1	2.17E-02	lb/ADTFP	Yes	7.49E-01	2.66E+00	Yes	7.49E-01	2.66E+00
Methyl Ethyl Ketone	78-93-3	3.49E-05	lb/ADTFP	Yes	1.20E-03	4.28E-03	Yes	1.20E-03	4.28E-03
Methylene Chloride	75-09-2	3.09E-03	lb/ADTFP	Yes	1.07E-01	3.79E-01	Yes	1.07E-01	3.79E-01
Naphthalene	91-20-3	1.09E-05	lb/ADTFP	Yes	3.76E-04	1.34E-03	Yes	3.76E-04	1.34E-03
p-Cymene	99-87-6	5.07E-03	lb/ADTFP	Yes	1.75E-01	6.21E-01	No		
Phenol	108-95-2	3.18E-03	lb/ADTFP	Yes	1.10E-01	3.90E-01	Yes	1.10E-01	3.90E-01
Propionaldehyde	123-38-6	3.05E-03	lb/ADTFP	Yes	1.05E-01	3.74E-01	Yes	1.05E-01	3.74E-01
Toluene	108-88-3	2.59E-03	lb/ADTFP	Yes	8.94E-02	3.17E-01	Yes	8.94E-02	3.17E-01
				Total	2.49	8.86		**Total**	7.67

Note:

ADTFP: ton of air-dried finished product

Reference: Emission factors from 100% secondary fiber furnish (referencing 2009 Update Table B.1 for Mill KK)) from NCASI

Unit 4: Plant Water Treatment Chemicals

Chemicals are added into the process system and water treatment system to maintain the correct pH levels of the water. Systems measure the pH levels in the water then meter the needed chemicals. A review of these chemicals found some were VOC emission source and state TAPS emission sources. The following table lists the chemicals used in processing and water treatment processes.

Product	Purpose	Chemical Name	CAS#	% Concentration	VOC	HAPs	State TAP
Process Chemical							
AMA-115	Biocide	5-chloro-2-methyl-2H-isothiazolin-3-one	26172-55-4	2	No	No	No
		Magnesium nitrate	10377-60-3	2	No	No	No
AMA-140	Biocide	Sodium dimethyldithiocarbamate	128-04-1	40	No	No	No
AMA-150	Biocide	2,2-Dibromo-3-nitrilopropionamide	10222-01-2	20	No	No	No
		Polyethyleneglycol	25322-68-3	54.5	No	No	No
		dibromoacetonitrile	3252-43-5	3	No	No	No
		Sodium Bromide	7647-15-6	4	No	No	No
CIO2	Chlorine Dioxide, Aqueous Solution, 500 - 5,000 mg/L	Chlorine oxide	0010049-04-4	1	No	No	No
Fennoslip 50					No	No	No
Fennotech 2543	Deformer				No	No	No
Fennobond 3300	Additive in paper industry, Modified polyacrylamide	Glyoxal	107-22-2	1	Yes	No	No
Fennofloc ZN 029	Water treatment chemical	Polyaluminium chloride	1327-41-9	40	No	No	No
Fennopol K 7905	Flocculating agent	Adipic acid	124-04-9	5	No	No	No
FennoSil 2185	Amorphous Silica, aqueous colloidal solution				No	No	No
FennoSize KD 166MB	Internal sizing agent	Aluminium sulphate	10043-01-3	3	No	No	No
FennoPas 8850	Process aid for industrial applications				No	No	No
FennoSan Q-10	Biocide	Alkyldimethylbenzyl ammonium chloride	68391-01-5	10	No	No	No
		Isopropanol (Isopropyl Alcohol)	67-63-0	2	Yes	No	Yes
FennoSurf 586	Precursor for biocide generation	Ammonium sulphate	7783-20-2	29.5	No	No	No
Water Treatment Chemicals							
Citric Acid		Citric Acid, Anhydrous	77-92-9	10	No	No	No
MEMCLEAN EXA2	caustic soda	sodium hydroxide	1310-73-2	50	No	No	Yes
		Citric Acid	77-92-9	5	No	No	No
		Sodium Gluconate	527-07-1	5	No	No	No
PerForm™ PC1448	Flocculating agent	ALIPHATIC HYDROCARBON			No	No	No
		ALCOHOL ALKOXYLATES			No	No	No

Product	Purpose	Chemical Name	CAS#	% Concentration	VOC	HAPs	State TAP
PerForm™ PC1370	Retention/Drainage/Clarification Aid				No	No	No
Sodium Chlorite Solution	Bleaching of textiles and other fibers	Sodium Chlorite	7758-19-2	41	No	No	No
Spectrum™ XD9400	Microbiocide Agent				No	No	No
Spectrum™ RX5080	Microbiocide Agent	2,2 DIBROMO-3-NITRILOPROPIONAMIDE	10222-01-2	30	No	No	No
		DIBROMOACETONITRILE	3252-43-5	5	No	No	No
Sulfuric Acid 93%		Sulfuric Acid	7664-93-9	93	No	No	Yes
Urea Solution	Diesel exhaust fluid	Urea	57-13-6	40	No	No	No
		Ammonia	7664-41-7	0.1	No	No	Yes

The chemicals that have components that are regulated pollutants were calculated based on the annual usage of these chemicals, the percent of concentration for the component, the density of the chemical, and the percentage consumed in the process. Since the chemicals are only added as needed to maintain the correct chemical composition of the treated water, it is estimated that 99 percent of the chemical will be consumed in the process. Example equation:

Chemical Annual Usage (gallons/yr) * percent of component (%)/100 * density (lbs/gal) * percentage consumed (100 - %)/100 = Emission Rate (lbs/yr)

Fennobond 3300 Usage - 105,000 gallons/yr * percent of component 1%/100 * density 8.345 lbs/gal * percentage consumed (100-99%)/100 = 87.62 lbs/yr

Table 6-4: PER and PTE Chemical Usage Fugitive Emission Rates

Product	Regulated Pollutant	Annual Usage (gallons)	Component Usage (gallons)	Density (lbs/gal)	Mass Usage (lbs/yr)	Percentage Consumed	Emission Rate (lbs/yr)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
Fennobond 3300	VOC	105,000	1,050	8.345	8762.3	99	87.62	0.010	0.044
FennoSan Q-10	VOC, State TAP	4,350	87	8	696.0	99	6.96	0.00079	0.0035
MEMCLEAN EXA2	State TAP	1,550	775	8.345	6467.4	99	64.67	0.0074	0.032
Sulfuric Acid 93%	State TAP	5,300	4,929	15.303	75428.5	99	754.28	0.086	0.38
Urea Solution	State TAP	55,000	55	9.4	517.0	99	5.17	0.00059	0.0026

Unit 5: Water Recovery Cooling Tower

Cooling tower particulate emission calculations based on the NMED Policy "Calculating PM, PM-10 and PM2.5 from Cooling Towers" dated June 25, 2013.

Cooling Tower PM Calculation

TDS=	1000	mg/l
rho Salt	2.5	

Droplet Diameter um	Droplet Volume (um)3	Droplet Mass ug	PM Mass ug	PM Volume (um)3	Solid Diameters um	Mass Fraction %
10	523.6	0.001	5.24E-07	0.2	0.7	0.000
20	4188.7	0.004	4.19E-06	1.7	1.5	0.196
30	14136.8	0.014	1.41E-05	5.7	2.2	0.226
40	33509.5	0.034	3.35E-05	13.4	2.9	0.514
50	65448.2	0.065	6.54E-05	26.2	3.7	1.816
60	113094.4	0.113	1.13E-04	45.2	4.4	5.702
70	179589.7	0.180	1.80E-04	71.8	5.2	21.348
90	381693.6	0.382	3.82E-04	152.7	6.6	48.812
110	696892.0	0.697	6.97E-04	278.8	8.1	70.509
130	1150316.8	1.150	1.15E-03	460.1	9.6	82.023
150	1767100.2	1.767	1.77E-03	706.8	11.1	88.012
180	3053549.1	3.054	3.05E-03	1221.4	13.3	91.032
210	4848922.9	4.849	4.85E-03	1939.6	15.5	92.468
240	7238042.4	7.238	7.24E-03	2895.2	17.7	94.091
270	10305728.3	10.306	1.03E-02	4122.3	19.9	94.689
300	14136801.6	14.137	1.41E-02	5654.7	22.1	96.288
350	22448717.3	22.449	2.24E-02	8979.5	25.8	97.011
400	33509455.6	33.509	3.35E-02	13403.8	29.5	98.340
450	47711705.3	47.712	4.77E-02	19084.7	33.2	99.071
500	65448155.4	65.448	6.54E-02	26179.3	36.8	99.071
600	113094412.6	113.094	1.13E-01	45237.8	44.2	100.000

PM diameter closest to 30 µm gives a mass fraction of 98.3%.

PM10 diameters closest to 10 µm gives a mass fraction of 82.0%.

PM2.5 diameters closest to 10 µm gives a mass fraction of 0.226%.

PMtotal = TDS(mg/l) x 1(lbs/mg)/453600 x 3.785(l/gal) x Qcirc(gpm) x Qdrift(%Qcirc)/100 x 60(min/hr)

Qdrift = 0.02% (Manufacturer Number)
Qcirc = Circulating Water = 1360 gallons/minute
TDS = 1000 mg/l

PMtotal = 1000(mg/l) x 1(lbs/mg)/453600 x 3.785(l/gal) x 1360(gpm) x 0.02%/100 x 60(min/hr) = 0.14 lb/hr

PM:

Emission Equation:

E_{hr} = PMtotal (lbs/hr) * PM mass fraction

PMtotal = 0.14 lbs/hr
PM mass fraction = 98.3%

E_{hr} = 0.14 lbs/hr * 98.3% = 0.13 lbs/hr
E_{yr} = 0.13 lbs/hr *8760/2000 lbs/ton = 0.59 tons/yr

PM10:

Emission Equation:

E_{hr} = PMtotal (lbs/hr) * PM_{10} mass fraction

PMtotal = 0.14 lbs/hr
PM10 mass fraction = 82.0%

E_{hr} = 0.14 lbs/hr * 82.3% = 0.11 lbs/hr
E_{yr} = 0.11 lbs/hr *8760/2000 lbs/ton = 0.49 tons/yr

PM2.5:

Emission Equation:

E_{hr} = PMtotal (lbs/hr) * $PM_{2.5}$ mass fraction

PMtotal = 0.14 lbs/hr
$PM_{2.5}$ mass fraction = 0.226%

E_{hr} = 0.14 lbs/hr * 0.226% = 0.00031 lbs/hr
E_{yr} = 0.00031 lbs/hr *8760/2000 lbs/ton = 0.0013 tons/yr

Unit 6: Vacuum Pump Cooling Tower

Cooling tower particulate emission calculations based on the NMED Policy "Calculating PM, PM-10 and PM2.5 from Cooling Towers" dated June 25, 2013.

Cooling Tower PM Calculation

TDS=	800	mg/l
rho Salt	2.5	

Droplet Diameter um	Droplet Volume (um)3	Droplet Mass ug	PM Mass ug	PM Volume (um)3	Solid Diameters um	Mass Fraction %
10	523.6	0.001	4.19E-07	0.2	0.7	0.000
20	4188.7	0.004	3.35E-06	1.3	1.4	0.196
30	14136.8	0.014	1.13E-05	4.5	2.1	0.226
40	33509.5	0.034	2.68E-05	10.7	2.7	0.514
50	65448.2	0.065	5.24E-05	20.9	3.4	1.816
60	113094.4	0.113	9.05E-05	36.2	4.1	5.702
70	179589.7	0.180	1.44E-04	57.5	4.8	21.348
90	381693.6	0.382	3.05E-04	122.1	6.2	48.812
110	696892.0	0.697	5.58E-04	223.0	7.5	70.509
130	1150316.8	1.150	9.20E-04	368.1	8.9	82.023
150	1767100.2	1.767	1.41E-03	565.5	10.3	88.012
180	3053549.1	3.054	2.44E-03	977.1	12.3	91.032
210	4848922.9	4.849	3.88E-03	1551.7	14.4	92.468
240	7238042.4	7.238	5.79E-03	2316.2	16.4	94.091
270	10305728.3	10.306	8.24E-03	3297.8	18.5	94.689
300	14136801.6	14.137	1.13E-02	4523.8	20.5	96.288
350	22448717.3	22.449	1.80E-02	7183.6	23.9	97.011
400	33509455.6	33.509	2.68E-02	10723.0	27.4	98.340
450	47711705.3	47.712	3.82E-02	15267.7	30.8	99.071
500	65448155.4	65.448	5.24E-02	20943.4	34.2	99.071
600	113094412.6	113.094	9.05E-02	36190.2	41.0	100.000

PM diameter closest to 30 µm gives a mass fraction of 99.1%.

PM10 diameters closest to 10 µm gives a mass fraction of 88.0%.

PM2.5 diameters closest to 10 µm gives a mass fraction of 0.514%.

PMtotal = TDS(mg/l) x 1(lbs/mg)/453600 x 3.785(l/gal) x Qcirc(gpm) x Qdrift(%Qcirc)/100 x 60(min/hr)

Qdrift = 0.005% (Manufacturer Number)
Qcirc = Circulating Water = 1300 gallons/minute
TDS = 800 mg/l

PMtotal = 800(mg/l) x 1(lbs/mg)/453600 x 3.785(l/gal) x 1300(gpm) x 0.005%/100 x 60(min/hr) = 0.026 lb/hr

PM:

Emission Equation:

E_{hr} = PMtotal (lbs/hr) * PM mass fraction

PMtotal = 0.026 lbs/hr

PM mass fraction = 99.1%

E_{hr} = 0.026 lbs/hr * 99.1% = 0.026 lbs/hr

E_{yr} = 0.026 lbs/hr *8760/2000 lbs/ton = 0.11 tons/yr

PM10:

Emission Equation:

E_{hr} = PMtotal (lbs/hr) * PM_{10} mass fraction

PMtotal = 0.026 lbs/hr

PM10 mass fraction = 88.0%

E_{hr} = 0.026 lbs/hr * 88.0% = 0.023 lbs/hr

E_{yr} = 0.023 lbs/hr *8760/2000 lbs/ton = 0.10 tons/yr

PM2.5:

Emission Equation:

E_{hr} = PMtotal (lbs/hr) * $PM_{2.5}$ mass fraction

PMtotal = 0.026 lbs/hr

$PM_{2.5}$ mass fraction = 0.514%

E_{hr} = 0.026 lbs/hr * 0.514% = 0.00013 lbs/hr

E_{yr} = 0.00013 lbs/hr *8760/2000 lbs/ton = 0.00059 tons/yr

Unit 7: Alley Cooling Tower

Cooling tower particulate emission calculations based on the NMED Policy "Calculating PM, PM-10 and PM2.5 from Cooling Towers" dated June 25, 2013.

Cooling Tower PM Calculation

TDS=	1150	mg/l
rho Salt	2.5	

Droplet Diameter um	Droplet Volume (um)3	Droplet Mass ug	PM Mass ug	PM Volume (um)3	Solid Diameters um	Mass Fraction %
10	523.6	0.001	6.02E-07	0.2	0.8	0.000
20	4188.7	0.004	4.82E-06	1.9	1.5	0.196
30	14136.8	0.014	1.63E-05	6.5	2.3	0.226
40	33509.5	0.034	3.85E-05	15.4	3.1	0.514
50	65448.2	0.065	7.53E-05	30.1	3.9	1.816
60	113094.4	0.113	1.30E-04	52.0	4.6	5.702
70	179589.7	0.180	2.07E-04	82.6	5.4	21.348
90	381693.6	0.382	4.39E-04	175.6	6.9	48.812
110	696892.0	0.697	8.01E-04	320.6	8.5	70.509
130	1150316.8	1.150	1.32E-03	529.1	10.0	82.023
150	1767100.2	1.767	2.03E-03	812.9	11.6	88.012
180	3053549.1	3.054	3.51E-03	1404.6	13.9	91.032
210	4848922.9	4.849	5.58E-03	2230.5	16.2	92.468
240	7238042.4	7.238	8.32E-03	3329.5	18.5	94.091
270	10305728.3	10.306	1.19E-02	4740.6	20.8	94.689
300	14136801.6	14.137	1.63E-02	6502.9	23.2	96.288
350	22448717.3	22.449	2.58E-02	10326.4	27.0	97.011
400	33509455.6	33.509	3.85E-02	15414.3	30.9	98.340
450	47711705.3	47.712	5.49E-02	21947.4	34.7	99.071
500	65448155.4	65.448	7.53E-02	30106.2	38.6	99.071
600	113094412.6	113.094	1.30E-01	52023.4	46.3	100.000

PM diameter closest to 30 µm gives a mass fraction of 98.3%.

PM10 diameters closest to 10 µm gives a mass fraction of 82.0%.

PM2.5 diameters closest to 10 µm gives a mass fraction of 0.226%.

PMtotal = TDS(mg/l) x 1(lbs/mg)/453600 x 3.785(l/gal) x Qcirc(gpm) x Qdrift(%Qcirc)/100 x 60(min/hr)

Qdrift = 0.02% (Manufacturer Number)
Qcirc = Circulating Water = 850 gallons/minute
TDS = 1150 mg/l

PMtotal = 1150(mg/l) x 1(lbs/mg)/453600 x 3.785(l/gal) x 850(gpm) x 0.02%/100 x 60(min/hr) = 0.098 lb/hr

PM:

Emission Equation:

E_{hr} = PMtotal (lbs/hr) * PM mass fraction

PMtotal = 0.098 lbs/hr
PM mass fraction = 98.3%

E_{hr} = 0.098 lbs/hr * 98.3% = 0.096 lbs/hr
E_{yr} = 0.096 lbs/hr *8760/2000 lbs/ton = 0.42 tons/yr

PM10:

Emission Equation:

E_{hr} = PMtotal (lbs/hr) * PM_{10} mass fraction

PMtotal = 0.098 lbs/hr
PM10 mass fraction = 82.0%

E_{hr} = 0.098 lbs/hr * 82.0% = 0.080 lbs/hr
E_{yr} = 0.080 lbs/hr *8760/2000 lbs/ton = 0.35 tons/yr

PM2.5:

Emission Equation:

E_{hr} = PMtotal (lbs/hr) * $PM_{2.5}$ mass fraction

PMtotal = 0.098 lbs/hr
$PM_{2.5}$ mass fraction = 0.226%

E_{hr} = 0.098 lbs/hr * 0.226% = 0.00022 lbs/hr
E_{yr} = 0.00022 lbs/hr *8760/2000 lbs/ton = 0.0010 tons/yr

Unit 8: Soda Ash Silo Loading

Soda ash is delivered to the water treatment facility to be used in the water treatment process. The annual throughput of soda ash is 3203 tons per year. Soda ash delivery truck silo loading rate is 25 tons per hour. PER particulate emissions for silo loading are based on AP-42 Section 11.12 "Concrete Batching" Table 11.12-2 "Cement Unloading to Elevated Storage Silo". PTE particulate emission rates are based on a control efficiency of the silo dust collector of 99.5%.

PER emissions based on AP-42 Section 11.12 "Concrete Batching" Table 11.12-2 "Cement Unloading to Elevated Storage Silo"

E(PM) =	0.73	lbs/ton	PER Soda Ash Silo Loading PM
E(PM10) =	0.47	lbs/ton	PER Soda Ash Silo Loading PM10
E(PM2.5) =	0.047	lbs/ton	PER Soda Ash Silo Loading PM2.5 (PM * 0.06441; Table 11.12-4 Uncontrolled)

Max tph Soda Ash Silo	25	tph Max	3203.00	tons/yr

	lb/hr	tons/yr
E(PM) uncontrolled	18.25	1.17
E(pm10) uncontrolled	11.75	0.75
E(pm2.5) uncontrolled	1.18	0.075

Dust Collector Control Efficiency	99.5	% Present Permit Requirement for PEGS

PTE emissions based on AP-42 Section 11.12 "Concrete Batching" Table 11.12-2 "Cement Unloading to Elevated Storage Silo" and %CE

E(PM) =	0.73	lbs/ton	PTE Soda Ash Silo Loading PM
E(PM10) =	0.47	lbs/ton	PTE Soda Ash Silo Loading PM10
E(PM2.5) =	0.1153	lbs/ton	PTE Soda Ash Silo Loading PM2.5 (PM * 0.1579; Table 11.12-4 Controlled K factors)

	lb/hr	tons/yr
E(PM) controlled	0.09125	0.0058
E(pm10) controlled	0.05875	0.0038
E(pm2.5) controlled	0.01441	0.0009

Unit 9: Soda Ash Silo Unloading

Soda ash is delivered to the water treatment facility to be used in the water treatment process. The soda ash is stored in a storage silo until metered into the water treatment process. The annual throughput of soda ash is 3203 tons per year. PER particulate emissions are based on AP-42 Section 13.2.4 (ver 11/06) emission equations. Two input parameters in to the emission equation are wind speed and material moisture content. Based on meteorological data collected at the Tri-State PEGS facility, the average annual wind speed is 7.22 miles per hour. The estimated moisture content for the soda ash is 1%. PTE particulate emission rates are based on a control efficiency for unloading of silos into an enclosed building of 80%. Hourly emission rates are based on the annual emission rate divided by 8760 hours per year.

Soda Ash Silo Unloading

AP-42 13.2.4 (ver 11/06)

E = k x (0.0032) x (U/5)^1.3 / (M/2)^1.4 lbs/ton

Soda Ash Delivered	3203	ton/yr	
k(tsp)	0.74		
k(pm10)	0.35		
k(pm2.5)	0.053		
U Ave	7.22	MPH	Site Ave WS
M	1	%	Soda Ash Moisture Content

	lbs/hr	tons/yr
Uncontrolled TSP	0.0037	0.0161
Uncontrolled PM10	0.0017	0.0076
Uncontrolled PM2.5	0.0003	0.0012

% Control Efficiency 80 % *Enclosure*

	lbs/hr	tons/yr
Controlled TSP	0.000737	0.003227
Controlled PM10	0.000348	0.001526
Controlled PM2.5	0.000053	0.000231

Unit 10: Lime Silo Loading

Lime is delivered to the water treatment facility to be used in the water treatment process. The annual throughput of lime is 2212 tons per year. Lime delivery truck silo loading rate is 25 tons per hour. PER particulate emissions for silo loading are based on AP-42 Section 11.12 "Concrete Batching" Table 11.12-2 "Cement Unloading to Elevated Storage Silo". PTE particulate emission rates are based on a control efficiency of the silo dust collector of 99.5%.

PER emissions based on AP-42 Section 11.12 "Concrete Batching" Table 11.12-2 "Cement Unloading to Elevated Storage Silo"

E(PM) =	0.73	lbs/ton	PER Lime Silo Loading PM
E(PM10) =	0.47	lbs/ton	PER Lime Silo Loading PM10
E(PM2.5) =	0.047	lbs/ton	PER Lime Silo Loading PM2.5 (PM * 0.06441; Table 11.12-4 Uncontrolled)

Max tph Lime Silo	25	tph Max	3203.00	tons/yr controlled

	lb/hr	tons/yr
E(PM) uncontrolled	18.25	0.81
E(pm10) uncontrolled	11.75	0.52
E(pm2.5) uncontrolled	1.18	0.052

Dust Collector Control Efficiency 99.5 % Present Permit Requirement for PEGS

PTE emissions based on AP-42 Section 11.12 "Concrete Batching" Table 11.12-2 "Cement Unloading to Elevated Storage Silo" and %CE

E(PM) =	0.73	lbs/ton	PTE Lime Silo Loading PM
E(PM10) =	0.47	lbs/ton	PTE Lime Silo Loading PM10
E(PM2.5) =	0.1153	lbs/ton	PTE Lime Silo Loading PM2.5 (PM * 0.1579; Table 11.12-4 Controlled K factors)

	lb/hr	tons/yr
E(PM) controlled	0.09125	0.0040
E(pm10) controlled	0.05875	0.0026
E(pm2.5) controlled	0.01441	0.0006

Unit 11: Lime Silo Unloading

Lime is delivered to the water treatment facility to be used in the water treatment process. The lime is stored in a storage silo until metered into the water treatment process. The annual throughput of lime is 2212 tons per year. PER particulate emissions are based on AP-42 Section 13.2.4 (ver 11/06) emission equations. Two input parameters in to the emission equation are wind speed and material moisture content. Based on meteorological data collected at the Tri-State PEGS facility, the average annual wind speed is 7.22 miles per hour. The estimated moisture content for the lime is 1%. PTE particulate emission rates are based on a control efficiency for unloading of silos into an enclosed building of 80%. Hourly emission rates are based on the annual emission rate divided by 8760 hours per year.

Lime Silo Unloading

AP-42 13.2.4 (ver 11/06)

E = k x (0.0032) x (U/5)^1.3 / (M/2)^1.4 lbs/ton

Lime Delivered	2212	ton/yr	
k(tsp)	0.74		
k(pm10)	0.35		
k(pm2.5)	0.053		
U Ave	7.22	MPH	Site Ave WS
M	1	%	Soda Ash Moisture Content

	lbs/hr	tons/yr
Uncontrolled TSP	0.0037	0.0161
Uncontrolled PM10	0.0017	0.0076
Uncontrolled PM2.5	0.0003	0.0012

% Control Efficiency 80 % *Enclosure*

	lbs/hr	tons/yr
Controlled TSP	0.000737	0.003227
Controlled PM10	0.000348	0.001526
Controlled PM2.5	0.000053	0.000231

Unit 12: Main Boiler

The main boiler is a new steam boiler that will be the main source of steam for MPC. The main boiler is rated at 166.8 MMBtu per hour. It will be permitted to operate 8760 hours per year. Emission rates are based on the worst-case of either regulatory emission limits or manufacturer. For NOx, Subpart Db emission limits were used in the application.

Hours per year	8760	hour/year		
Heat Input	166.8	MMBtu/yr	1461168.0	MMBtu/yr
Natural Gas Usage	169,685	scf/hr	Based on 983 LHV Btu/scf	
Natural Gas Usage	0.1697	MMscf/hr		
Natural Gas Usage	1486.4	MMscf/yr		

Manufacturer's specifications:

NOx	30	PPM
	0.036	lbs/MMBtu
NOx	6.00	lbs/hr
	26.30	tons/yr

EPA Subpart Db Limit	
0.10	lbs/MMBtu
16.68	lbs/hr
73.1	tons/yr

Manufacturer's specifications:

CO	50	PPM
	0.037	lbs/MMBtu
CO	6.17	lbs/hr
	27.03	tons/yr

SO_2 emission rate is based on a sulfur (S) content for natural gas of 0.5 grains S/100 scf gas

SO_2 = 0.5 grains S/100 scf * 169.685 100 scf/hr / 7000grain/lb * 2 S/SO2 = 0.24 lbs/hr
0.24 lbs/hr * 8760 hrs/yr / 2000 lbs/ton = 1.06 tons/yr

These emission factors are based on AP-42 Section 1.4 Natural Gas Utility Boilers >100 MMbtu/hr input and Manufacturer's specifications.

AP-42 Section 1.4:
PM_{10} (filterable) = 1.9 lb/million cu. ft. gas (filterable)
PM_{10} (total) = 7.6 lb/million cu. ft. gas (filterable plus condensable)
VOC = 5.5 lb/million cu. ft. gas

Based on the above emission numbers and the maximum heat input of 166.8 MMbtu/hr and 0.1697 MMscf/hr gas flow rate the following are the emissions calculations using AP-42.

PM (filterable) = 1.9 lb/million cu. ft. gas * 0.1697 million cu. ft. gas/hr = 0.32 lbs/hr
0.32 lbs/hr * 8760 hrs/yr / 2000 lbs/ton = 1.41 tons/yr

PM (total) = 7.6 lb/million cu. ft. gas *0.1697 million cu. ft. gas/hr = 1.29 lbs/hr
1.29 lbs/hr * 8760 hrs/yr / 2000 lbs/ton = 4.09 tons/yr

PM = PM_{10} = $PM_{2.5}$

VOC = 5.5 lb/million cu. ft. gas *0.1697 million cu. ft. gas/hr = 0.93 lbs/hr
0.93 lbs/hr * 8760 hrs/yr / 2000 lbs/ton = 4.09 tons/yr

HAP Emissions

Main boiler HAP emissions have been calculated using AP42 emission factors (AP42 1.4, 7/98) and 0. 1697 million cu. ft. gas/hr.

HAPs	Emission Factor million cu. ft. gas	Emissions lb/hr	Emissions tpy
SPECIATED ORGANIC COMPOUNDS			
Benzene	2.10E-03	0.00036	0.00156
Formaldehyde	7.50E-02	0.01273	0.05574
Hexane	1.80E+00	0.30543	1.33779
Naphthalene	6.10E-04	0.00010	0.00045
Toluene	3.40E-03	0.00058	0.00253
METALS			
Arsenic	2.00E-04	0.00003	0.00015
Beryllium	1.20E-05	0.00000	0.00001
Cadmium	1.10E-03	0.00019	0.00082
Chromium	1.40E-03	0.00024	0.00104
Cobalt	8.40E-05	0.00001	0.00006
Lead	5.00E-04	0.00008	0.00037
Manganese	3.80E-04	0.00006	0.00028
Mercury	2.60E-04	0.00004	0.00019
Nickel	2.10E-03	0.00036	0.00156
Selenium	2.40E-05	0.00000	0.00002
	Total HAPs	**0.32**	**1.40**

TAP Emissions

Main boiler state TAP emissions have been calculated using AP42 emission factors (AP42 1.4, 7/98) and 0. 1697 million cu. ft. gas/hr.

State TAPs	Emission Factor million cu. ft. gas	Emissions lb/hr	Emissions tpy
Barium	4.40E-03	0.00075	0.00327
Copper	8.50E-04	0.00014	0.00063
Molybdenum	1.10E-03	0.00019	0.00082
Vanadium	2.30E-03	0.00039	0.00171
Zinc	2.90E-02	0.00492	0.02155
	Total TAPs	**0.0064**	**0.028**

Unit 13: Auxiliary Boiler

The auxiliary boiler will provide a backup source of steam for MPC if the main boiler is offline. The auxiliary boiler is rated at 190.0 MMBtu per hour. It will be permitted to operate 8760 hours per year, but only one boiler (either Unit 12 or Unit 13) will operate at any one time. Emission rates are based on the worst-case of either regulatory emission limits or manufacturer. For NOx, Subpart Db emission limits were used in the application.

Hours per year	8760	hour/year		
Heat Input	190.0	MMBtu/yr	1664400.0	MMBtu/yr
Natural Gas Usage	193,286	scf/hr	Based on 983 LHV Btu/scf	
Natural Gas Usage	0.1933	MMscf/hr		
Natural Gas Usage	1693.2	MMscf/yr		

Present Permit Emission Rate per PEGS Permit:

NOx	11.4	lbs/hr
	49.9	tons/yr

EPA Subpart Db Limit	
0.10	lbs/MMBtu
19.00	lbs/hr
83.2	tons/yr

Manufacturer's specifications:

CO	100	PPM
Mass Rate of Flue Gas	174000	lbs/hr
CO	17.4	lbs/hr
	76.2	tons/yr

SO_2 emission rate is based on a sulfur (S) content for natural gas of 0.5 grains S/100 scf gas

SO_2 = 0.5 grains S/100 scf * 193.286 100 scf/hr / 7000grain/lb * 2 S/SO2 = 0.28 lbs/hr
0.28 lbs/hr * 8760 hrs/yr / 2000 lbs/ton = 1.21 tons/yr

These emission factors are based on AP-42 Section 1.4 Natural Gas Utility Boilers >100 MMbtu/hr input and Manufacturer's specifications.

AP-42 Section 1.4:
PM_{10} (filterable) = 1.9 lb/million cu. ft. gas (filterable)
PM_{10} (total) = 7.6 lb/million cu. ft. gas (filterable plus condensable)
VOC = 5.5 lb/million cu. ft. gas

Based on the above emission numbers and the maximum heat input of 190.0 MMbtu/hr and 0.1933 MMscf/hr gas flow rate the following are the emissions calculations using AP-42.

PM (filterable) = 1.9 lb/million cu. ft. gas * 0. 1933 million cu. ft. gas/hr = 0.37 lbs/hr
0.32 lbs/hr * 8760 hrs/yr / 2000 lbs/ton = 1.61 tons/yr

PM (total) = 7.6 lb/million cu. ft. gas *0. 1933 million cu. ft. gas/hr = 1.47 lbs/hr
1.29 lbs/hr * 8760 hrs/yr / 2000 lbs/ton = 6.43 tons/yr

PM = PM_{10} = $PM_{2.5}$

VOC = 5.5 lb/million cu. ft. gas *0. 1933 million cu. ft. gas/hr = 1.06 lbs/hr
0.93 lbs/hr * 8760 hrs/yr / 2000 lbs/ton = 4.66 tons/yr

HAP Emissions

Main boiler HAP emissions have been calculated using AP42 emission factors (AP42 1.4, 7/98) and 0.1933 million cu. ft. gas/hr.

HAPs	Emission Factor million cu. ft. gas	Emissions lb/hr	Emissions tpy
SPECIATED ORGANIC COMPOUNDS			
Benzene	2.10E-03	0.00041	0.00178
Formaldehyde	7.50E-02	0.01450	0.06349
Hexane	1.80E+00	0.34791	1.52387
Naphthalene	6.10E-04	0.00012	0.00052
Toluene	3.40E-03	0.00066	0.00288
METALS			
Arsenic	2.00E-04	0.00004	0.00017
Beryllium	1.20E-05	0.00000	0.00001
Cadmium	1.10E-03	0.00021	0.00093
Chromium	1.40E-03	0.00027	0.00119
Cobalt	8.40E-05	0.00002	0.00007
Lead	5.00E-04	0.00010	0.00042
Manganese	3.80E-04	0.00007	0.00032
Mercury	2.60E-04	0.00005	0.00022
Nickel	2.10E-03	0.00041	0.00178
Selenium	2.40E-05	0.00000	0.00002
	Total HAPs	**0.36**	**1.60**

TAP Emissions

Main boiler state TAP emissions have been calculated using AP42 emission factors (AP42 1.4, 7/98) and 0.1933 million cu. ft. gas/hr.

State TAPs	Emission Factor million cu. ft. gas	Emissions lb/hr	Emissions tpy
Barium	4.40E-03	0.00085	0.00373
Copper	8.50E-04	0.00016	0.00072
Molybdenum	1.10E-03	0.00021	0.00093
Vanadium	2.30E-03	0.00044	0.00195
Zinc	2.90E-02	0.00561	0.02455
	Total TAPs	**0.0064**	**0.028**

Unit 14: Fire Pump Engine

Hours per year	500	hour/year	Emergency Engine Subpart ZZZZ			
AP-42 Section 3.3, Table 3.3-1		NOx, CO, VOC and PM Emissions				
Engine Size		kW		horsepower	375	bhp
	19.3	gal/hr		%sulfur	0.05	%

Fuel usage based on a rate of 0.36 lbs/bhp and a fuel density of 7.0 lbs/gal

Uncontrolled Hours	500
Controlled Hours	500

Emission Factors

NOx	0.03100	lbs/hp-hr
CO	0.00668	lbs/hp-hr
VOC	0.00247	lbs/hp-hr
SO2	0.13500	lbs/hr
PM	0.00220	lbs/hp-hr

SO2 emissions based on fuel usage gal/hr times 7.0 lbs/gal times fuel % sulfur content times a factor of 2.

Calculated PER Emissions

NOx	11.63	lbs/hr	2.91	tons/yr
CO	2.51	lbs/hr	0.63	tons/yr
VOC	0.93	lbs/hr	0.23	tons/yr
SO2	0.14	lbs/hr	0.034	tons/yr
PM	0.83	lbs/hr	0.21	tons/yr

Calculated PTE Emissions

NOx	11.63	lbs/hr	2.91	tons/yr
CO	2.51	lbs/hr	0.63	tons/yr
VOC	0.93	lbs/hr	0.23	tons/yr
SO2	0.14	lbs/hr	0.034	tons/yr
PM	0.83	lbs/hr	0.21	tons/yr

HAPs

Type of Fuel:	Diesel		
Emission Factors	AP-42 Section 3.3 and Section 1.3		
MMBtu/hr:	2.468571429	Btu	(based on 128000 Btu/gallon)
Btu x 10^-12/hr:	2.46857E-06	Btu x10^-12	(based on 128000 Btu/gallon)

Non-PAH HAPS	**CAS#**	**Emission Factor (lbs/MMBtu)**	**Emission Rate (lbs/hr)**	**Emission Rate (ton/yr)**
Acetalehyde	75-07-0	7.67E-04	0.001893	0.000473
Acrolein	107-02-8	9.25E-05	0.000228	0.000057
Benzene	71-43-2	9.33E-04	0.002303	0.000576
1,3-Butadiene	106-99-0	3.91E-05	0.000097	0.000024
Formaldehyde	50-00-0	1.18E-03	0.002913	0.000728
Propylene	115-07-1	2.58E-03	0.006369	0.001592
Toluene	108-88-3	4.09E-04	0.001010	0.000252
Xylene	1330-20-7	2.85E-04	0.000704	0.000176
Total Non-PAH HAPS		6.29E-03	0.015516	0.003879

PAH HAPS	**CAS#**	**Emission Factor (lbs/MMBtu)**	**Emission Rate (lbs/hr)**	**Emission Rate (ton/yr)**
Acenaphthene	83-32-9	1.42E-06	0.000004	0.000001
Acenaphthylene	208-96-8	5.06E-06	0.000012	0.000003
Anthracene	120-12-7	1.87E-06	0.000005	0.000001
Benzo(a)anthracene	56-55-3	1.68E-06	0.000004	0.000001
Benzo(a)pyrene	50-32-8	1.88E-07	0.000000	0.000000
Benzo(b)fluoranthene	205-99-2	9.91E-08	0.000000	0.000000
Benzo(a)pyrene	192-97-2	1.55E-07	0.000000	0.000000
Benzo(g,h,I)perylene	191-24-2	4.89E-07	0.000001	0.000000
Benzo(k)fluoranthene	207-08-9	1.55E-07	0.000000	0.000000
Dibenz(a,h)anthracene		5.83E-07	0.000001	0.000000
Chrysene	218-01-9	3.53E-07	0.000001	0.000000
Fluoranthene	206-44-0	7.61E-06	0.000019	0.000005
Fluorene	86-73-7	2.92E-05	0.000072	0.000018
Indeno(1,2,3-cd)pyrene	193-39-5	3.75E-07	0.000001	0.000000
Naphthalene	91-20-3	8.48E-05	0.000209	0.000052
Phenanthrene	85-01-8	2.94E-05	0.000073	0.000018
Pyrene	129-00-0	4.78E-06	0.000012	0.000003
	Total PAH HAPS	1.68E-04	0.000415	0.000104

HAPS Metals		**Emission Factor (lbs/Btu^12)**	**Emission Rate (lbs/hr)**	**Emission Rate (ton/yr)**
Arsenic		4	0.000010	0.000002
Beryllium		3	0.000007	0.000002
Cadmium		3	0.000007	0.000002
Chromium		3	0.000007	0.000002
Lead		9	0.000022	0.000006
Manganese		6	0.000015	0.000004
Mercury		3	0.000007	0.000002
Nickel		3	0.000007	0.000002
Selenium		15	0.000037	0.000009
	Total Metals HAPS	49	0.000121	0.000030
	Total HAPS		**0.01605**	**0.00401**

State Toxics
Type of Fuel:
Emission Factors

TAPS	Emission Factor (lbs/Btu^-12)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)	20.2.72.502 Table A (lbs/hr)	% of Limit
Cadmium	3	0.00001	0.0000019	0.003330	0.2%
Chromium	3	0.00001	0.0000019	1.003330	0.0%
Copper	6	0.00001	0.0000037	2.003330	0.0%
Manganese	6	0.00001	0.0000037	3.003330	0.0%
Nickel	3	0.00001	0.0000019	4.003330	0.0%
Selenium	15	0.00004	0.0000093	5.003330	0.0%
Zinc	4	0.00001	0.0000025	6.003330	0.0%
	Total TAPS	**0.00010**	**0.0000247**		

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)

Unit 12: Main Boiler

Greenhouse Gas Emissions

Greenhouse gas emissions were calculated using emission factors found in EPA's Emission Factors for Greenhouse Gas Inventories (Modified 03/09/2018) Table 1.

Pollutant	Emission Factor (kg/MMBtu)	Equivalence Factor
Carbon Dioxide	53.02	1
Methane	0.001	25
Nitrous Oxide	0.0001	298

The maximum heat input rating of the main boiler is 1,461,168 MMBtu/yr. To convert from kg to pounds, a factor of 2.20462 kg/lbs was used. The maximum operating hours is 8760 hour/year.

Pollutant	Emission Factor (kg/MMBtu)	Emission (lbs/hr)	Emission (tons/year)	CO_2e Emissions (tons/yr)
Carbon Dioxide	53.02	19497	85397	85397
Methane	0.001	0.37	1.61	40
Nitrous Oxide	0.0001	0.037	0.16	48
	Total GHGs	**19497**	**85399**	**85485**

Unit 13: Auxiliary Boiler

Greenhouse Gas Emissions

Greenhouse gas emissions were calculated using emission factors found in EPA's Emission Factors for Greenhouse Gas Inventories (Modified 03/09/2018) Table 1.

Pollutant	Emission Factor (kg/MMBtu)	Equivalence Factor
Carbon Dioxide	53.02	1
Methane	0.001	25
Nitrous Oxide	0.0001	298

The maximum heat input rating of the auxiliary boiler is 1,664,400 MMBtu/yr. To convert from kg to pounds, a factor of 2.20462 kg/lbs was used. The maximum operating hours is 8760 hour/year.

Pollutant	Emission Factor (kg/MMBtu)	Emission (lbs/hr)	Emission (tons/year)	CO_2e Emissions (tons/yr)
Carbon Dioxide	53.02	22209	97275	97275
Methane	0.001	0.42	1.83	46
Nitrous Oxide	0.0001	0.042	0.18	55
	Total GHGs	**22209**	**97277**	**97376**

Unit 14: Fire Pump Engine

Greenhouse Gas Emissions

Greenhouse gas emissions were calculated using emission factors found in EPA's Emission Factors for Greenhouse Gas Inventories (Modified 03/09/2018) Table 1.

Pollutant	Emission Factor (g/gallon)	Equivalence Factor
Carbon Dioxide	10210	1
Methane	0.41	25
Nitrous Oxide	0.0001	298

The maximum diesel fuel usage of the fire pump is 19.3 gallon/hr or 9650 gallons/yr. To convert from grams to pounds, a factor of 2204.62 g/lbs was used. The maximum operating hours is 500 hour/year.

Pollutant	Emission Factor (g/gallon)	Emission (lbs/hr)	Emission (tons/year)	CO_2e Emissions (tons/yr)
Carbon Dioxide	10210	957.02	239.26	239
Methane	0.41	0.038	0.010	0.24
Nitrous Oxide	0.0001	0.000009	0.000002	0.00070
	Total GHGs	**957**	**239**	**239**

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.
- **X** 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.

A-XXXX-7-AP42S1-4	Natural Gas HAPs Emission Factors
A-XXXX-7-AP42S1-3	Diesel-Fired Engine HAPs Emission Factors
A-XXXX-7-AP42S3-3	Diesel-Fired Engine HAPs Emission Factors
A-XXXX-7-AP42S3-4	Diesel-Fired Engine HAPs Emission Factors
A-XXXX-7-AP42S11-12	Soda Ash and Lime Silos Emission Factors
A-XXXX-7-AP42S13-2-1	Paved Road Emission Factors
A-XXXX-7-AP42S13-2-4	Soda Ash and Lime Material Handling Emission Factors
A-XXXX-7-FirePump	Fire Pump Manufacturer Spec Sheet
A-XXXX-7-GHG	EPA GHG Emission Factors
A-XXXX-7-MainBoiler	Main Boiler Manufacturer Spec Sheet
A-XXXX-7-CoolTower	NMED Cooling Tower Policy
A-XXXX-7-NCASI-TB973	OCC Processing Emission Factors
A-XXXX-7- NCASI-TableB1	Paper Machine Emission Factors
A-XXXX-7-EI.xls	MPC Emissions Spreadsheet (Electronic File)

A-XXXX-7-AP42S1-4

1.4 Natural Gas Combustion

1.4.1 General[1-2]

Natural gas is one of the major combustion fuels used throughout the country. It is mainly used to generate industrial and utility electric power, produce industrial process steam and heat, and heat residential and commercial space. Natural gas consists of a high percentage of methane (generally above 85 percent) and varying amounts of ethane, propane, butane, and inerts (typically nitrogen, carbon dioxide, and helium). The average gross heating value of natural gas is approximately 1,020 British thermal units per standard cubic foot (Btu/scf), usually varying from 950 to 1,050 Btu/scf.

1.4.2 Firing Practices[3-5]

There are three major types of boilers used for natural gas combustion in commercial, industrial, and utility applications: watertube, firetube, and cast iron. Watertube boilers are designed to pass water through the inside of heat transfer tubes while the outside of the tubes is heated by direct contact with the hot combustion gases and through radiant heat transfer. The watertube design is the most common in utility and large industrial boilers. Watertube boilers are used for a variety of applications, ranging from providing large amounts of process steam, to providing hot water or steam for space heating, to generating high-temperature, high-pressure steam for producing electricity. Furthermore, watertube boilers can be distinguished either as field erected units or packaged units.

Field erected boilers are boilers that are constructed on site and comprise the larger sized watertube boilers. Generally, boilers with heat input levels greater than 100 MMBtu/hr, are field erected. Field erected units usually have multiple burners and, given the customized nature of their construction, also have greater operational flexibility and NO_x control options. Field erected units can also be further categorized as wall-fired or tangential-fired. Wall-fired units are characterized by multiple individual burners located on a single wall or on opposing walls of the furnace while tangential units have several rows of air and fuel nozzles located in each of the four corners of the boiler.

Package units are constructed off-site and shipped to the location where they are needed. While the heat input levels of packaged units may range up to 250 MMBtu/hr, the physical size of these units are constrained by shipping considerations and generally have heat input levels less than 100 MMBtu/hr. Packaged units are always wall-fired units with one or more individual burners. Given the size limitations imposed on packaged boilers, they have limited operational flexibility and cannot feasibly incorporate some NO_x control options.

Firetube boilers are designed such that the hot combustion gases flow through tubes, which heat the water circulating outside of the tubes. These boilers are used primarily for space heating systems, industrial process steam, and portable power boilers. Firetube boilers are almost exclusively packaged units. The two major types of firetube units are Scotch Marine boilers and the older firebox boilers. In cast iron boilers, as in firetube boilers, the hot gases are contained inside the tubes and the water being heated circulates outside the tubes. However, the units are constructed of cast iron rather than steel. Virtually all cast iron boilers are constructed as package boilers. These boilers are used to produce either low-pressure steam or hot water, and are most commonly used in small commercial applications.

Natural gas is also combusted in residential boilers and furnaces. Residential boilers and furnaces generally resemble firetube boilers with flue gas traveling through several channels or tubes with water or air circulated outside the channels or tubes.

1.4.3 Emissions[3-4]

The emissions from natural gas-fired boilers and furnaces include nitrogen oxides (NO_x), carbon monoxide (CO), and carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), volatile organic compounds (VOCs), trace amounts of sulfur dioxide (SO_2), and particulate matter (PM).

Nitrogen Oxides -

Nitrogen oxides formation occurs by three fundamentally different mechanisms. The principal mechanism of NO_x formation in natural gas combustion is thermal NO_x. The thermal NO_x mechanism occurs through the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most NO_x formed through the thermal NO_x mechanism occurs in the high temperature flame zone near the burners. The formation of thermal NO_x is affected by three furnace-zone factors: (1) oxygen concentration, (2) peak temperature, and (3) time of exposure at peak temperature. As these three factors increase, NO_x emission levels increase. The emission trends due to changes in these factors are fairly consistent for all types of natural gas-fired boilers and furnaces. Emission levels vary considerably with the type and size of combustor and with operating conditions (e.g., combustion air temperature, volumetric heat release rate, load, and excess oxygen level).

The second mechanism of NO_x formation, called prompt NO_x, occurs through early reactions of nitrogen molecules in the combustion air and hydrocarbon radicals from the fuel. Prompt NO_x reactions occur within the flame and are usually negligible when compared to the amount of NO_x formed through the thermal NO_x mechanism. However, prompt NO_x levels may become significant with ultra-low-NO_x burners.

The third mechanism of NO_x formation, called fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Due to the characteristically low fuel nitrogen content of natural gas, NO_x formation through the fuel NO_x mechanism is insignificant.

Carbon Monoxide -

The rate of CO emissions from boilers depends on the efficiency of natural gas combustion. Improperly tuned boilers and boilers operating at off-design levels decrease combustion efficiency resulting in increased CO emissions. In some cases, the addition of NO_x control systems such as low NO_x burners and flue gas recirculation (FGR) may also reduce combustion efficiency, resulting in higher CO emissions relative to uncontrolled boilers.

Volatile Organic Compounds -

The rate of VOC emissions from boilers and furnaces also depends on combustion efficiency. VOC emissions are minimized by combustion practices that promote high combustion temperatures, long residence times at those temperatures, and turbulent mixing of fuel and combustion air. Trace amounts of VOC species in the natural gas fuel (e.g., formaldehyde and benzene) may also contribute to VOC emissions if they are not completely combusted in the boiler.

Sulfur Oxides -

Emissions of SO_2 from natural gas-fired boilers are low because pipeline quality natural gas typically has sulfur levels of 2,000 grains per million cubic feet. However, sulfur-containing odorants are added to natural gas for detecting leaks, leading to small amounts of SO_2 emissions. Boilers combusting unprocessed natural gas may have higher SO_2 emissions due to higher levels of sulfur in the natural gas. For these units, a sulfur mass balance should be used to determine SO_2 emissions.

Particulate Matter -

Because natural gas is a gaseous fuel, filterable PM emissions are typically low. Particulate matter from natural gas combustion has been estimated to be less than 1 micrometer in size and has filterable and condensable fractions. Particulate matter in natural gas combustion are usually larger molecular weight hydrocarbons that are not fully combusted. Increased PM emissions may result from poor air/fuel mixing or maintenance problems.

Greenhouse Gases -[6-9]

CO_2, CH_4, and N_2O emissions are all produced during natural gas combustion. In properly tuned boilers, nearly all of the fuel carbon (99.9 percent) in natural gas is converted to CO_2 during the combustion process. This conversion is relatively independent of boiler or combustor type. Fuel carbon not converted to CO_2 results in CH_4, CO, and/or VOC emissions and is due to incomplete combustion. Even in boilers operating with poor combustion efficiency, the amount of CH_4, CO, and VOC produced is insignificant compared to CO_2 levels.

Formation of N_2O during the combustion process is affected by two furnace-zone factors. N_2O emissions are minimized when combustion temperatures are kept high (above 1475°F) and excess oxygen is kept to a minimum (less than 1 percent).

Methane emissions are highest during low-temperature combustion or incomplete combustion, such as the start-up or shut-down cycle for boilers. Typically, conditions that favor formation of N_2O also favor emissions of methane.

1.4.4 Controls[4,10]

NO_x Controls -

Currently, the two most prevalent combustion control techniques used to reduce NO_x emissions from natural gas-fired boilers are flue gas recirculation (FGR) and low NO_x burners. In an FGR system, a portion of the flue gas is recycled from the stack to the burner windbox. Upon entering the windbox, the recirculated gas is mixed with combustion air prior to being fed to the burner. The recycled flue gas consists of combustion products which act as inerts during combustion of the fuel/air mixture. The FGR system reduces NO_x emissions by two mechanisms. Primarily, the recirculated gas acts as a dilutent to reduce combustion temperatures, thus suppressing the thermal NO_x mechanism. To a lesser extent, FGR also reduces NO_x formation by lowering the oxygen concentration in the primary flame zone. The amount of recirculated flue gas is a key operating parameter influencing NO_x emission rates for these systems. An FGR system is normally used in combination with specially designed low NO_x burners capable of sustaining a stable flame with the increased inert gas flow resulting from the use of FGR. When low NO_x burners and FGR are used in combination, these techniques are capable of reducing NO_x emissions by 60 to 90 percent.

Low NO_x burners reduce NO_x by accomplishing the combustion process in stages. Staging partially delays the combustion process, resulting in a cooler flame which suppresses thermal NO_x formation. The two most common types of low NO_x burners being applied to natural gas-fired boilers are staged air burners and staged fuel burners. NO_x emission reductions of 40 to 85 percent (relative to uncontrolled emission levels) have been observed with low NO_x burners.

Other combustion control techniques used to reduce NO_x emissions include staged combustion and gas reburning. In staged combustion (e.g., burners-out-of-service and overfire air), the degree of staging is a key operating parameter influencing NO_x emission rates. Gas reburning is similar to the use of overfire in the use of combustion staging. However, gas reburning injects additional amounts of natural gas in the upper furnace, just before the overfire air ports, to provide increased reduction of NO_x to NO_2.

Two postcombustion technologies that may be applied to natural gas-fired boilers to reduce NO_x emissions are selective noncatalytic reduction (SNCR) and selective catalytic reduction (SCR). The SNCR system injects ammonia (NH_3) or urea into combustion flue gases (in a specific temperature zone) to reduce NO_x emission. The Alternative Control Techniques (ACT) document for NO_x emissions from utility boilers, maximum SNCR performance was estimated to range from 25 to 40 percent for natural gas-fired boilers.[12] Performance data available from several natural gas fired utility boilers with SNCR show a 24 percent reduction in NO_x for applications on wall-fired boilers and a 13 percent reduction in NO_x for applications on tangential-fired boilers.[11] In many situations, a boiler may have an SNCR system installed to trim NO_x emissions to meet permitted levels. In these cases, the SNCR system may not be operated to achieve maximum NO_x reduction. The SCR system involves injecting NH_3 into the flue gas in the presence of a catalyst to reduce NO_x emissions. No data were available on SCR performance on natural gas fired boilers at the time of this publication. However, the ACT Document for utility boilers estimates NO_x reduction efficiencies for SCR control ranging from 80 to 90 percent.[12]

Emission factors for natural gas combustion in boilers and furnaces are presented in Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4.[11] Tables in this section present emission factors on a volume basis (lb/10^6 scf). To convert to an energy basis (lb/MMBtu), divide by a heating value of 1,020 MMBtu/10^6 scf. For the purposes of developing emission factors, natural gas combustors have been organized into three general categories: large wall-fired boilers with greater than 100 MMBtu/hr of heat input, boilers and residential furnaces with less than 100 MMBtu/hr of heat input, and tangential-fired boilers. Boilers within these categories share the same general design and operating characteristics and hence have similar emission characteristics when combusting natural gas.

Emission factors are rated from A to E to provide the user with an indication of how “good” the factor is, with “A” being excellent and “E” being poor. The criteria that are used to determine a rating for an emission factor can be found in the Emission Factor Documentation for AP-42 Section 1.4 and in the introduction to the AP-42 document.

1.4.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section are summarized below. For further detail, consult the Emission Factor Documentation for this section. These and other documents can be found on the Emission Factor and Inventory Group (EFIG) home page (http://www.epa.gov/ttn/chief).

Supplement D, March 1998

- Text was revised concerning Firing Practices, Emissions, and Controls.

- All emission factors were updated based on 482 data points taken from 151 source tests. Many new emission factors have been added for speciated organic compounds, including hazardous air pollutants.

July 1998 - minor changes

- Footnote D was added to table 1.4-3 to explain why the sum of individual HAP may exceed VOC or TOC, the web address was updated, and the references were reordered.

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO_x) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[a]

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO_x[b]		CO	
	Emission Factor (lb/10^6 scf)	Emission Factor Rating	Emission Factor (lb/10^6 scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS)[c]	280	A	84	B
Uncontrolled (Post-NSPS)[c]	190	A	84	B
Controlled - Low NO_x burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO_x burners	50	D	84	B
Controlled - Low NO_x burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170	A	24	C
Controlled - Flue gas recirculation	76	D	98	D
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from lb/10^6 scf to kg/10^6 m^3, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from 1b/10^6 scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. SCC = Source Classification Code. ND = no data. NA = not applicable.

[b] Expressed as NO_2. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate NO_X emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate NO_X emission factor.

[c] NSPS=New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction modification, or reconstruction after June 19, 1984.

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
CO_2[b]	120,000	A
Lead	0.0005	D
N_2O (Uncontrolled)	2.2	E
N_2O (Controlled-low-NO_X burner)	0.64	E
PM (Total)[c]	7.6	D
PM (Condensable)[c]	5.7	D
PM (Filterable)[c]	1.9	B
SO_2[d]	0.6	A
TOC	11	B
Methane	2.3	B
VOC	5.5	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. TOC = Total Organic Compounds. VOC = Volatile Organic Compounds.

[b] Based on approximately 100% conversion of fuel carbon to CO_2. $CO_2[lb/10^6$ scf$]$ = (3.67) (CON) (C)(D), where CON = fractional conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.76), and D = density of fuel, $4.2x10^4$ $lb/10^6$ scf.

[c] All PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{10}, $PM_{2.5}$ or PM_1 emissions. Total PM is the sum of the filterable PM and condensible PM. Condensible PM is the particulate matter collected using EPA Method 202 (or equivalent). Filterable PM is the particulate matter collected on, or prior to, the filter of an EPA Method 5 (or equivalent) sampling train.

[d] Based on 100% conversion of fuel sulfur to SO_2.
Assumes sulfur content is natural gas of 2,000 grains/10^6 scf. The SO_2 emission factor in this table can be converted to other natural gas sulfur contents by multiplying the SO_2 emission factor by the ratio of the site-specific sulfur content (grains/10^6 scf) to 2,000 grains/10^6 scf.

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
91-57-6	2-Methylnaphthalene[b, c]	2.4E-05	D
56-49-5	3-Methylchloranthrene[b, c]	<1.8E-06	E
	7,12-Dimethylbenz(a)anthracene[b,c]	<1.6E-05	E
83-32-9	Acenaphthene[b,c]	<1.8E-06	E
203-96-8	Acenaphthylene[b,c]	<1.8E-06	E
120-12-7	Anthracene[b,c]	<2.4E-06	E
56-55-3	Benz(a)anthracene[b,c]	<1.8E-06	E
71-43-2	Benzene[b]	2.1E-03	B
50-32-8	Benzo(a)pyrene[b,c]	<1.2E-06	E
205-99-2	Benzo(b)fluoranthene[b,c]	<1.8E-06	E
191-24-2	Benzo(g,h,i)perylene[b,c]	<1.2E-06	E
205-82-3	Benzo(k)fluoranthene[b,c]	<1.8E-06	E
106-97-8	Butane	2.1E+00	E
218-01-9	Chrysene[b,c]	<1.8E-06	E
53-70-3	Dibenzo(a,h)anthracene[b,c]	<1.2E-06	E
25321-22-6	Dichlorobenzene[b]	1.2E-03	E
74-84-0	Ethane	3.1E+00	E
206-44-0	Fluoranthene[b,c]	3.0E-06	E
86-73-7	Fluorene[b,c]	2.8E-06	E
50-00-0	Formaldehyde[b]	7.5E-02	B
110-54-3	Hexane[b]	1.8E+00	E
193-39-5	Indeno(1,2,3-cd)pyrene[b,c]	<1.8E-06	E
91-20-3	Naphthalene[b]	6.1E-04	E
109-66-0	Pentane	2.6E+00	E
85-01-8	Phenanathrene[b,c]	1.7E-05	D

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION (Continued)

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
74-98-6	Propane	1.6E+00	E
129-00-0	Pyrene[b, c]	5.0E-06	E
108-88-3	Toluene[b]	3.4E-03	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. Emission Factors preceeded with a less-than symbol are based on method detection limits.

[b] Hazardous Air Pollutant (HAP) as defined by Section 112(b) of the Clean Air Act.

[c] HAP because it is Polycyclic Organic Matter (POM). POM is a HAP as defined by Section 112(b) of the Clean Air Act.

[d] The sum of individual organic compounds may exceed the VOC and TOC emission factors due to differences in test methods and the availability of test data for each pollutant.

TABLE 1.4-4. EMISSION FACTORS FOR METALS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
7440-38-2	Arsenic[b]	2.0E-04	E
7440-39-3	Barium	4.4E-03	D
7440-41-7	Beryllium[b]	<1.2E-05	E
7440-43-9	Cadmium[b]	1.1E-03	D
7440-47-3	Chromium[b]	1.4E-03	D
7440-48-4	Cobalt[b]	8.4E-05	D
7440-50-8	Copper	8.5E-04	C
7439-96-5	Manganese[b]	3.8E-04	D
7439-97-6	Mercury[b]	2.6E-04	D
7439-98-7	Molybdenum	1.1E-03	D
7440-02-0	Nickel[b]	2.1E-03	C
7782-49-2	Selenium[b]	<2.4E-05	E
7440-62-2	Vanadium	2.3E-03	D
7440-66-6	Zinc	2.9E-02	E

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. Emission factors preceeded by a less-than symbol are based on method detection limits. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by l6. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020.

[b] Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.

A-XXXX-7-AP42S1-3

1.3 Fuel Oil Combustion

1.3.1 General[1-3]

Two major categories of fuel oil are burned by combustion sources: distillate oils and residual oils. These oils are further distinguished by grade numbers, with Nos. 1 and 2 being distillate oils; Nos. 5 and 6 being residual oils; and No. 4 being either distillate oil or a mixture of distillate and residual oils. No. 6 fuel oil is sometimes referred to as Bunker C. Distillate oils are more volatile and less viscous than residual oils. They have negligible nitrogen and ash contents and usually contain less than 0.3 percent sulfur (by weight). Distillate oils are used mainly in domestic and small commercial applications, and include kerosene and diesel fuels. Being more viscous and less volatile than distillate oils, the heavier residual oils (Nos. 5 and 6) may need to be heated for ease of handling and to facilitate proper atomization. Because residual oils are produced from the residue remaining after the lighter fractions (gasoline, kerosene, and distillate oils) have been removed from the crude oil, they contain significant quantities of ash, nitrogen, and sulfur. Residual oils are used mainly in utility, industrial, and large commercial applications.

1.3.2 Firing Practices[4]

The major boiler configurations for fuel oil-fired combustors are watertube, firetube, cast iron, and tubeless design. Boilers are classified according to design and orientation of heat transfer surfaces, burner configuration, and size. These factors can all strongly influence emissions as well as the potential for controlling emissions.

Watertube boilers are used in a variety of applications ranging from supplying large amounts of process steam to providing space heat for industrial facilities. In a watertube boiler, combustion heat is transferred to water flowing through tubes which line the furnace walls and boiler passes. The tube surfaces in the furnace (which houses the burner flame) absorb heat primarily by radiation from the flames. The tube surfaces in the boiler passes (adjacent to the primary furnace) absorb heat primarily by convective heat transfer.

Firetube boilers are used primarily for heating systems, industrial process steam generators, and portable power boilers. In firetube boilers, the hot combustion gases flow through the tubes while the water being heated circulates outside of the tubes. At high pressures and when subjected to large variations in steam demand, firetube units are more susceptible to structural failure than watertube boilers. This is because the high-pressure steam in firetube units is contained by the boiler walls rather than by multiple small-diameter watertubes, which are inherently stronger. As a consequence, firetube boilers are typically small and are used primarily where boiler loads are relatively constant. Nearly all firetube boilers are sold as packaged units because of their relatively small size.

A cast iron boiler is one in which combustion gases rise through a vertical heat exchanger and out through an exhaust duct. Water in the heat exchanger tubes is heated as it moves upward through the tubes. Cast iron boilers produce low pressure steam or hot water, and generally burn oil or natural gas. They are used primarily in the residential and commercial sectors.

Another type of heat transfer configuration used on smaller boilers is the tubeless design. This design incorporates nested pressure vessels with water in between the shells. Combustion gases are fired into the inner pressure vessel and are then sometimes recirculated outside the second vessel.

Table 1.3-9. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM FUEL OIL COMBUSTION[a]

Organic Compound	Average Emission Factor[b] (lb/10^3 Gal)	EMISSION FACTOR RATING
Benzene	2.14E-04	C
Ethylbenzene	6.36E-05[c]	E
Formaldehyde[d]	3.30E-02	C
Naphthalene	1.13E-03	C
1,1,1-Trichloroethane	2.36E-04[c]	E
Toluene	6.20E-03	D
o-Xylene	1.09E-04[c]	E
Acenaphthene	2.11E-05	C
Acenaphthylene	2.53E-07	D
Anthracene	1.22E-06	C
Benz(a)anthracene	4.01E-06	C
Benzo(b,k)fluoranthene	1.48E-06	C
Benzo(g,h,i)perylene	2.26E-06	C
Chrysene	2.38E-06	C
Dibenzo(a,h) anthracene	1.67E-06	D
Fluoranthene	4.84E-06	C
Fluorene	4.47E-06	C
Indo(1,2,3-cd)pyrene	2.14E-06	C
Phenanthrene	1.05E-05	C
Pyrene	4.25E-06	C
OCDD	3.10E-09[c]	E

[a] Data are for residual oil fired boilers, Source Classification Codes (SCCs) 1-01-004-01/04.
[b] References 64-72. To convert from lb/10^3 gal to kg/10^3 L, multiply by 0.12.
[c] Based on data from one source test (Reference 67).
[d] The formaldehyde number presented here is based only on data from utilities using No. 6 oil. The number presented in Table 1.3-7 is based on utility, commercial, and industrial boilers.

Table 1.3-10. EMISSION FACTORS FOR TRACE ELEMENTS FROM DISTILLATE FUEL OIL COMBUSTION SOURCES[a]

EMISSION FACTOR RATING: E

Firing Configuration (SCC)	Emission Factor (lb/10^{12} Btu)										
	As	Be	Cd	Cr	Cu	Pb	Hg	Mn	Ni	Se	Zn
Distillate oil fired (1-01-005-01, 1-02-005-01, 1-03-005-01)	4	3	3	3	6	9	3	6	3	15	4

[a] Data are for distillate oil fired boilers, SCC codes 1-01-005-01, 1-02-005-01, and 1-03-005-01. References 29-32, 40-44 and 83. To convert from lb/10^{12} Btu to pg/J, multiply by 0.43.

Table 1.3-11. EMISSION FACTORS FOR METALS FROM UNCONTROLLED NO. 6 FUEL OIL COMBUSTION[a]

Metal	Average Emission Factor[b, d] (lb/10^3 Gal)	EMISSION FACTOR RATING
Antimony	5.25E-03[c]	E
Arsenic	1.32E-03	C
Barium	2.57E-03	D
Beryllium	2.78E-05	C
Cadmium	3.98E-04	C
Chloride	3.47E-01	D
Chromium	8.45E-04	C
Chromium VI	2.48E-04	C
Cobalt	6.02E-03	D
Copper	1.76E-03	C
Fluoride	3.73E-02	D
Lead	1.51E-03	C
Manganese	3.00E-03	C
Mercury	1.13E-04	C
Molybdenum	7.87E-04	D
Nickel	8.45E-02	C
Phosphorous	9.46E-03	D
Selenium	6.83E-04	C
Vanadium	3.18E-02	D
Zinc	2.91E-02	D

[a] Data are for residual oil fired boilers, Source Classification Codes (SCCs) 1-01-004-01/04.
[b] References 64-72. 18 of 19 sources were uncontrolled and 1 source was controlled with low efficiency ESP. To convert from lb/10^3 gal to kg/10^3 L, multiply by 0.12.
[c] References 29-32,40-44.
[d] For oil/water mixture, reduce factors in proportion to water content of the fuel (due to dilution). To adjust the listed values for water content, multiply the listed value by 1-decimal fraction of water (ex: For fuel with 9 percent water by volume, multiply by 1-0.9=.91).

A-XXXX-7-AP42S3-3

3.3 Gasoline And Diesel Industrial Engines

3.3.1 General

The engine category addressed by this section covers a wide variety of industrial applications of both gasoline and diesel internal combustion (IC) engines such as aerial lifts, fork lifts, mobile refrigeration units, generators, pumps, industrial sweepers/scrubbers, material handling equipment (such as conveyors), and portable well-drilling equipment. The three primary fuels for reciprocating IC engines are gasoline, diesel fuel oil (No.2), and natural gas. Gasoline is used primarily for mobile and portable engines. Diesel fuel oil is the most versatile fuel and is used in IC engines of all sizes. The rated power of these engines covers a rather substantial range, up to 250 horsepower (hp) for gasoline engines and up to 600 hp for diesel engines. (Diesel engines greater than 600 hp are covered in Section 3.4, "Large Stationary Diesel And All Stationary Dual-fuel Engines".) Understandably, substantial differences in engine duty cycles exist. It was necessary, therefore, to make reasonable assumptions concerning usage in order to formulate some of the emission factors.

3.3.2 Process Description

All reciprocating IC engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated.

There are 2 methods used for stationary reciprocating IC engines: compression ignition (CI) and spark ignition (SI). This section deals with both types of reciprocating IC engines. All diesel-fueled engines are compression ignited, and all gasoline-fueled engines are spark ignited.

In CI engines, combustion air is first compression heated in the cylinder, and diesel fuel oil is then injected into the hot air. Ignition is spontaneous because the air temperature is above the autoignition temperature of the fuel. SI engines initiate combustion by the spark of an electrical discharge. Usually the fuel is mixed with the air in a carburetor (for gasoline) or at the intake valve (for natural gas), but occasionally the fuel is injected into the compressed air in the cylinder.

CI engines usually operate at a higher compression ratio (ratio of cylinder volume when the piston is at the bottom of its stroke to the volume when it is at the top) than SI engines because fuel is not present during compression; hence there is no danger of premature autoignition. Since engine thermal efficiency rises with increasing pressure ratio (and pressure ratio varies directly with compression ratio), CI engines are more efficient than SI engines. This increased efficiency is gained at the expense of poorer response to load changes and a heavier structure to withstand the higher pressures.[1]

3.3.3 Emissions

Most of the pollutants from IC engines are emitted through the exhaust. However, some total organic compounds (TOC) escape from the crankcase as a result of blowby (gases that are vented from the oil pan after they have escaped from the cylinder past the piston rings) and from the fuel tank and carburetor because of evaporation. Nearly all of the TOCs from diesel CI engines enter the

Table 3.3-2. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR UNCONTROLLED DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (Fuel Input) (lb/MMBtu)
Benzene[b]	9.33 E-04
Toluene[b]	4.09 E-04
Xylenes[b]	2.85 E-04
Propylene	2.58 E-03
1,3-Butadiene[b,c]	<3.91 E-05
Formaldehyde[b]	1.18 E-03
Acetaldehyde[b]	7.67 E-04
Acrolein[b]	<9.25 E-05
Polycyclic aromatic hydrocarbons (PAH)	
Naphthalene[b]	8.48 E-05
Acenaphthylene	<5.06 E-06
Acenaphthene	<1.42 E-06
Fluorene	2.92 E-05
Phenanthrene	2.94 E-05
Anthracene	1.87 E-06
Fluoranthene	7.61 E-06
Pyrene	4.78 E-06
Benzo(a)anthracene	1.68 E-06
Chrysene	3.53 E-07
Benzo(b)fluoranthene	<9.91 E-08
Benzo(k)fluoranthene	<1.55 E-07
Benzo(a)pyrene	<1.88 E-07
Indeno(1,2,3-cd)pyrene	<3.75 E-07
Dibenz(a,h)anthracene	<5.83 E-07
Benzo(g,h,l)perylene	<4.89 E-07
TOTAL PAH	1.68 E-04

[a] Based on the uncontrolled levels of 2 diesel engines from References 6-7. Source Classification Codes 2-02-001-02, 2-03-001-01. To convert from lb/MMBtu to ng/J, multiply by 430.
[b] Hazardous air pollutant listed in the *Clean Air Act*.
[c] Based on data from 1 engine.

A-XXXX-7-AP42S3-4

3.4 Large Stationary Diesel And All Stationary Dual-fuel Engines

3.4.1 General

The primary domestic use of large stationary diesel engines (greater than 600 horsepower [hp]) is in oil and gas exploration and production. These engines, in groups of 3 to 5, supply mechanical power to operate drilling (rotary table), mud pumping, and hoisting equipment, and may also operate pumps or auxiliary power generators. Another frequent application of large stationary diesels is electricity generation for both base and standby service. Smaller uses include irrigation, hoisting, and nuclear power plant emergency cooling water pump operation.

Dual-fuel engines were developed to obtain compression ignition performance and the economy of natural gas, using a minimum of 5 to 6 percent diesel fuel to ignite the natural gas. Large dual-fuel engines have been used almost exclusively for prime electric power generation. This section includes all dual-fuel engines.

3.4.2 Process Description

All reciprocating internal combustion (IC) engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated.

There are 2 ignition methods used in stationary reciprocating IC engines, compression ignition (CI) and spark ignition (SI). In CI engines, combustion air is first compression heated in the cylinder, and diesel fuel oil is then injected into the hot air. Ignition is spontaneous because the air temperature is above the autoignition temperature of the fuel. SI engines initiate combustion by the spark of an electrical discharge. Usually the fuel is mixed with the air in a carburetor (for gasoline) or at the intake valve (for natural gas), but occasionally the fuel is injected into the compressed air in the cylinder. Although all diesel- fueled engines are compression ignited and all gasoline- and gas-fueled engines are spark ignited, gas can be used in a CI engine if a small amount of diesel fuel is injected into the compressed gas/air mixture to burn any mixture ratio of gas and diesel oil (hence the name dual fuel), from 6 to 100 percent diesel oil.

CI engines usually operate at a higher compression ratio (ratio of cylinder volume when the piston is at the bottom of its stroke to the volume when it is at the top) than SI engines because fuel is not present during compression; hence there is no danger of premature autoignition. Since engine thermal efficiency rises with increasing pressure ratio (and pressure ratio varies directly with compression ratio), CI engines are more efficient than SI engines. This increased efficiency is gained at the expense of poorer response to load changes and a heavier structure to withstand the higher pressures.[1]

3.4.3 Emissions And Controls

Most of the pollutants from IC engines are emitted through the exhaust. However, some total organic compounds (TOC) escape from the crankcase as a result of blowby (gases that are vented from the oil pan after they have escaped from the cylinder past the piston rings) and from the fuel tank and carburetor because of evaporation. Nearly all of the TOCs from diesel CI engines enter the atmosphere from the exhaust. Crankcase blowby is minor because TOCs are not present during compression of the charge. Evaporative losses are insignificant in diesel engines due to the low volatility of diesel fuels. In general, evaporative losses are also negligible in engines using gaseous fuels because these engines receive their fuel continuously from a pipe rather than via a fuel storage tank and fuel pump.

The primary pollutants from internal combustion engines are oxides of nitrogen (NO_x), hydrocarbons and other organic compounds, carbon monoxide (CO), and particulates, which include both visible (smoke) and nonvisible emissions. Nitrogen oxide formation is directly related to high pressures and temperatures during the combustion process and to the nitrogen content, if any, of the fuel. The other pollutants, HC, CO, and smoke, are primarily the result of incomplete combustion. Ash and metallic additives in the fuel also contribute to the particulate content of the exhaust. Sulfur oxides also appear in the exhaust from IC engines. The sulfur compounds, mainly sulfur dioxide (SO_2), are directly related to the sulfur content of the fuel.[2]

3.4.3.1 Nitrogen Oxides -

Nitrogen oxide formation occurs by two fundamentally different mechanisms. The predominant mechanism with internal combustion engines is thermal NO_x which arises from the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most thermal NO_x is formed in the high-temperature region of the flame from dissociated molecular nitrogen in the combustion air. Some NO_x, called prompt NO_x, is formed in the early part of the flame from reaction of nitrogen intermediary species, and HC radicals in the flame. The second mechanism, fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Gasoline, and most distillate oils, have no chemically-bound fuel N_2 and essentially all NO_x formed is thermal NO_x.

3.4.3.2 Total Organic Compounds -

The pollutants commonly classified as hydrocarbons are composed of a wide variety of organic compounds and are discharged into the atmosphere when some of the fuel remains unburned or is only partially burned during the combustion process. Most unburned hydrocarbon emissions result from fuel droplets that were transported or injected into the quench layer during combustion. This is the region immediately adjacent to the combustion chamber surfaces, where heat transfer outward through the cylinder walls causes the mixture temperatures to be too low to support combustion.

Partially burned hydrocarbons can occur because of poor air and fuel homogeneity due to incomplete mixing, before or during combustion; incorrect air/fuel ratios in the cylinder during combustion due to maladjustment of the engine fuel system; excessively large fuel droplets (diesel engines); and low cylinder temperature due to excessive cooling (quenching) through the walls or early cooling of the gases by expansion of the combustion volume caused by piston motion before combustion is completed.[2]

3.4.3.3 Carbon Monoxide -

Carbon monoxide is a colorless, odorless, relatively inert gas formed as an intermediate combustion product that appears in the exhaust when the reaction of CO to CO_2 cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon (fuel) molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short. The oxidation rate of CO is limited by reaction kinetics and, as a consequence, can be accelerated only to a certain extent by improvements in air and fuel mixing during the combustion process.[2-3]

3.4.3.4 Smoke, Particulate Matter, and PM-10 -

White, blue, and black smoke may be emitted from IC engines. Liquid particulates appear as white smoke in the exhaust during an engine cold start, idling, or low load operation. These are formed in the quench layer adjacent to the cylinder walls, where the temperature is not high enough to ignite the fuel. Blue smoke is emitted when lubricating oil leaks, often past worn piston rings, into the combustion chamber and is partially burned. Proper maintenance is the most effective method of preventing blue smoke emissions from all types of IC engines. The primary constituent of black smoke is agglomerated carbon particles (soot).[2]

3.4.3.5 Sulfur Oxides -

Sulfur oxide emissions are a function of only the sulfur content in the fuel rather than any combustion variables. In fact, during the combustion process, essentially all the sulfur in the fuel is oxidized to SO_2. The oxidation of SO_2 gives sulfur trioxide (SO_3), which reacts with water to give sulfuric acid (H_2SO_4), a contributor to acid precipitation. Sulfuric acid reacts with basic substances to give sulfates, which are fine particulates that contribute to PM-10 and visibility reduction. Sulfur oxide emissions also contribute to corrosion of the engine parts.[2,3]

Table 3.4-1 contains gaseous emission factors for the pollutants discussed above, expressed in units of pounds per horsepower-hour (lb/hp-hr), and pounds per million British thermal unit (lb/MMBtu). Table 3.4-2 shows the particulate and particle-sizing emission factors. Table 3.4-3 shows the speciated organic compound emission factors and Table 3.4-4 shows the emission factors for polycyclic aromatic hydrocarbons (PAH). These tables do not provide a complete speciated organic compound and PAH listing because they are based only on a single engine test; they are to be used only for rough order of magnitude comparisons.

Table 3.4-5 shows the NO_x reduction and fuel consumption penalties for diesel and dual-fueled engines based on some of the available control techniques. The emission reductions shown are those that have been demonstrated. The effectiveness of controls on a particular engine will depend on the specific design of each engine, and the effectiveness of each technique could vary considerably. Other NO_x control techniques exist but are not included in Table 3.4-5. These techniques include internal/external exhaust gas recirculation, combustion chamber modification, manifold air cooling, and turbocharging.

3.4.4 Control Technologies

Control measures to date are primarily directed at limiting NO_x and CO emissions since they are the primary pollutants from these engines. From a NO_x control viewpoint, the most important distinction between different engine models and types of reciprocating engines is whether they are rich-burn or lean-burn. Rich-burn engines have an air-to-fuel ratio operating range that is near stoichiometric or fuel-rich of stoichiometric and as a result the exhaust gas has little or no excess oxygen. A lean-burn engine has an air-to-fuel operating range that is fuel-lean of stoichiometric; therefore, the exhaust from these engines is characterized by medium to high levels of O_2. The most common NO_x control technique for diesel and dual fuel engines focuses on modifying the combustion process. However, selective catalytic reduction (SCR) and nonselective catalytic reduction (NSCR) which are post-combustion techniques are becoming available. Control for CO have been partly adapted from mobile sources.[5]

Combustion modifications include injection timing retard (ITR), preignition chamber combustion (PCC), air-to-fuel ratio, and derating. Injection of fuel into the cylinder of a CI engine initiates the combustion process. Retarding the timing of the diesel fuel injection causes the combustion process to occur later in the power stroke when the piston is in the downward motion and combustion chamber volume is increasing. By increasing the volume, the combustion temperature and pressure are lowered, thereby lowering NO_x formation. ITR reduces NO_x from all diesel engines; however, the effectiveness is specific to each engine model. The amount of NO_x reduction with ITR diminishes with increasing levels of retard.[5]

Improved swirl patterns promote thorough air and fuel mixing and may include a precombustion chamber (PCC). A PCC is an antechamber that ignites a fuel-rich mixture that propagates to the main combustion chamber. The high exit velocity from the PCC results in improved mixing and complete combustion of the lean air/fuel mixture which lowers combustion temperature, thereby reducing NO_x emissions.[5]

The air-to-fuel ratio for each cylinder can be adjusted by controlling the amount of fuel that enters each cylinder. At air-to-fuel ratios less than stoichiometric (fuel-rich), combustion occurs under conditions of insufficient oxygen which causes NO_x to decrease because of lower oxygen and lower temperatures. Derating involves restricting engine operation to lower than normal levels of power production for the given application. Derating reduces cylinder pressures and temperatures thereby lowering NO_x formation rates.[5]

SCR is an add-on NO_x control placed in the exhaust stream following the engine and involves injecting ammonia (NH_3) into the flue gas. The NH_3 reacts with the NO_x in the presence of a catalyst to form water and nitrogen. The effectiveness of SCR depends on fuel quality and engine duty cycle (load fluctuations). Contaminants in the fuel may poison or mask the catalyst surface causing a reduction or termination in catalyst activity. Load fluctuations can cause variations in exhaust temperature and NO_x concentration which can create problems with the effectiveness of the SCR system.[5]

NSCR is often referred to as a three-way conversion catalyst system because the catalyst reactor simultaneously reduces NO_x, CO, and HC and involves placing a catalyst in the exhaust stream of the engine. The reaction requires that the O_2 levels be kept low and that the engine be operated at fuel-rich air-to-fuel ratios.[5]

3.4.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the memoranda describing each supplement or the background report for this section. These and other documents can be found on the CHIEF electronic bulletin board (919-541-5742), or on the new EFIG home page (http://www.epa.gov/oar/oaqps/efig/).

Supplement A, February 1996

No changes.

Supplement B, October 1996

- The general text was updated.
- Controlled NO_x factors and PM factors were added for diesel units.
- Math errors were corrected in factors for CO from diesel units and for uncontrolled NO_x from dual fueled units.

Table 3.4-1. GASEOUS EMISSION FACTORS FOR LARGE STATIONARY DIESEL AND ALL STATIONARY DUAL-FUEL ENGINES[a]

	Diesel Fuel (SCC 2-02-004-01)			Dual Fuel[b] (SCC 2-02-004-02)		
Pollutant	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	EMISSION FACTOR RATING	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	EMISSION FACTOR RATING
NO_x						
Uncontrolled	0.024	3.2	B	0.018	2.7	D
Controlled	0.013[c]	1.9[c]	B	ND	ND	NA
CO	5.5 E-03	0.85	C	7.5 E-03	1.16	D
SO_x[d]	8.09 E-03S_1	1.01S_1	B	4.06 E-04S_1 + 9.57 E-03S_2	0.05S_1 + 0.895S_2	B
CO_2[e]	1.16	165	B	0.772	110	B
PM	0.0007[c]	0.1[c]	B	ND	ND	NA
TOC (as CH_4)	7.05 E-04	0.09	C	5.29 E-03	0.8	D
Methane	f	f	E	3.97 E-03	0.6	E
Nonmethane	f	f	E	1.32 E-03	0.2[g]	E

[a] Based on uncontrolled levels for each fuel, from References 2,6-7. When necessary, the average heating value of diesel was assumed to be 19,300 Btu/lb with a density of 7.1 lb/gallon. The power output and fuel input values were averaged independently from each other, because of the use of actual brake-specific fuel consumption (BSFC) values for each data point and of the use of data possibly sufficient to calculate only 1 of the 2 emission factors (e. g., enough information to calculate lb/MMBtu, but not lb/hp-hr). Factors are based on averages across all manufacturers and duty cycles. The actual emissions from a particular engine or manufacturer could vary considerably from these levels. To convert from lb/hp-hr to kg/kw-hr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code.

[b] Dual fuel assumes 95% natural gas and 5% diesel fuel.

[c] References 8-26. Controlled NO_x is by ignition timing retard.

[d] Assumes that all sulfur in the fuel is converted to SO_2. S_1 = % sulfur in fuel oil; S_2 = % sulfur in natural gas. For example, if sulfer content is 1.5%, then S = 1.5.

[e] Assumes 100% conversion of carbon in fuel to CO_2 with 87 weight % carbon in diesel, 70 weight % carbon in natural gas, dual-fuel mixture of 5% diesel with 95% natural gas, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and natural gas heating value of 1050 Btu/scf.

[f] Based on data from 1 engine, TOC is by weight 9% methane and 91% nonmethane.

[g] Assumes that nonmethane organic compounds are 25% of TOC emissions from dual-fuel engines. Molecular weight of nonmethane gas stream is assumed to be that of methane.

Table 3.4-2. PARTICULATE AND PARTICLE-SIZING EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (lb/MMBtu) (fuel input)
Filterable particulate[b]	
< 1 µm	0.0478
< 3 µm	0.0479
< 10 µm	0.0496
Total filterable particulate	0.0620
Condensable particulate	0.0077
Total PM-10[c]	0.0573
Total particulate[d]	0.0697

[a] Based on 1 uncontrolled diesel engine from Reference 6. Source Classification Code 2-02-004-01. The data for the particulate emissions were collected using Method 5, and the particle size distributions were collected using a Source Assessment Sampling System. To convert from lb/MMBtu to ng/J, multiply by 430. PM-10 = particulate matter ≤ 10 micrometers (µm) aerometric diameter.
[b] Particle size is expressed as aerodynamic diameter.
[c] Total PM-10 is the sum of filterable particulate less than 10 µm aerodynamic diameter and condensable particulate.
[d] Total particulate is the sum of the total filterable particulate and condensable particulate.

Table 3.4-3. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (lb/MMBtu) (fuel input)
Benzene[b]	7.76 E-04
Toluene[b]	2.81 E-04
Xylenes[b]	1.93 E-04
Propylene	2.79 E-03
Formaldehyde[b]	7.89 E-05
Acetaldehyde[b]	2.52 E-05
Acrolein[b]	7.88 E-06

[a]Based on 1 uncontrolled diesel engine from Reference 7. Source Classification Code 2-02-004-01. Not enough information to calculate the output-specific emission factors of lb/hp-hr. To convert from lb/MMBtu to ng/J, multiply by 430.
[b]Hazardous air pollutant listed in the *Clean Air Act*.

Table 3.4-4. PAH EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

PAH	Emission Factor (lb/MMBtu) (fuel input)
Naphthalene[b]	1.30 E-04
Acenaphthylene	9.23 E-06
Acenaphthene	4.68 E-06
Fluorene	1.28 E-05
Phenanthrene	4.08 E-05
Anthracene	1.23 E-06
Fluoranthene	4.03 E-06
Pyrene	3.71 E-06
Benz(a)anthracene	6.22 E-07
Chrysene	1.53 E-06
Benzo(b)fluoranthene	1.11 E-06
Benzo(k)fluoranthene	<2.18 E-07
Benzo(a)pyrene	<2.57 E-07
Indeno(1,2,3-cd)pyrene	<4.14 E-07
Dibenz(a,h)anthracene	<3.46 E-07
Benzo(g,h,l)perylene	<5.56 E-07
TOTAL PAH	<2.12 E-04

[a] Based on 1 uncontrolled diesel engine from Reference 7. Source Classification Code 2-02-004-01. Not enough information to calculate the output-specific emission factors of lb/hp-hr. To convert from lb/MMBtu to ng/J, multiply by 430.
[b] Hazardous air pollutant listed in the *Clean Air Act*.

Table 3.4-5. NO_x REDUCTION AND FUEL CONSUMPTION PENALTIES FOR LARGE STATIONARY DIESEL AND DUAL-FUEL ENGINES[a]

Control Approach		Diesel (SCC 2-02-004-01) NO_x Reduction (%)	Diesel (SCC 2-02-004-01) ΔBSFC[b] (%)	Dual Fuel (SCC 2-02-004-02) NO_x Reduction (%)	Dual Fuel (SCC 2-02-004-02) ΔBSFC (%)
Derate	10%	ND	ND	<20	4
	20%	<20	4	ND	ND
	25%	5 - 23	1 - 5	1 - 33	1 - 7
Retard	2°	<20	4	<20	3
	4°	<40	4	<40	1
	8°	28 - 45	2 - 8	50 - 73	3 - 5
Air-to-fuel	3%	ND	ND	<20	0
	±10%	7 - 8	3	25 - 40	1 - 3
Water injection (H_2O/fuel ratio)	50%	25 - 35	2 - 4	ND	ND
SCR		80 - 95	0	80 - 95	0

[a] References 1,27-28. The reductions shown are typical and will vary depending on the engine and duty cycle. SCC = Source Classification Code. ΔBSFC = change in brake-specific fuel consumption. ND = no data.

A-XXXX-7-AP42S11-12

11.12 CONCRETE BATCHING

11.12-1 Process Description [1-5]

Concrete is composed essentially of water, cement, sand (fine aggregate) and coarse aggregate. Coarse aggregate may consist of gravel, crushed stone or iron blast furnace slag. Some specialty aggregate products could be either heavyweight aggregate (of barite, magnetite, limonite, ilmenite, iron or steel) or lightweight aggregate (with sintered clay, shale, slate, diatomaceous shale, perlite, vermiculite, slag pumice, cinders, or sintered fly ash). Supplementary cementitious materials, also called mineral admixtures or pozzolan minerals may be added to make the concrete mixtures more economical, reduce permeability, increase strength, or influence other concrete properties. Typical examples are natural pozzolans, fly ash, ground granulated blast-furnace slag, and silica fume, which can be used individually with portland or blended cement or in different combinations. Chemical admixtures are usually liquid ingredients that are added to concrete to entrain air, reduce the water required to reach a required slump, retard or accelerate the setting rate, to make the concrete more flowable or other more specialized functions.

Approximately 75 percent of the U.S. concrete manufactured is produced at plants that store, convey, measure and discharge these constituents into trucks for transport to a job site. At most of these plants, sand, aggregate, cement and water are all gravity fed from the weight hopper into the mixer trucks. The concrete is mixed on the way to the site where the concrete is to be poured. At some of these plants, the concrete may also be manufactured in a central mix drum and transferred to a transport truck. Most of the remaining concrete manufactured are products cast in a factory setting. Precast products range from concrete bricks and paving stones to bridge girders, structural components, and panels for cladding. Concrete masonry, another type of manufactured concrete, may be best known for its conventional 8 x 8 x 16-inch block. In a few cases concrete is dry batched or prepared at a building construction site. Figure 11.12-1 is a generalized process diagram for concrete batching.

The raw materials can be delivered to a plant by rail, truck or barge. The cement is transferred to elevated storage silos pneumatically or by bucket elevator. The sand and coarse aggregate are transferred to elevated bins by front end loader, clam shell crane, belt conveyor, or bucket elevator. From these elevated bins, the constituents are fed by gravity or screw conveyor to weigh hoppers, which combine the proper amounts of each material.

11.12-2 Emissions and Controls [6-8]

Particulate matter, consisting primarily of cement and pozzolan dust but including some aggregate and sand dust emissions, is the primary pollutant of concern. In addition, there are emissions of metals that are associated with this particulate matter. All but one of the emission points are fugitive in nature. The only point sources are the transfer of cement and pozzolan material to silos, and these are usually vented to a fabric filter or “sock”. Fugitive sources include the transfer of sand and aggregate, truck loading, mixer loading, vehicle traffic, and wind erosion from sand and aggregate storage piles. The amount of fugitive emissions generated during the transfer of sand and aggregate depends primarily on the surface moisture content of these materials. The extent of fugitive emission control varies widely from plant to plant. Particulate emission factors for concrete batching are give in Tables 11.12-1 and 11.12-2.

Types of controls used may include water sprays, enclosures, hoods, curtains, shrouds, movable and telescoping chutes, central duct collection systems, and the like. A major source of potential emissions, the movement of heavy trucks over unpaved or dusty surfaces in and around the plant, can be controlled by good maintenance and wetting of the road surface.

Predictive equations that allow for emission factor adjustment based on plant specific conditions are given in the Background Document for Chapter 11.12 and Chapter 13. Whenever plant specific data are available, they should be used with these predictive equations (e.g. Equations 11.12-1 through 11.12-3) in lieu of the general fugitive emission factors presented in Table 11.12-1 through11.12-5 in order to adjust to site specific conditions, such as moisture levels and localized wind speeds.

11.12-3 Updates since the 5th Edition.

October 2001 – This major revision of the section replaced emissions factors based upon engineering judgment and poorly documented and performed source test reports with emissions tests conducted at modern operating truck mix and central mix facilities. Emissions factors for both total PM and total PM_{10} were developed from this test data.

June 2006 – This revision of the section supplemented the two source tests with several additional source tests of central mix and truck mix facilities. The measurement of the capture efficiency, local wind speed and fines material moisture level was improved over the previous two source tests. In addition to quantifying total PM and PM_{10}, $PM_{2.5}$ emissions were quantified at all of the facilities. Single value emissions factors for truck mix and central mix operations were revised using all of the data. Additionally, parameterized emissions factor equations using local wind speed and fines material moisture content were developed from the newer data.

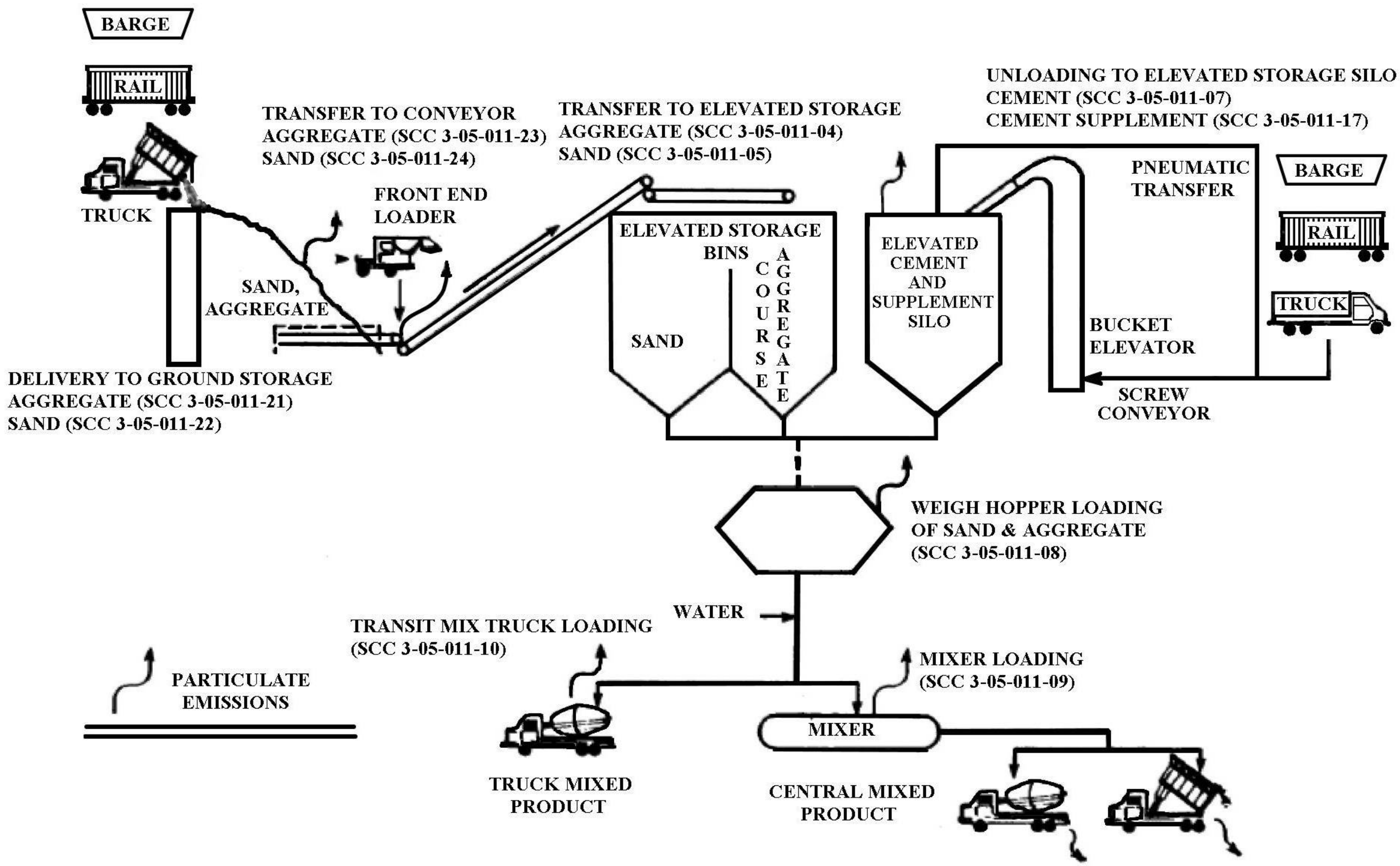

Figure 11.12-1. Typical Concrete Batching Process.

TABLE 11.12-1 (METRIC UNITS)
EMISSION FACTORS FOR CONCRETE BATCHING [a]

Source (SCC)	Uncontrolled				Controlled			
	Total PM	Emission Factor Rating	Total PM_{10}	Emission Factor Rating	Total PM	Emission Factor Rating	Total PM_{10}	Emission Factor Rating
Aggregate transfer [b] (3-05-011-04,-21,23)	0.0035	D	0.0017	D	ND		ND	
Sand transfer [b] (3-05-011-05,22,24)	0.0011	D	0.00051	D	ND		ND	
Cement unloading to elevated storage silo (pneumatic)[c] (3-05-011-07)	0.36	E	0.23	E	0.00050	D	0.00017	D
Cement supplement unloading to elevated storage silo (pneumatic)[d] (3-05-011-17)	1.57	E	0.65	E	0.0045	D	0.0024	E
Weigh hopper loading [e] (3-05-011-08)	0.0026	D	0.0013	D	ND		ND	
Mixer loading (central mix)[f] (3-05-011-09)	0.272 or Eqn. 11.12-1	B	0.067 or Eqn. 11.12-1	B	0.0087 or Eqn. 11.12-1	B	0.0024 or Eqn. 11.12-1	B
Truck loading (truck mix)[g] (3-05-011-10)	0.498	B	0.139	B	0.0280 or Eqn. 11.12-1	B	0.0080 or Eqn. 11.12-1	B
Vehicle traffic (paved roads)	See AP-42 Section 13.2.1							
Vehicle traffic (unpaved roads)	See AP-42 Section 13.2.2							
Wind erosion from aggregate and sand storage piles	See AP-42 Section 13.2.5							

ND = No data

[a] All emission factors are in kg of pollutant per Mg of material loaded unless noted otherwise. Loaded material includes course aggregate, sand, cement, cement supplement and the surface moisture associated with these materials. The average material composition of concrete batches presented in references 9 and 10 was 846 kg course aggregate, 648 kg sand, 223 kg cement and 33kg cement supplement. Approximately 75 liters of water was added to this solid material to produce 1826 kg of concrete.

[b] Reference 9 and 10. Emission factors are based upon an equation from AP-42, Section 13.2.2, with k_{PM-10} =.35, k_{PM} = .74, U = 10mph, $M_{aggregate}$ =1.77%, and M_{sand} = 4.17%. These moisture contents of the materials ($M_{aggregate}$ and M_{sand}) are the averages of the values obtained from Reference 9 and Reference 10.

[c] The uncontrolled PM & PM-10 emission factors were developed from Reference 9. The controlled emission factor for PM was developed from References 9, 10, 11, and 12. The controlled emission factor for PM-10 was developed from References 9 and 10.

[d] The controlled PM emission factor was developed from Reference 10 and Reference 12, whereas the controlled PM-10 emission factor was developed from only Reference 10.

[e] Emission factors were developed by using the Aggregate and Sand Transfer Emission Factors in conjunction with the ratio of aggregate and sand used in an average $yard^3$ of concrete. The unit for these emission factors is kg of pollutant per Mg of aggregate and sand.

[f] References 9, 10, and 14. The emission factor units are kg of pollutant per Mg of cement and cement supplement. The general factor is the arithmetic mean of all test data.

[g] Reference 9, 10, and 14. The emission factor units are kg of pollutant per Mg of cement and cement supplement. The general factor is the arithmetic mean of all test data.

TABLE 11.12-2 (ENGLISH UNITS)
EMISSION FACTORS FOR CONCRETE BATCHING [a]

Source (SCC)	Uncontrolled				Controlled			
	Total PM	Emission Factor Rating	Total PM_{10}	Emission Factor Rating	Total PM	Emission Factor Rating	Total PM_{10}	Emission Factor Rating
Aggregate transfer [b] (3-05-011-04,-21,23)	0.0069	D	0.0033	D	ND		ND	
Sand transfer [b] (3-05-011-05,22,24)	0.0021	D	0.00099	D	ND		ND	
Cement unloading to elevated storage silo (pneumatic)[c] (3-05-011-07)	0.72	E	0.46	E	0.00099	D	0.00034	D
Cement supplement unloading to elevated storage silo (pneumatic)[d] (3-05-011-17)	3.14	E	1.10	E	0.0089	D	0.0049	E
Weigh hopper loading [e] (3-05-011-08)	0.0051	D	0.0024	D	ND		ND	
Mixer loading (central mix)[f] (3-05-011-09)	0.544 or Eqn. 11.12-1	B	0.134 or Eqn. 11.12-1	B	0.0173 or Eqn. 11.12-1	B	0.0048 or Eqn. 11.12-1	B
Truck loading (truck mix)[g] (3-05-011-10)	0.995	B	0.278	B	0.0568 or Eqn. 11.12-1	B	0.0160 or Eqn. 11.12-1	B
Vehicle traffic (paved roads)	See AP-42 Section 13.2.1							
Vehicle traffic (unpaved roads)	See AP-42 Section 13.2.2							
Wind erosion from aggregate and sand storage piles	See AP-42 Section 13.2.5							

ND = No data
[a] All emission factors are in lb of pollutant per ton of material loaded unless noted otherwise. Loaded material includes course aggregate, sand, cement, cement supplement and the surface moisture associated with these materials. The average material composition of concrete batches presented in references 9 and 10 was 1865 lbs course aggregate, 1428 lbs sand, 491 lbs cement and 73 lbs cement supplement. Approximately 20 gallons of water was added to this solid material to produce 4024 lbs (one cubic yard) of concrete.
[b] Reference 9 and 10. Emission factors are based upon an equation from AP-42, Section 13.2.2, with k_{PM-10} =.35, k_{PM} = .74, U = 10mph, $M_{aggregate}$ =1.77%, and M_{sand} = 4.17%. These moisture contents of the materials ($M_{aggregate}$ and M_{sand}) are the averages of the values obtained from Reference 9 and Reference 10.
[c] The uncontrolled PM & PM-10 emission factors were developed from Reference 9. The controlled emission factor for PM was developed from References 9, 10, 11, and 12. The controlled emission factor for PM-10 was developed from References 9 and 10.
[d] The controlled PM emission factor was developed from Reference 10 and Reference 12, whereas the controlled PM-10 emission factor was developed from only Reference 10.
[e] Emission factors were developed by using the Aggregate and Sand Transfer Emission Factors in conjunction with the ratio of aggregate and sand used in an average $yard^3$ of concrete. The unit for these emission factors is lb of pollutant per ton of aggregate and sand.
[f] References 9, 10, and 14. The emission factor units are lb of pollutant per ton of cement and cement supplement. The general factor is the arithmetic mean of all test data.
[g] Reference 9, 10, and 14. The emission factor units are lb of pollutant per ton of cement and cement supplement. The general factor is the arithmetic mean of all test data.

The particulate matter emissions from truck mix and central mix loading operations are calculated in accordance with the values in Tables 11.12-1 or 11.12-2 or by Equation 11.12-1[14] when site specific data are available.

$$E = k\,(0.0032)\left[\frac{U^{a}}{M^{b}}\right] + c \qquad \text{Equation 11.12-1}$$

E	=	Emission factor in lbs./ton of cement and cement supplement
k	=	Particle size multiplier (dimensionless)
U	=	Wind speed, miles per hour (mph)
M	=	Minimum moisture (% by weight) of cement and cement supplement
a, b	=	Exponents
c	=	Constant

The parameters for Equation 11.12-1 are summarized in Tables 11.12-3 and 11.12-4.

Table 11.12-3. Equation Parameters for Truck Mix Operations

Condition	Parameter Category	k	a	b	c
Controlled[1]	Total PM	0.8	1.75	0.3	0.013
	PM_{10}	0.32	1.75	0.3	0.0052
	$PM_{10-2.5}$	0.288	1.75	0.3	0.00468
	$PM_{2.5}$	0.048	1.75	0.3	0.00078
Uncontrolled[1]	Total PM	0.995			
	PM_{10}	0.278			
	$PM_{10-2.5}$	0.228			
	$PM_{2.5}$	0.050			

Table 11.12-4. Equation Parameters for Central Mix Operations

Condition	Parameter Category	k	a	b	c
Controlled[1]	Total PM	0.19	0.95	0.9	0.0010
	PM_{10}	0.13	0.45	0.9	0.0010
	$PM_{10-2.5}$	0.12	0.45	0.9	0.0009
	$PM_{2.5}$	0.03	0.45	0.9	0.0002
Uncontrolled[1]	Total PM	5.90	0.6	1.3	0.120
	PM_{10}	1.92	0.4	1.3	0.040
	$PM_{10-2.5}$	1.71	0.4	1.3	0.036
	$PM_{2.5}$	0.38	0.4	1.3	0

1. Emission factors expressed in lbs/tons of cement and cement supplement

To convert from units of lbs/ton to units of kilograms per mega gram, the emissions calculated by Equation 11.12-1 should be divided by 2.0.

Particulate emission factors per yard of concrete for an average batch formulation at a typical facility are given in Tables 11.12-4 and 11.12-5. For truck mix loading and central mix loading, the emissions of PM, PM-10, PM-10-2.5, and PM-2.5 are calculated by multiplying the emission factor calculated using Equation 11.12-2 by a factor of 0.140 to convert from emissions per ton of cement and cement supplement to emissions per yard of concrete. This equation is based on a typical concrete formulation of 564 pounds of cement and cement supplement in a total of 4,024 pounds of material (including aggregate, sand, and water). This calculation is summarized in Equation 11.12-2.

$$\text{PM, PM10, PM10-2.5, PM2.5 emissions}\left(\frac{\text{pounds}}{\text{yd}^3\ \text{of concrete}}\right) = 0.140\,(\text{Equation 11.12}-1\ \text{factor or Table 11.12-2 Factor})$$

Equation 11.12-2

Metals emission factors for concrete batching are given in Tables 11.12-6 and 11.12-7. Alternatively, the metals emissions from ready mix plants can be calculated based on (1) the weighted average concentration of the metal in the cement and the cement supplement (i.e. flyash) and (2) on the total particulate matter emission factors calculated in accordance with Equation 11.12-3. Emission factors calculated using Equation 11.12-3 are rated D.

$$\text{Metal}_{EF} = \text{PM}_{EF}\left(\frac{aC + bS}{C + S}\right)$$

Equation 11.12-3

Where:

Metal_{EF}	=	Metal Emissions, Lbs. As per Ton of Cement and Cement Supplement
PM_{EF}	=	Controlled Particulate Matter Emission Factor (PM, PM10, or PM2.5) Lbs. per Ton of Cement and Cement Supplement
a	=	ppm of Metal in Cement
C	=	Quantity of Cement Used, Lbs. per hour
b	=	ppm of Metal in Cement Supplement
S	=	Quantity of Cement Supplement Used, Lbs. per hour

This equation is based on the assumption that 100% of the particulate matter emissions are material entrained from the cement and cement supplement streams. Equation 11.12-3 over-estimates total metal emissions to the extent that sand and fines from aggregate contribute to the total particulate matter emissions.

TABLE 11.12-5 (ENGLISH UNITS)
PLANT WIDE EMISSION FACTORS PER YARD OF TRUCK MIX CONCRETE [a]

	Uncontrolled		Controlled	
	PM (lb/yd^3)	PM-10 (lb/yd^3)	PM (lb/yd^3)	PM-10 (lb/yd^3)
Aggregate delivery to ground storage (3-05-011-21)	0.0064	0.0031	0.0064	0.0031
Sand delivery to ground storage (3-05-011-22)	0.0015	0.0007	0.0015	0.0007
Aggregate transfer to conveyor (3-05-011-23)	0.0064	0.0031	0.0064	0.0031
Sand transfer to conveyor (3-05-011-24)	0.0015	0.0007	0.0015	0.0007
Aggregate transfer to elevated storage (3-05-011-04)	0.0064	0.0031	0.0064	0.0031
Sand transfer to elevated storage (3-05-011-05)	0.0015	0.0007	0.0015	0.0007
Cement delivery to Silo (3-05-011-07 controlled)	0.0002	0.0001	0.0002	0.0001
Cement supplement delivery to Silo (3-05-011-17 controlled)	0.0003	0.0002	0.0003	0.0002
Weigh hopper loading (3-05-011-08)	0.0079	0.0038	0.0079	0.0038
Truck mix loading (3-05-011-10)	See Equation 11.12-2			

TABLE 11.12-6 (ENGLISH UNITS)
PLANT WIDE EMISSION FACTORS PER YARD OF CENTRAL MIX CONCRETE [a]

	Uncontrolled		Controlled	
	PM (lb/yd^3)	PM-10 (lb/yd^3)	PM (lb/yd^3)	PM-10 (lb/yd^3)
Aggregate delivery to ground storage (3-05-011-21)	0.0064	0.0031	0.0064	0.0031
Sand delivery to ground storage (3-05-011-22)	0.0015	0.0007	0.0015	0.0007
Aggregate transfer to conveyor (3-05-011-23)	0.0064	0.0031	0.0064	0.0031
Sand transfer to conveyor (3-05-011-24)	0.0015	0.0007	0.0015	0.0007
Aggregate transfer to elevated storage (3-05-011-04)	0.0064	0.0031	0.0064	0.0031
Sand transfer to elevated storage (3-05-011-05)	0.0015	0.0007	0.0015	0.0007
Cement delivery to Silo (3-05-011-07 controlled)	0.0002	0.0001	0.0002	0.0001
Cement supplement delivery to Silo (3-05-011-17 controlled)	0.0003	0.0002	0.0003	0.0002
Weigh hopper loading (3-05-011-08)	0.0079	0.0038	0.0079	0.0038
Central mix loading (3-05-011-09)	See Equation 11.12-2			

[a] Total facility emissions are the sum of the emissions calculated in Tables 11.12-4 or 11.12-5. Total facility emissions do not include road dust and wind blown dust. The emission factors in Tables 11.12-4 and 11.12-5 are based upon the following composition of one yard of concrete.

Coarse Aggregate	1865. pounds
Sand	1428. pounds
Cement	491. pounds
Cement Supplement	73. pounds
Water	20. gallons (167 pounds)

TABLE 11.12-7 (METRIC UNITS)
CONCRETE BATCH PLANT METAL EMISSION FACTORS [a]

	Arsenic	Beryllium	Cadmium	Total Chromium	Lead	Manganese	Nickel	Total Phosphorus	Selenium	Emission Factor Rating
Cement Silo Filling [b] (SCC 3-05-011-07) w/ Fabric Filter	8.38e-07 2.12e-09	8.97e-09 2.43e-10	1.17e-07 2.43e-10	1.26e-07 1.45e-08	3.68e-07 5.46e-09	1.01e-04 5.87e-08	8.83e-06 2.09e-08	5.88e-05 ND	ND ND	E E
Cement Supplement Silo Filling [c] (SCC 3-05-011-17) w/ Fabric Filter	ND 5.02e-07	ND 4.52e-08	ND 9.92e-09	ND 6.10e-07	ND 2.60e-07	ND 1.28e-07	ND 1.14e-06	ND 1.77e-06	ND 3.62e-08	E E
Central Mix Batching [e] (SCC 3-05-011-09) w/ Fabric Filter	1.16e-07 9.35e-09	ND ND	5.92e-09 3.55e-10	7.11e-07 6.34e-08	1.91e-07 1.83e-08	3.06e-05 1.89e-06	1.64e-06 1.24e-07	1.01e-05 6.04e-07	ND ND	E E
Truck Loading [g] (SCC 3-05-011-10) w/ Fabric Filter	1.52e-06 5.80e-07	1.22e-07 5.18e-08	1.71e-08 4.53e-09	5.71e-06 2.05e-06	1.81e-06 7.67e-07	3.06e-05 1.04e-05	5.99e-06 2.39e-06	1.92e-05 6.16e-06	1.31e-06 5.64e-08	E E

ND=No data

[a] All emission factors are in kg of pollutant per Mg of material loaded unless noted otherwise. Loaded material includes course aggregate, sand, cement, cement supplement and the surface moisture associated with these materials. The average material composition of concrete batches presented in references 9 and 10 was 846 Kg course aggregate, 648 kg sand, 223 kg cement and 33kg cement supplement. Approximately 75 liters of water was added to this solid material to produce 1826 kg of concrete.

[b] The uncontrolled emission factors were developed from Reference 8. The controlled emission factors were developed form Reference 9 and 10. Although controlled emissions of phosphorous compounds were below detection, it is reasonable to assume that the effectiveness is comparable to the average effectiveness (98%) for the other metals.

[c] Reference 10.

[d] Reference 9. The emission factor units are kg of pollutant per Mg of cement and cement supplement. Emission factors were developed from a typical central mix operation. The average estimate of the percent of emissions captured during each run is 94%.

[e] Reference 9 and 10. The emission factor units are kg of pollutant per Mg of cement and cement supplement. Emission factors were developed from two typical truck mix loading operations. Based upon visual observations of every loading operation during the two test programs, the average capture efficiency during the testing was 71%.

TABLE 11.12-8 (ENGLISH UNITS)
CONCRETE BATCH PLANT METAL EMISSION FACTORS [a]

	Arsenic	Beryllium	Cadmium	Total Chromium	Lead	Manganese	Nickel	Total Phosphorus	Selenium	Emission Factor Rating
Cement Silo Filling [b] (SCC 3-05-011-07) w/ Fabric Filter	1.68e-06 4.24e-09	1.79e-08 4.86e-10	2.34e-07 4.86e-10	2.52e-07 2.90e-08	7.36e-07 1.09e-08	2.02e-04 1.17e-07	1.76e-05 4.18e-08	1.18e-05 ND	ND ND	E E
Cement Supplement Silo Filling [c] (SCC 3-05-011-17) w/ Fabric Filter	ND 1.00e-06	ND 9.04e-08	ND 1.98e-10	ND 1.22e-06	ND 5.20e-07	ND 2.56e-07	ND 2.28e-06	ND 3.54e-06	ND 7.24e-08	E E
Central Mix Batching [e] (SCC 3-05-011-09) w/ Fabric Filter	2.32e-07 1.87e-08	ND ND	1.18e-08 7.10e-10	1.42e-06 1.27e-07	3.82e-07 3.66e-08	6.12e-05 3.78e-06	3.28e-06 2.48e-07	2.02e-05 1.20e-06	ND ND	E E
Truck Loading [g] (SCC 3-05-011-10) w/ Fabric Filter	3.04e-06 1.16e-06	2.44e-07 1.04e-07	3.42e-08 9.06e-09	1.14e-05 4.10e-06	3.62e-06 1.53e-06	6.12e-05 2.08e-05	1.19e-05 4.78e-06	3.84e-05 1.23e-05	2.62e-06 1.13e-07	E E

ND=No data

[a] All emission factors are in lb of pollutant per ton of material loaded unless noted otherwise. Loaded material includes course aggregate, sand, cement, cement supplement and the surface moisture associated with these materials. The average material composition of concrete batches presented in references 9 and 10 was 1865 lbs course aggregate, 1428 lbs sand, 491 lbs cement and 73 lbs cement supplement. Approximately 20 gallons of water was added to this solid material to produce 4024 lbs (one cubic yard) of concrete.

[b] The uncontrolled emission factors were developed from Reference 8. The controlled emission factors were developed form Reference 9 and 10. Although controlled emissions of phosphorous compounds were below detection, it is reasonable to assume that the effectiveness is comparable to the average effectiveness (98%) for the other metals.

[c] Reference 10.

[d] Reference 9. The emission factor units are lb of pollutant per ton of cement and cement supplement. Emission factors were developed from a typical central mix operation. The average estimate of the percent of emissions captured during each test run is 94%.

[e] Reference 9 and 10. The emission factor units are lb of pollutant per ton of cement and cement supplement. Emission factors were developed from two typical truck mix loading operations. Based upon visual observations of every loading operation during the two test programs, the average capture efficiency during the testing was 71%.

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A-XXXX-7-AP42S13-2-1

13.2.1 Paved Roads

13.2.1.1 General

Particulate emissions occur whenever vehicles travel over a paved surface such as a road or parking lot. Particulate emissions from paved roads are due to direct emissions from vehicles in the form of exhaust, brake wear and tire wear emissions and resuspension of loose material on the road surface. In general terms, resuspended particulate emissions from paved roads originate from, and result in the depletion of, the loose material present on the surface (i.e., the surface loading). In turn, that surface loading is continuously replenished by other sources. At industrial sites, surface loading is replenished by spillage of material and trackout from unpaved roads and staging areas. Figure 13.2.1-1 illustrates several transfer processes occurring on public streets.

Various field studies have found that public streets and highways, as well as roadways at industrial facilities, can be major sources of the atmospheric particulate matter within an area.[1-9] Of particular interest in many parts of the United States are the increased levels of emissions from public paved roads when the equilibrium between deposition and removal processes is upset. This situation can occur for various reasons, including application of granular materials for snow and ice control, mud/dirt carryout from construction activities in the area, and deposition from wind and/or water erosion of surrounding unstabilized areas. In the absence of continuous addition of fresh material (through localized track out or application of antiskid material), paved road surface loading should reach an equilibrium value in which the amount of material resuspended matches the amount replenished. The equilibrium surface loading value depends upon numerous factors. It is believed that the most important factors are: mean speed of vehicles traveling the road; the average daily traffic (ADT); the number of lanes and ADT per lane; the fraction of heavy vehicles (buses and trucks); and the presence/absence of curbs, storm sewers and parking lanes.[10]

The particulate emission factors presented in a previous version of this section of AP-42, dated October 2002, implicitly included the emissions from vehicles in the form of exhaust, brake wear, and tire wear as well as resuspended road surface material. EPA included these sources in the emission factor equation for paved roads 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 paved road emission factor equation only estimates particulate emissions from resuspended road surface material[28]. The particulate emissions from vehicle exhaust, brake wear, and tire wear are now estimated separately using EPA's MOVES[29] model. 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 MOVES to estimate particulate emissions from vehicle traffic on paved roads. It also incorporates the decrease in exhaust emissions that has occurred since the paved road emission factor equation was developed. Earlier versions of the paved 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.

13.2.1.3 Predictive Emission Factor Equations[10,29]

The quantity of particulate emissions from resuspension of loose material on the road surface due to vehicle travel on a dry paved road may be estimated using the following empirical expression:

$$E = k\,(sL)^{0.91} \times (W)^{1.02} \qquad (1)$$

where:
- E = particulate emission factor (having units matching the units of k),
- k = particle size multiplier for particle size range and units of interest (see below),
- sL = road surface silt loading (grams per square meter) (g/m^2), and
- W = average weight (tons) of the vehicles traveling the road.

It is important to note that Equation 1 calls for the average weight of all vehicles traveling the road. For example, if 99 percent of traffic on the road are 2 ton cars/trucks while the remaining 1 percent consists of 20 ton trucks, then the mean weight "W" is 2.2 tons. More specifically, Equation 1 is *not* intended to be used to calculate a separate emission factor for each vehicle weight class. Instead, only one emission factor should be calculated to represent the "fleet" average weight of all vehicles traveling the road.

The particle size multiplier (k) above varies with aerodynamic size range as shown in Table 13.2.1-1. To determine particulate emissions for a specific particle size range, use the appropriate value of k shown in Table 13.2.1-1.

To obtain the total emissions factor, the emission factors for the exhaust, brake wear and tire wear obtained from either EPA's MOBILE6.2 [27] or MOVES2010 [29] model should be added to the emissions factor calculated from the empirical equation.

Table 13.2.1-1. PARTICLE SIZE MULTIPLIERS FOR PAVED ROAD EQUATION

Size range[a]	Particle Size Multiplier k[b]		
	g/VKT	g/VMT	lb/VMT
PM-2.5[c]	0.15	0.25	0.00054
PM-10	0.62	1.00	0.0022
PM-15	0.77	1.23	0.0027
PM-30[d]	3.23	5.24	0.011

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

[b] Units shown are grams per vehicle kilometer traveled (g/VKT), grams per vehicle mile traveled (g/VMT), and pounds per vehicle mile traveled (lb/VMT). The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required in Equation 1.

[c] The k-factors for $PM_{2.5}$ were based on the average $PM_{2.5}$:PM_{10} ratio of test runs in Reference 30.

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

Equation 1 is based on a regression analysis of 83 tests for PM-10.[3, 5-6, 8, 27-29, 31-36] Sources tested include public paved roads, as well as controlled and uncontrolled industrial paved roads. The majority of tests involved freely flowing vehicles traveling at constant speed on relatively level roads. However, 22 tests of slow moving or "stop-and-go" traffic or vehicles under load were available for inclusion in the data base.[32-36] Engine exhaust, tire wear and break wear were subtracted from the emissions measured in the test programs prior to stepwise regression to determine Equation 1.[37, 39] The equations retain the quality rating of A (D for PM-2.5), if applied within the range of source conditions that were tested in developing the equation as follows:

Silt loading:	0.03 - 400 g/m^2 0.04 - 570 grains/square foot (ft^2)
Mean vehicle weight:	1.8 - 38 megagrams (Mg) 2.0 - 42 tons
Mean vehicle speed:	1 - 88 kilometers per hour (kph) 1 - 55 miles per hour (mph)

The upper and lower 95% confidence levels of equation 1 for PM_{10} is best described with equations using an exponents of 1.14 and 0.677 for silt loading and an exponents of 1.19 and 0.85 for weight. Users are cautioned that application of equation 1 outside of the range of variables and operating conditions specified above, e.g., application to roadways or road networks with speeds above 55 mph and average vehicle weights of 42 tons, will result in emission estimates with a higher level of uncertainty. In these situations, users are encouraged to consider an assessment of the impacts of the influence of extrapolation to the overall emissions and alternative methods that are equally or more plausible in light of local emissions data and/or ambient concentration or compositional data.

To retain the quality rating for the emission factor equation when it is applied to a specific paved road, it is necessary that reliable correction parameter values for the specific road in question be determined. With the exception of limited access roadways, which are difficult to sample, the collection and use of site-specific silt loading (sL) data for public paved road emission inventories are strongly recommended. The field and laboratory procedures for determining surface material silt content and surface dust loading are summarized in Appendices C.1 and C.2. In the event that site-specific values cannot be obtained, an appropriate value for a paved public road may be selected from the values in Table 13.2.1-2, but the quality rating of the equation should be reduced by 2 levels.

Equation 1 may be extrapolated to average uncontrolled conditions (but including natural mitigation) under the simplifying assumption that annual (or other long-term) average emissions are inversely proportional to the frequency of measurable (> 0.254 mm [0.01 inch]) precipitation by application of a precipitation correction term. The precipitation correction term can be applied on a daily or an hourly basis [26, 38].

For the daily basis, Equation 1 becomes:

$$E_{ext} = [\, k\,(sL)^{0.91} \times (W)^{1.02}\,]\,(1 - P/4N) \qquad (2)$$

where k, sL, W, and S are as defined in Equation 1 and

E_{ext} = annual or other long-term average emission factor in the same units as k,

P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and

N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

Note that the assumption leading to Equation 2 is based on analogy with the approach used to develop long-term average unpaved road emission factors in Section 13.2.2. However, Equation 2 above incorporates an additional factor of "4" in the denominator to account for the fact that paved roads dry more quickly than unpaved roads and that the precipitation may not occur over the complete 24-hour day.

For the hourly basis, equation 1 becomes:

$$E_{ext} = [\ k\ (sL)^{0.91} \times (W)^{1.02}\ ]\ (1 - 1.2P/N) \qquad (3)$$

where k, sL, W, and S are as defined in Equation 1 and

E_{ext} = annual or other long-term average emission factor in the same units as k,
P = number of hours with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and
N = number of hours in the averaging period (e.g., 8760 for annual, 2124 for season 720 for monthly)

Note: In the hourly moisture correction term (1-1.2P/N) for equation 3, the 1.2 multiplier is applied to account for the residual mitigative effect of moisture. For most applications, this equation will produce satisfactory results. Users should select a time interval to include sufficient "dry" hours such that a reasonable emissions averaging period is evaluated. For the special case where this equation is used to calculate emissions on an hour by hour basis, such as would be done in some emissions modeling situations, the moisture correction term should be modified so that the moisture correction "credit" is applied to the first hours following cessation of precipitation. In this special case, it is suggested that this 20% "credit" be applied on a basis of one hour credit for each hour of precipitation up to a maximum of 12 hours.

Note that the assumption leading to Equation 3 is based on analogy with the approach used to develop long-term average unpaved road emission factors in Section 13.2.2.

Figure 13.2.1-2 presents the geographical distribution of "wet" days on an annual basis for the United States. Maps showing this information on a monthly basis are available in the *Climatic Atlas of the United States*[23] . Alternative sources include other Department of Commerce publications (such as local climatological data summaries). The National Climatic Data Center (NCDC) offers several products that provide hourly precipitation data. In particular, NCDC offers *Solar and Meteorological Surface Observation Network 1961-1990* (SAMSON) CD-ROM, which contains 30 years worth of hourly meteorological data for first-order National Weather Service locations. Whatever meteorological data are used, the source of that data and the averaging period should be clearly specified.

It is emphasized that the simple assumption underlying Equations 2 and 3 has not been verified in any rigorous manner. For that reason, the quality ratings for Equations 2 and 3 should be downgraded one letter from the rating that would be applied to Equation 1.

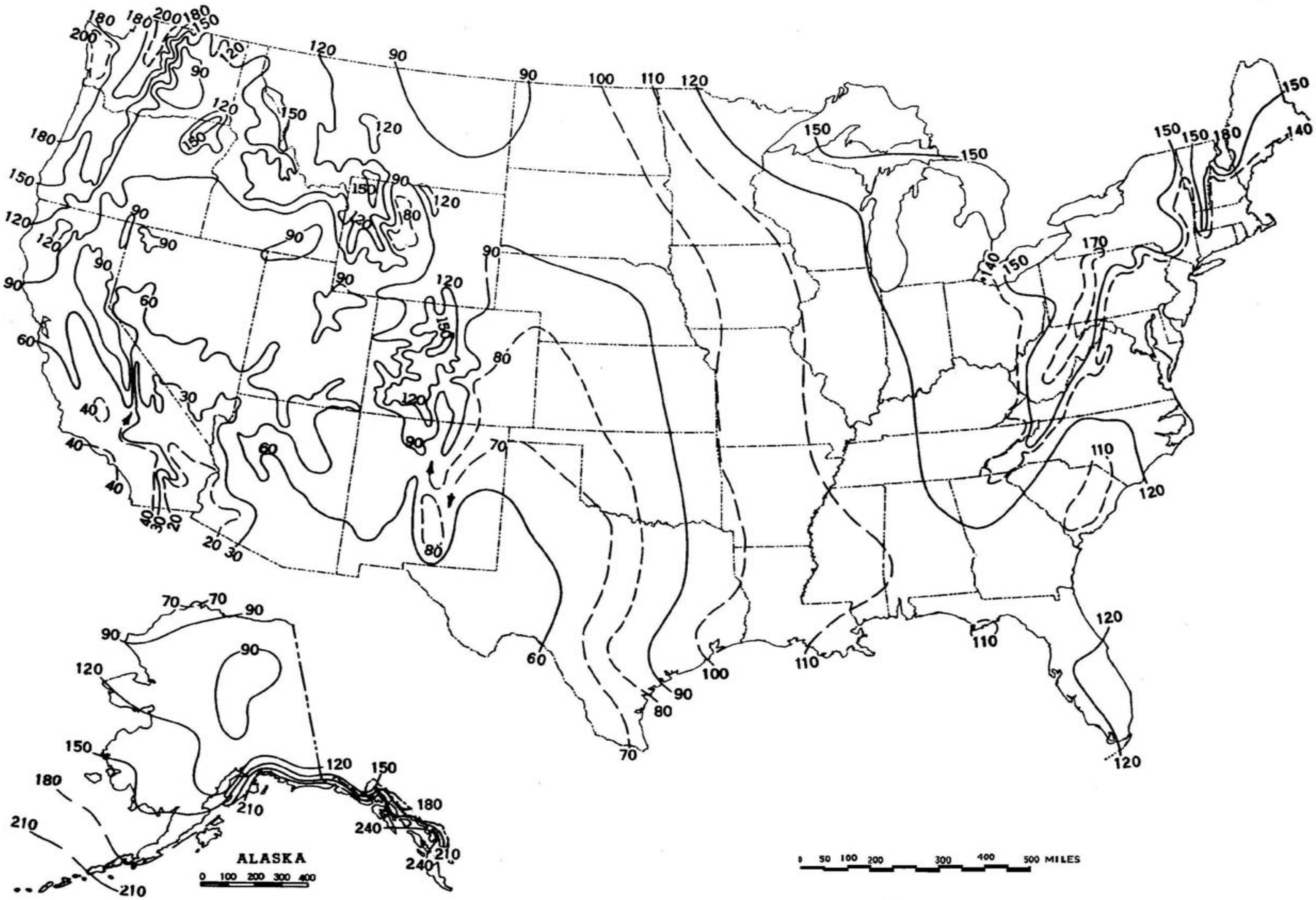

Figure 13.2.1-2. Mean number of days with 0.01 inch or more of precipitation in the United States.

Table 13.2.1-2 presents recommended default silt loadings for normal baseline conditions and for wintertime baseline conditions in areas that experience frozen precipitation with periodic application of antiskid material[24]. The winter baseline is represented as a multiple of the non-winter baseline, depending on the ADT value for the road in question. As shown, a multiplier of 4 is applied for low volume roads (< 500 ADT) to obtain a wintertime baseline silt loading of 4 X 0.6 = 2.4 g/m^2.

Table 13.2.1-2. Ubiquitous Silt Loading Default Values with Hot Spot Contributions from Anti-Skid Abrasives (g/m^2)

ADT Category	< 500	500-5,000	5,000-10,000	> 10,000
Ubiquitous Baseline g/m^2	0.6	0.2	0.06	0.03 0.015 limited access
Ubiquitous Winter Baseline Multiplier during months with frozen precipitation	X4	X3	X2	X1
Initial peak additive contribution from application of antiskid abrasive (g/m^2)	2	2	2	2
Days to return to baseline conditions (assume linear decay)	7	3	1	0.5

It is suggested that an additional (but temporary) silt loading contribution of 2 g/m^2 occurs with each application of antiskid abrasive for snow/ice control. This was determined based on a typical application rate of 500 lb per lane mile and an initial silt content of 1 % silt content. Ordinary rock salt and other chemical deicers add little to the silt loading, because most of the chemical dissolves during the snow/ice melting process.

To adjust the baseline silt loadings for mud/dirt trackout, the number of trackout points is required. It is recommended that in calculating PM_{10} emissions, six additional miles of road be added for each active trackout point from an active construction site, to the paved road mileage of the specified category within the county. In calculating $PM_{2.5}$ emissions, it is recommended that three additional miles of road be added for each trackout point from an active construction site.

It is suggested the number of trackout points for activities other than road and building construction areas be related to land use. For example, in rural farming areas, each mile of paved road would have a specified number of trackout points at intersections with unpaved roads. This value could be estimated from the unpaved road density (mi/sq. mi.).

The use of a default value from Table 13.2.1-2 should be expected to yield only an order-of-magnitude estimate of the emission factor. Public paved road silt loadings are dependent

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13.2.4 Aggregate Handling And Storage Piles

13.2.4.1 General

Inherent in operations that use minerals in aggregate form is the maintenance of outdoor storage piles. Storage piles are usually left uncovered, partially because of the need for frequent material transfer into or out of storage.

Dust emissions occur at several points in the storage cycle, such as material loading onto the pile, disturbances by strong wind currents, and loadout from the pile. The movement of trucks and loading equipment in the storage pile area is also a substantial source of dust.

13.2.4.2 Emissions And Correction Parameters

The quantity of dust emissions from aggregate storage operations varies with the volume of aggregate passing through the storage cycle. Emissions also depend on 3 parameters of the condition of a particular storage pile: age of the pile, moisture content, and proportion of aggregate fines.

When freshly processed aggregate is loaded onto a storage pile, the potential for dust emissions is at a maximum. Fines are easily disaggregated and released to the atmosphere upon exposure to air currents, either from aggregate transfer itself or from high winds. As the aggregate pile weathers, however, potential for dust emissions is greatly reduced. Moisture causes aggregation and cementation of fines to the surfaces of larger particles. Any significant rainfall soaks the interior of the pile, and then the drying process is very slow.

Silt (particles equal to or less than 75 micrometers [µm] in diameter) content is determined by measuring the portion of dry aggregate material that passes through a 200-mesh screen, using ASTM-C-136 method.[1] Table 13.2.4-1 summarizes measured silt and moisture values for industrial aggregate materials.

The quantity of particulate emissions generated by either type of drop operation, per kilogram (kg) (ton) of material transferred, may be estimated, with a rating of A, using the following empirical expression:[11]

$$E = k(0.0016) \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (kg/megagram [Mg])}$$

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)} \tag{1}$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1				
< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.053[a]

[a] Multiplier for < 2.5 µm taken from Reference 14.

The equation retains the assigned quality rating if applied within the ranges of source conditions that were tested in developing the equation, as follows. Note that silt content is included, even though silt content does not appear as a correction parameter in the equation. While it is reasonable to expect that silt content and emission factors are interrelated, no significant correlation between the 2 was found during the derivation of the equation, probably because most tests with high silt contents were conducted under lower winds, and vice versa. It is recommended that estimates from the equation be reduced 1 quality rating level if the silt content used in a particular application falls outside the range given:

Ranges Of Source Conditions For Equation 1			
Silt Content (%)	Moisture Content (%)	Wind Speed	
		m/s	mph
0.44 - 19	0.25 - 4.8	0.6 - 6.7	1.3 - 15

To retain the quality rating of the equation when it is applied to a specific facility, reliable correction parameters must be determined for specific sources of interest. The field and laboratory procedures for aggregate sampling are given in Reference 3. In the event that site-specific values for

A-XXXX-7-FirePump

J300K

Motor type 6081HF001
Alternator type LSA462L9

GENERAL CHARACTERISTICS

- Mechanic governor
- Mechanically welded chassis with antivibration suspension
- Main line circuit breaker
- Radiator for wiring temperature of 48/50°C max with
- Protective grille for fan and rotating parts
- 9 dB(A) silencer supplied separately
- Charger DC starting battery with electrolyte
- 12 V charge alternator and starter
- Delivered with oil and coolant -30°C
- Manual for use and installation

J300K : JOHN DEERE, 6081HF001 - LEROY SOMER, LSA462L9						
Voltage (V)	Voltage Code	Power ESP		Power PRP		Standby Amps
		kWe	kVA	kWe	kVA	
415/240	T51A1	242	303	220	275	422
400/230	T51A2	242	303	220	275	437
380/220	T51A3	242	303	220	275	460
240/120	T51C1	242	303	220	275	729
230/115	T51C2	242	303	220	275	761
220/110	T51C3	242	303	220	275	795
200/115	T51B2	242	303	220	275	875

POWER DEFINITION

PRP : Prime Power is available for an unlimited number of annual operating hours in variable load applications, in accordance with ISO 8528-1.
ESP : The standby power rating is applicable for supplying emergency power in variable load applications in accordance with ISO 8528-1. Overload is not allowed.

TERMS OF USE

Standard reference conditions 25°C Air Intlet Temp, 1000 m A.S.L. 60 % relative humidity. All engine performance data based on the above mentioned maximum continuous ratings.

ENGINE SPECIFICATIONS

GENERAL CHARACTERISTICS	Description	6081HF001
	Motor model	JOHN DEERE
	Cylinder arrangement	L
	Number of cylinders	6
	Bore (mm)	116
	Stroke (mm)	129
	Displacement (C.I.)	8.18
	Compression ratio	15.7 : 1
	Speed (RPM)	1500
	Pistons speed (m/s)	6.45
	Maximum stand-by power at rated RPM (kW)	261
	Governor type	Mechanical
	Frequency regulation (%)	+/- 2.5%
	BMEP (bar)	23.18
EXHAUST	Exhaust gas flow (L/s)	740
	Exhaust gas temperature (°C)	640
	Max. exhaust back pressure (mm CE)	750
FUEL	Consumption @ 110% load (L/h)	68
	Consumption @ 100% load (L/h)	56.9
	Consumption @ 75% load (L/h)	42.6
	Consumption @ 50% load (L/h)	29.4
	Maximum fuel pump flow (L/hr)	203
OIL SYSTEM	Oil capacity (L)	32
	Min. oil pressure (bar)	2.1
	Max. oil pressure (bar)	2.75
	Oil consumption 100% load (L/h)	0.08
	Carter oil capacity (L)	31
HEAT BALANCE	Heat rejection to exhaust (kW)	213
	Radiated heat to ambiant (kW)	34
	Haet rejection to coolant (kW)	103+55
AIR INTAKE	Intake air flow (L/s)	303
	Max. intake restriction (mm CE)	625
COOLING SYSTEM	Radiator & Engine capacity (L)	40
	Max water temperature (°C)	105
	Outlet water temperature (°C)	93
	Fan power (kW)	7
	Fan air flow w/o restriction (m3/s)	5.5
	Available restriction on air flow (mm CE)	20
	Type of coolant	Gencool
	Thermostat (°C)	82-94
EMISSIONS	Emission HC (mg/Nm3)	59
	Emission Nox (mg/Nm3)	2050
	Emission CO (mg/Nm3)	300
	Emissions PM (mg/Nm3)	60

A-XXXX-7-GHG

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Emission Factors for Greenhouse Gas Inventories

Last Modified: 9 March 2018

Red text indicates an update from the 2015 version of this document.

Typically, greenhouse gas emissions are reported in units of carbon dioxide equivalent (CO_2e). Gases are converted to CO_2e by multiplying by their global warming potential (GWP). The emission factors listed in this document

Gas	100-Year GWP
CH_4	25
N_2O	298

Source: Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment

Table 1 Stationary Combustion

Fuel Type	Heat Content (HHV)	CO_2 Factor	CH_4 Factor	N_2O Factor	CO_2 Factor	CH_4 Factor	N_2O Factor
	mmBtu per short ton	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per short ton	g CH_4 per short ton	g N_2O per short ton
Coal and Coke							
Anthracite Coal	25.09	103.69	11	1.6	2,602	276	40
Bituminous Coal	24.93	93.28	11	1.6	2,325	274	40
Sub-bituminous Coal	17.25	97.17	11	1.6	1,676	190	28
Lignite Coal	14.21	97.72	11	1.6	1,389	156	23
Mixed (Commercial Sector)	21.39	94.27	11	1.6	2,016	235	34
Mixed (Electric Power Sector)	19.73	95.52	11	1.6	1,885	217	32
Mixed (Industrial Coking)	26.28	93.90	11	1.6	2,468	289	42
Mixed (Industrial Sector)	22.35	94.67	11	1.6	2,116	246	36
Coal Coke	24.80	113.67	11	1.6	2,819	273	40
Other Fuels - Solid							
Municipal Solid Waste	9.95	90.70	32	4.2	902	318	42
Petroleum Coke (Solid)	30.00	102.41	32	4.2	3,072	960	126
Plastics	38.00	75.00	32	4.2	2,850	1,216	160
Tires	28.00	85.97	32	4.2	2,407	896	118
Biomass Fuels - Solid							
Agricultural Byproducts	8.25	118.17	32	4.2	975	264	35
Peat	8.00	111.84	32	4.2	895	256	34
Solid Byproducts	10.39	105.51	32	4.2	1,096	332	44
Wood and Wood Residuals	17.48	93.80	7.2	3.6	1,640	126	63
	mmBtu per scf	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per scf	g CH_4 per scf	g N_2O per scf
Natural Gas							
Natural Gas	0.001026	53.06	1.0	0.10	0.05444	0.00103	0.00010
Other Fuels - Gaseous							
Blast Furnace Gas	0.000092	274.32	0.022	0.10	0.02524	0.000002	0.000009
Coke Oven Gas	0.000599	46.85	0.48	0.10	0.02806	0.000288	0.000060
Fuel Gas	0.001388	59.00	3.0	0.60	0.08189	0.004164	0.000833
Propane Gas	0.002516	61.46	3.0	0.60	0.15463	0.007548	0.001510
Biomass Fuels - Gaseous							
Landfill Gas	0.000485	52.07	3.2	0.63	0.025254	0.001552	0.000306
Other Biomass Gases	0.000655	52.07	3.2	0.63	0.034106	0.002096	0.000413
	mmBtu per gallon	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per gallon	g CH_4 per gallon	g N_2O per gallon
Petroleum Products							
Asphalt and Road Oil	0.158	75.36	3.0	0.60	11.91	0.47	0.09
Aviation Gasoline	0.120	69.25	3.0	0.60	8.31	0.36	0.07
Butane	0.103	64.77	3.0	0.60	6.67	0.31	0.06
Butylene	0.105	68.72	3.0	0.60	7.22	0.32	0.06
Crude Oil	0.138	74.54	3.0	0.60	10.29	0.41	0.08
Distillate Fuel Oil No. 1	0.139	73.25	3.0	0.60	10.18	0.42	0.08
Distillate Fuel Oil No. 2	0.138	73.96	3.0	0.60	10.21	0.41	0.08
Distillate Fuel Oil No. 4	0.146	75.04	3.0	0.60	10.96	0.44	0.09
Ethane	0.068	59.60	3.0	0.60	4.05	0.20	0.04
Ethylene	0.058	65.96	3.0	0.60	3.83	0.17	0.03
Heavy Gas Oils	0.148	74.92	3.0	0.60	11.09	0.44	0.09
Isobutane	0.099	64.94	3.0	0.60	6.43	0.30	0.06
Isobutylene	0.103	68.86	3.0	0.60	7.09	0.31	0.06
Kerosene	0.135	75.20	3.0	0.60	10.15	0.41	0.08
Kerosene-Type Jet Fuel	0.135	72.22	3.0	0.60	9.75	0.41	0.08
Liquefied Petroleum Gases (LPG)	0.092	61.71	3.0	0.60	5.68	0.28	0.06
Lubricants	0.144	74.27	3.0	0.60	10.69	0.43	0.09
Motor Gasoline	0.125	70.22	3.0	0.60	8.78	0.38	0.08
Naphtha (<401 deg F)	0.125	68.02	3.0	0.60	8.50	0.38	0.08
Natural Gasoline	0.110	66.88	3.0	0.60	7.36	0.33	0.07
Other Oil (>401 deg F)	0.139	76.22	3.0	0.60	10.59	0.42	0.08
Pentanes Plus	0.110	70.02	3.0	0.60	7.70	0.33	0.07
Petrochemical Feedstocks	0.125	71.02	3.0	0.60	8.88	0.38	0.08
Petroleum Coke	0.143	102.41	3.0	0.60	14.64	0.43	0.09
Propane	0.091	62.87	3.0	0.60	5.72	0.27	0.05
Propylene	0.091	67.77	3.0	0.60	6.17	0.27	0.05
Residual Fuel Oil No. 5	0.140	72.93	3.0	0.60	10.21	0.42	0.08
Residual Fuel Oil No. 6	0.150	75.10	3.0	0.60	11.27	0.45	0.09
Special Naphtha	0.125	72.34	3.0	0.60	9.04	0.38	0.08
Unfinished Oils	0.139	74.54	3.0	0.60	10.36	0.42	0.08
Used Oil	0.138	74.00	3.0	0.60	10.21	0.41	0.08
Biomass Fuels - Liquid							
Biodiesel (100%)	0.128	73.84	1.1	0.11	9.45	0.14	0.01
Ethanol (100%)	0.084	68.44	1.1	0.11	5.75	0.09	0.01
Rendered Animal Fat	0.125	71.06	1.1	0.11	8.88	0.14	0.01
Vegetable Oil	0.120	81.55	1.1	0.11	9.79	0.13	0.01
Biomass Fuels - Kraft Pulping Liquor, by Wood Furnish							
North American Softwood		94.4	1.9	0.42			
North American Hardwood		93.7	1.9	0.42			
Bagasse		95.5	1.9	0.42			
Bamboo		93.7	1.9	0.42			
Straw		95.1	1.9	0.42			

Source:

Federal Register EPA; 40 CFR Part 98; e-CFR, June 13, 2017 (see link below). Table C-1, Table C-2, Table AA-1.

https://www.ecfr.gov/cgi-bin/text-idx?SID=ae265d7d6f98ec86fcd8640b9793a3f6&mc=true&node=pt40.23.98&rgn=div5#ap40.23.98_19.1

Note: Emission factors are per unit of heat content using higher heating values (HHV). If heat content is available from the fuel supplier, it is preferable to use that value. If not, default heat contents are provided.

Table 2 Mobile Combustion CO_2

Fuel Type	kg CO_2 per unit	Unit
Aviation Gasoline	8.31	gallon
Biodiesel (100%)	9.45	gallon
Compressed Natural Gas (CNG)	0.05444	scf
Diesel Fuel	10.21	gallon
Ethanol (100%)	5.75	gallon
Kerosene-Type Jet Fuel	9.75	gallon
Liquefied Natural Gas (LNG)	4.50	gallon
Liquefied Petroleum Gases (LPG)	5.68	gallon
Motor Gasoline	8.78	gallon
Residual Fuel Oil	11.27	gallon

Source:

Federal Register EPA; 40 CFR Part 98; e-CFR, June 13, 2017 (see link below). Table C-1, Table C-2, Table AA-1.

https://www.ecfr.gov/cgi-bin/text-idx?SID=ae265d7d6f98ec86fcd8640b9793a3f6&mc=true&node=pt40.23.98&rgn=div5#ap40.23.98_19.1

LNG: The factor was developed based on the CO_2 factor for Natural Gas factor and LNG fuel density from GREET1_2017.xlsx Model, Argonne National Laboratory. This represents a methodology change from previous versions.

Table 3 Mobile Combustion CH_4 and N_2O for On-Road Gasoline Vehicles

Vehicle Type	Year	CH_4 Factor (g / mile)	N_2O Factor (g / mile)
Gasoline Passenger Cars	1973-74	0.1696	0.0197
	1975	0.1423	0.0443
	1976-77	0.1406	0.0458
	1978-79	0.1389	0.0473
	1980	0.1326	0.0499
	1981	0.0802	0.0626
	1982	0.0795	0.0627
	1983	0.0782	0.0630
	1984-93	0.0704	0.0647
	1994	0.0531	0.0560
	1995	0.0358	0.0473
	1996	0.0272	0.0426
	1997	0.0268	0.0422
	1998	0.0241	0.0379
	1999	0.0216	0.0337
	2000	0.0178	0.0273
	2001	0.0110	0.0158
	2002	0.0107	0.0153
	2003	0.0115	0.0133
	2004	0.0157	0.0063
	2005	0.0164	0.0051
	2006	0.0161	0.0057
	2007	0.0170	0.0041
	2008	0.0172	0.0038
	2009-present	0.0173	0.0036
Gasoline Light-Duty Trucks (Vans, Pickup Trucks, SUVs)	1973-74	0.1908	0.0218
	1975	0.1634	0.0513
	1976	0.1594	0.0555
	1977-78	0.1614	0.0534
	1979-80	0.1594	0.0555
	1981	0.1479	0.0660
	1982	0.1442	0.0681
	1983	0.1368	0.0722
	1984	0.1294	0.0764
	1985	0.1220	0.0806
	1986	0.1146	0.0848
	1987-93	0.0813	0.1035
	1994	0.0646	0.0982
	1995	0.0517	0.0908
	1996	0.0452	0.0871
	1997	0.0452	0.0871
	1998	0.0412	0.0778
	1999	0.0333	0.0593
	2000	0.0340	0.0607
	2001	0.0221	0.0328
	2002	0.0242	0.0378
	2003	0.0225	0.0330
	2004	0.0162	0.0098
	2005	0.0160	0.0081
	2006	0.0159	0.0088
	2007	0.0161	0.0079
	2008-present	0.0163	0.0066
Gasoline Heavy-Duty Vehicles	<1981	0.4604	0.0497
	1982-84	0.4492	0.0538
	1985-86	0.4090	0.0515
	1987	0.3675	0.0849
	1988-1989	0.3492	0.0933
	1990-1995	0.3246	0.1142
	1996	0.1278	0.1680
	1997	0.0924	0.1726
	1998	0.0655	0.1750
	1999	0.0648	0.1721
	2000	0.0630	0.1650
	2001	0.0578	0.1435
	2002	0.0634	0.1664
	2003	0.0603	0.1534
	2004	0.0323	0.0195
	2005	0.0329	0.0162
	2006	0.0318	0.0227
	2007	0.0333	0.0134
	2008-present	0.0333	0.0134
Gasoline Motorcycles	1960-1995	0.0899	0.0087
	1996-present	0.0672	0.0069

Source: EPA (2017) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015. All values are calculated from Tables A-104 through A-110.

Table 4 Mobile Combustion CH_4 and N_2O for On-Road Diesel and Alternative Fuel Vehicles

Vehicle Type	Vehicle Year	CH_4 Factor (g / mile)	N_2O Factor (g / mile)
Diesel Passenger Cars	1960-1982	0.0006	0.0012
	1983-1995	0.0005	0.0010
	1996-present	0.0005	0.0010
Diesel Light-Duty Trucks	1960-1982	0.0011	0.0017
	1983-1995	0.0009	0.0014
	1996-present	0.0010	0.0015
Diesel Medium- and Heavy-Duty Vehicles	1960-present	0.0051	0.0048
CNG Light-Duty Vehicles		0.737	0.050
CNG Medium- and Heavy-Duty Vehicles		1.966	0.175
CNG Buses		1.966	0.175
LPG Light-Duty Vehicles		0.037	0.067
LPG Medium- and Heavy-Duty Vehicles		0.066	0.175
LNG Medium- and Heavy-Duty Vehicles		1.966	0.175
Ethanol Light-Duty Vehicles		0.055	0.067
Ethanol Medium- and Heavy-Duty Vehicles		0.197	0.175
Ethanol Buses		0.197	0.175
Biodiesel Light-Duty Vehicles		0.0005	0.001
Biodiesel Medium- and Heavy-Duty Vehicles		0.005	0.005
Biodiesel Buses		0.005	0.005

Source: EPA (2017) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015. All values are calculated from Tables A-104 through A-110.

Table 5 Mobile Combustion CH_4 and N_2O for Non-Road Vehicles

Vehicle Type	CH_4 Factor (g / gallon)	N_2O Factor (g / gallon)
Residual Fuel Oil Ships and Boats	0.11	0.57
Gasoline Ships and Boats	0.64	0.22
Diesel Ships and Boats	0.06	0.45
Diesel Locomotives	0.80	0.26
Gasoline Agricultural Equip.	1.26	0.22
Diesel Agricultural Equip.	1.44	0.26
Gasoline Construction Equip.	0.50	0.22
Diesel Construction Equip.	0.57	0.26
Jet Fuel Aircraft	0.00	0.30
Aviation Gasoline Aircraft	7.06	0.11
Other Gasoline Non-Road Vehicles	0.50	0.22
Other Diesel Non-Road Vehicles	0.57	0.26
LPG Non-Road Vehicles	0.50	0.22
Biodiesel Non-Road Vehicles	0.57	0.26

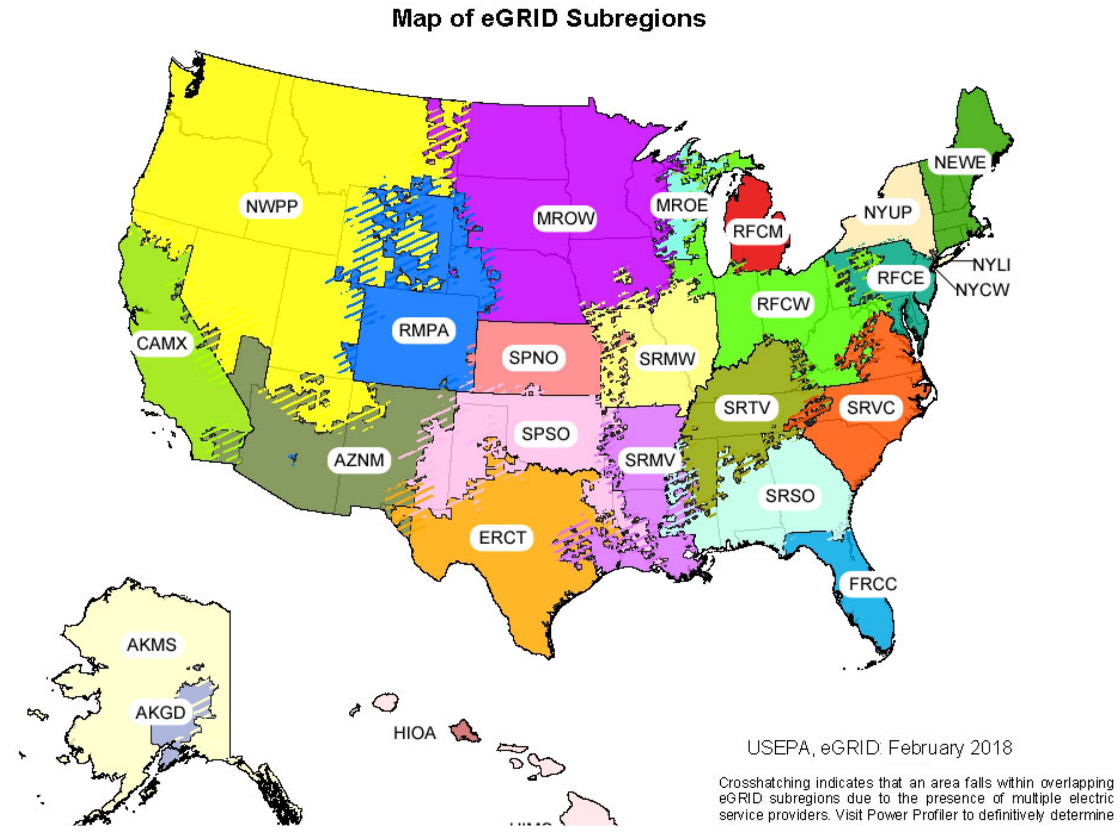
Source: EPA (2017) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015. All values are calculated from Table A-110.
Note: LPG non-road vehicles assumed equal to other gasoline sources. Biodiesel vehicles assumed equal to other diesel sources.

Table 6 Electricity

eGRID Subregion	Total Output Emission Factors			Non-Baseload Emission Factors		
	CO_2 Factor (lb / MWh)	CH_4 Factor (lb / MWh)	N_2O Factor (lb / MWh)	CO_2 Factor (lb / MWh)	CH_4 Factor (lb / MWh)	N_2O Factor (lb / MWh)
AKGD (ASCC Alaska Grid)	1,072.3	0.077	0.011	1,367.8	0.110	0.016
AKMS (ASCC Miscellaneous)	503.1	0.023	0.004	1,533.8	0.068	0.012
AZNM (WECC Southwest)	1,043.6	0.079	0.012	1,384.8	0.097	0.014
CAMX (WECC California)	527.9	0.033	0.004	942.9	0.045	0.006
ERCT (ERCOT All)	1,009.2	0.076	0.011	1,402.8	0.108	0.015
FRCC (FRCC All)	1,011.7	0.075	0.010	1,188.5	0.078	0.011
HIMS (HICC Miscellaneous)	1,152.0	0.095	0.015	1,530.0	0.147	0.023
HIOA (HICC Oahu)	1,662.9	0.181	0.028	1,637.5	0.153	0.024
MROE (MRO East)	1,668.2	0.156	0.026	1,740.1	0.156	0.025
MROW (MRO West)	1,238.8	0.115	0.020	1,822.0	0.154	0.029
NEWE (NPCC New England)	558.2	0.090	0.012	975.1	0.086	0.011
NWPP (WECC Northwest)	651.2	0.061	0.009	1,524.9	0.124	0.020
NYCW (NPCC NYC/Westchester)	635.8	0.022	0.003	1,061.7	0.022	0.002
NYLI (NPCC Long Island)	1,178.3	0.126	0.016	1,338.8	0.036	0.004
NYUP (NPCC Upstate NY)	294.7	0.021	0.003	1,018.2	0.061	0.008
RFCE (RFC East)	758.2	0.050	0.009	1,434.4	0.079	0.017
RFCM (RFC Michigan)	1,272.0	0.067	0.018	1,806.1	0.101	0.025
RFCW (RFC West)	1,243.4	0.108	0.019	1,934.4	0.172	0.029
RMPA (WECC Rockies)	1,367.8	0.137	0.020	1,688.3	0.147	0.021
SPNO (SPP North)	1,412.4	0.149	0.022	1,990.8	0.202	0.029
SPSO (SPP South)	1,248.3	0.095	0.015	1,662.5	0.121	0.019
SRMV (SERC Mississippi Valley)	838.9	0.050	0.007	1,186.0	0.071	0.010
SRMW (SERC Midwest)	1,612.6	0.082	0.026	1,955.2	0.084	0.031
SRSO (SERC South)	1,089.4	0.087	0.013	1,453.5	0.115	0.017
SRTV (SERC Tennessee Valley)	1,185.4	0.093	0.017	1,757.4	0.135	0.025
SRVC (SERC Virginia/Carolina)	805.3	0.067	0.011	1,422.2	0.111	0.019
US Average	998.4	0.080	0.013	1,501.0	0.111	0.018

Source: EPA eGRID2016, February 2018
Note: Total output emission factors can be used as default factors for estimating GHG emissions from electricity use when developing a carbon footprint or emissions inventory. Annual non-baseload output emission factors should not be used for those purposes, but can be used to estimate GHG emissions reductions from reductions in electricity use.

Map of eGRID Subregions



HIMS

the eGRID subregion associated with your location and electric service provider.
http://www.epa.gov/energy/power-profiler

Table 7 Steam and Heat

	CO_2 Factor (kg / mmBtu)	CH_4 Factor (g / mmBtu)	N_2O Factor (g / mmBtu)
Steam and Heat	66.33	1.250	0.125

Note: Emission factors are per mmBtu of steam or heat purchased. These factors assume natural gas fuel is used to generate steam or heat at 80 percent thermal efficiency.

Table 8 Business Travel and Employee Commuting

Vehicle Type	CO_2 Factor (kg / unit)	CH_4 Factor (g / unit)	N_2O Factor (g / unit)	Units
Passenger Car [A]	0.343	0.019	0.011	vehicle-mile
Light-Duty Truck [B]	0.472	0.019	0.018	vehicle-mile
Motorcycle	0.189	0.070	0.007	vehicle-mile
Intercity Rail (i.e. Amtrak) [C]	0.140	0.0087	0.0031	passenger-mile
Commuter Rail [D]	0.161	0.0081	0.0032	passenger-mile
Transit Rail (i.e. Subway, Tram) [E]	0.119	0.0025	0.0017	passenger-mile
Bus	0.056	0.0013	0.0009	passenger-mile
Air Travel - Short Haul (< 300 miles)	0.225	0.0039	0.0072	passenger-mile
Air Travel - Medium Haul (>= 300 miles, < 2300 miles)	0.136	0.0006	0.0043	passenger-mile
Air Travel - Long Haul (>= 2300 miles)	0.166	0.0006	0.0053	passenger-mile

Source:

CO_2, CH_4, and N_2O emissions data for highway vehicles are from Table 2-13 of the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2015. Vehicle-miles and passenger-miles data for highway vehicles are from Table VM-1 of the Federal Highway Administration Highway Statistics 2015.

Fuel consumption data and passenger-miles data for rail are from Tables A.14 to A.16 and 9.10 to 9.12 of the Transportation Energy Data Book: Edition 35. Fuel consumption was converted to emissions by using fuel and electricity emission factors presented in the tables above.

Air Travel factors from 2017 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting. Version 1.0 August 2017.

Notes:

[A] Passenger car: includes passenger cars, minivans, SUVs, and small pickup trucks (vehicles with wheelbase less than 121 inches).

[B] Light-duty truck: includes full-size pickup trucks, full-size vans, and extended-length SUVs (vehicles with wheelbase greater than 121 inches).

[C] Intercity rail: long-distance rail between major cities, such as Amtrak

[D] Commuter rail: rail service between a central city and adjacent suburbs (also called regional rail or suburban rail)

[E] Transit rail: rail typically within an urban center, such as subways, elevated railways, metropolitan railways (metro), streetcars, trolley cars, and tramways.

Table 9 Upstream Transportation and Distribution and Downstream Transportation and Distribution

Vehicle Type	CO_2 Factor (kg / unit)	CH_4 Factor (g / unit)	N_2O Factor (g / unit)	Units
Medium- and Heavy-Duty Truck	1.467	0.014	0.010	vehicle-mile
Passenger Car [A]	0.343	0.019	0.011	vehicle-mile
Light-Duty Truck [B]	0.472	0.019	0.018	vehicle-mile
Medium- and Heavy-Duty Truck[C]	0.202	0.0020	0.0015	ton-mile
Rail	0.023	0.0018	0.0006	ton-mile
Waterborne Craft	0.059	0.0005	0.0040	ton-mile
Aircraft	1.308	0.0000	0.0402	ton-mile

Source:

CO_2, CH_4, and N_2O emissions data for road vehicles are from Table 2-13 of the U.S. Greenhouse Gas Emissions and Sinks: 1990–2015 (April 15, 2017). Vehicle-miles and passenger-miles data for road vehicles are from Table VM-1 of the Federal Highway Administration Highway Statistics 2015.

CO_2e emissions data for non-road vehicles are based on Table A-117 of the U.S. Greenhouse Gas Emissions and Sinks: 1990–2015, which are distributed into CO_2, CH_4, and N_2O emissions based on fuel/vehicle emission factors. Freight ton-mile data for non-road vehicles are from Table 1-50 of the Bureau of Transportation Statistics, National Transportation Statistics for 2015 (Data based on 2014).

Notes:

Vehicle-mile factors are appropriate to use when the entire vehicle is dedicated to transporting the reporting organization's product. Ton-mile factors are appropriate when the vehicle is shared with products from other organizations.

[A] Passenger car: includes passenger cars, minivans, SUVs, and small pickup trucks (vehicles with wheelbase less than 121 inches).

[B] Light-duty truck: includes full-size pickup trucks, full-size vans, and extended-length SUVs (vehicles with wheelbase greater than 121 inches).

[C] Medium- and Heavy-Duty Truck: updates due to a methodology change.

Table 10a Global Warming Potentials (GWPs)

Gas	100-Year GWP
CO_2	1
CH_4	25
N_2O	298
HFC-23	14,800
HFC-32	675
HFC-41	92
HFC-125	3,500
HFC-134	1,100
HFC-134a	1,430
HFC-143	353
HFC-143a	4,470
HFC-152	53
HFC-152a	124
HFC-161	12
HFC-227ea	3,220
HFC-236cb	1,340
HFC-236ea	1,370
HFC-236fa	9,810
HFC-245ca	693
HFC-245fa	1,030
HFC-365mfc	794
HFC-43-10mee	1,640
SF_6	22,800
NF_3	17,200
CF_4	7,390
C_2F_6	12,200
C_3F_8	8,830
$c\text{-}C_4F_8$	10,300
C_4F_{10}	8,860
C_5F_{12}	9,160
C_6F_{14}	9,300
$C_{10}F_{18}$	>7,500

Source:
100-year GWPs from IPCC Fourth Assessment Report (AR4), 2007. IPCC AR4 was published in 2007 and is among the most current and comprehensive peer-reviewed assessments of climate change. AR4 provides revised GWPs of several GHGs relative to the values provided in previous assessment reports, following advances in scientific knowledge on the radiative efficiencies and atmospheric lifetimes of these GHGs and of CO_2. Because the GWPs provided in AR4 reflect an improved scientific understanding of the radiative effects of these gases in the atmosphere, the values provided are more appropriate for supporting the overall goal of organizational GHG reporting than the Second Assessment Report (SAR) GWP values previously used in the Emission Factors Hub.
While EPA recognizes that Fifth Assessment Report (AR5) GWPs have been published, in an effort to ensure consistency and comparability of GHG data between EPA's voluntary and non-voluntary GHG reporting programs (e.g. GHG Reporting Program and National Inventory), EPA recommends the use of AR4 GWPs. The United States and other developed countries to the UNFCCC have agreed to submit annual inventories in 2015 and future years to the UNFCCC using GWP values from AR4, which will replace the current use of SAR GWP values. Utilizing AR4 GWPs improves EPA's ability to analyze corporate, national, and sub-national GHG data consistently, enhances communication of GHG information between programs, and gives outside stakeholders a consistent, predictable set of GWPs to avoid confusion and additional burden.

Table 10b Global Warming Potentials (GWPs) for Blended Refrigerants

ASHRAE #	100-year GWP	Blend Composition
R-401A	16	53% HCFC-22 , 34% HCFC-124 , 13% HFC-152a
R-401B	14	61% HCFC-22 , 28% HCFC-124 , 11% HFC-152a
R-401C	19	33% HCFC-22 , 52% HCFC-124 , 15% HFC-152a
R-402A	2,100	38% HCFC-22 , 6% HFC-125 , 2% propane
R-402B	1,330	6% HCFC-22 , 38% HFC-125 , 2% propane
R-403B	3,444	56% HCFC-22 , 39% PFC-218 , 5% propane
R-404A	3,922	44% HFC-125 , 4% HFC-134a , 52% HFC 143a
R-406A	0	55% HCFC-22 , 41% HCFC-142b , 4% isobutane
R-407A	2,107	20% HFC-32 , 40% HFC-125 , 40% HFC-134a
R-407B	2,804	10% HFC-32 , 70% HFC-125 , 20% HFC-134a
R-407C	1,774	23% HFC-32 , 25% HFC-125 , 52% HFC-134a
R-407D	1,627	15% HFC-32 , 15% HFC-125 , 70% HFC-134a
R-407E	1,552	25% HFC-32 , 15% HFC-125 , 60% HFC-134a
R-408A	2,301	47% HCFC-22 , 7% HFC-125 , 46% HFC 143a
R-409A	0	60% HCFC-22 , 25% HCFC-124 , 15% HCFC-142b
R-410A	2,088	50% HFC-32 , 50% HFC-125
R-410B	2,229	45% HFC-32 , 55% HFC-125
R-411A	14	87.5% HCFC-22 , 11 HFC-152a , 1.5% propylene
R-411B	4	94% HCFC-22 , 3% HFC-152a , 3% propylene
R-413A	2,053	88% HFC-134a , 9% PFC-218 , 3% isobutane
R-414A	0	51% HCFC-22 , 28.5% HCFC-124 , 16.5% HCFC-142b
R-414B	0	5% HCFC-22 , 39% HCFC-124 , 9.5% HCFC-142b
R-417A	2,346	46.6% HFC-125 , 5% HFC-134a , 3.4% butane
R-422A	3,143	85.1% HFC-125 , 11.5% HFC-134a , 3.4% isobutane
R-422D	2,729	65.1% HFC-125 , 31.5% HFC-134a , 3.4% isobutane
R-423A	2,280	47.5% HFC-227ea , 52.5% HFC-134a ,
R-424A	2,440	50.5% HFC-125, 47% HFC-134a, 2.5% butane/pentane
R-426A	1,508	5.1% HFC-125, 93% HFC-134a, 1.9% butane/pentane
R-428A	3,607	77.5% HFC-125 , 2% HFC-143a , 1.9% isobutane
R-434A	3,245	63.2% HFC-125, 16% HFC-134a, 18% HFC-143a, 2.8% isobutane
R-500	32	73.8% CFC-12 , 26.2% HFC-152a , 48.8% HCFC-22
R-502	0	48.8% HCFC-22 , 51.2% CFC-115
R-504	325	48.2% HFC-32 , 51.8% CFC-115
R-507	3,985	5% HFC-125 , 5% HFC143a
R-508A	13,214	39% HFC-23 , 61% PFC-116
R-508B	13,396	46% HFC-23 , 54% PFC-116

Source:
100-year GWPs from IPCC Fourth Assessment Report (AR4), 2007. See the source note to Table 13 for further explanation. GWPs of blended refrigerants are based on their HFC and PFC constituents, which are based on data from http://www.epa.gov/ozone/snap/refrigerants/refblend.html.

A-XXXX-7-MainBoiler

		SPECIFICATIONS	BOILER 2	BOILER 3	BOILER 4	BOILER 5
SUPPLIER			CLEVER BROOKS	BABCOCK & WILCOX ME MEXICO	LOCKE AMI	VICTORY
CONTACT			Steve Dunaway	Alberto Hernandez	Michael Harrington	Gabrielle Yuliana
PHONE			214 637 0020	5260 5075	913 782 8500 e105 cel: 816 863 1758	918-382-4834
BRAND/ MANUFACTURER			CLEAVER BROOKS Sales & Service	BABCOCK & WILCOX	BABCOCK & WILCOX	VICTORY ENERGY
MODEL			NB-500D-95	DS- 106/97	FM120-97	DT-4-81
TYPE	more usual	" D "	"D"	"D"	D"	"D"
MANUFACTURING YEAR						
CAPACITY	Pound / h	132,000	132,000	132,000	132,000	130,000
CAPACITY	TON / h	60				
EFICIENCY (WARRANTY)	%	AS DESIGN	83.90%	81.63% BC / 90.46% AC	83.6%	84.22%
STEAM TEMPERATURE	°F	AS DESIGN	459 ° F	459 ° F	459 ° F	466 ° F
STEAM PRESSURE	kg / cm^2	14				
DESIGN STEAM PRESSURE	PSI	200	300	300	250	
OPERATION PRESSURE	PSI	170	200	170	170	250
OPERATION TEMPERATURE	° F	459	459 ° F	459 ° F	459°F	466 ° F
ECONOMIZER		YES	YES	YES	YES	YES
FAN			Forced Draft Fan		YES	FD Fan
FAN MOTOR	HP		350 HP 4160V 3PH		500 / 4160	250 HP 460v
SUPER HEATER			YES	YES	YES/Horizontal	YES
ATOMIZING TYPE		STEAM / MECHANIC				
BURNER (S)	No.	2 A 4	CB Low Nox Burner	BABCOCK	BABCOCK	VEO Vision
			P-167-G37-2328			
REQUIRED STEAM		OVERHEATED	OVERHEATED	OVERHEATED	OVERHEATED	OVERHEATED
EXHAUST GASES	°C / °F	DISEÑO				
N0x / CO2, EMISIONS	Lowest poss.		Nox 30 ppm CO2 50 PPMVD	Low Nox 30 ppm CO2 80 ppm	Nox 30 ppm CO2 50 PPMVD	Low NOx 30 ppm CO2 80 ppm
FUEL	NATURAL GAS	NATURAL GAS	Yes / Single	Yes / Single		YES
PACK BOILER		SI	YES	YES		YES
WATER TUBE				YES	YES	YES
COMBUSTION CONTROL				PLC Allen Bradley		Allen Bradley
SIZE (LONG / WIDTH / HIGHT)			48' X 12' 6" X 14' 11"		42.67' X 16.73' X12.53	40" x 12 ' /15" 10"
WEIGHT	POUNDS				145,000	

Saul,
Please see below our response to your request. Let us know if there are any additional questions or if you need any additional data.

Here are values at 100% MCR

Do you have information on either the exhaust gas lbs/hour or cubic feet/minute? 147,626 lb/hr

I would also need the exhaust gas temperature at stack exit? 292°F

Also need to know what Cleaver Brooks estimates as the amount of natural gas that will be combusted at maximum capacity or the burner Btu rating. 7,443 lb/hr of natural gas

This information is not as urgent as the previous ones but if is possible, With this last data, what is the estimated amount of NOx and CO that would be emitted per day at maximum capacity.

We have proposed a 30 ppm NOx and 50 ppm CO burner, which correspond to 0.036 lb/btu NOx and 0.037 lb/mmbtu CO. Your boiler has a heat input of 166.8 mmbtu/hr, thus we can calculate the emissions per day, based on 24 hour operation.

NOx:

0.036	lb	166.8	~~mmbtu~~	24	~~hr~~	=	144.1	lb
	~~mmbtu~~		~~hr~~		day			day

CO:

0.037	lb	166.8	~~mmbtu~~	24	~~hr~~	=	144.1	lb
	~~mmbtu~~		~~hr~~		day			day

A-XXXX-7-CoolTower

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BUTCH TONGATE
Deputy Secretary

TECHNICAL MEMORANDUM

TO: All Permitting Staff

FROM: Daren Zigich

THROUGH: Ted Schooley, Ned Jerabek, Cember Hardison

VERSION: June 25, 2013

SUBJECT: Calculating TSP, PM-10 and PM-2.5 from Cooling Towers

The goal of this memo is to standardize a step-by-step approach for calculating particulate emissions from cooling towers.

Due to the variability of methods used by permittees to estimate particulate emissions from cooling towers, a consistent, defensible approach is warranted. For example, some permittees have used a droplet settling ratio from Reference 3 to lower the total potential emissions rate of total particulate matter (PM_{total}). This is unacceptable due to the following:

1. Particulate settling is not appropriate since any verification testing would be completed inside the cooling tower fan stack. All particulate mass that can be measured by an EPA reference method and are emitted to the atmosphere shall be counted as particulate emissions. Particle size distribution can then be used to modify the emission rate of each regulated particulate size.
2. The New Mexico, AQB is not aware of information that verifies the droplet settling data is representative for arid climates where evaporation rates are high.
3. The droplet size distribution and % mass data from Reference 1 only consider droplets up to 600 microns. Reference 3 states that settling only exists for droplets greater than 450 microns. Reference 1 lists the % mass of droplets greater than 450 microns to be less than 1 percent of the total mass.
4. Reference 2 test data shows that towers with significant drift droplet diameters greater than 600 microns usually suffer from poor installation of the drift eliminator or from

poor water distribution due to issues with the tower packing. Large droplets may indicate that the assumed or guaranteed drift eliminator efficiency is not being met. Thus providing emissions credit for poor installation, operation or maintenance runs counter to general AQB practice.

5. References 1 and 2 make no reference to and assign no credit for the settling theory stated in Reference 3.

For the above reasons, the Reference 3 settling ratio is not an acceptable emissions reduction approach.

Acceptable Calculation Method

Cooling tower particulate emissions are a function of the Drift rate and the concentration of dissolved solids present in the water. The Drift rate is normally listed as a percentage of the circulating water flow rate of the cooling tower.

Step 1 – Establish maximum water circulation rate (Q_{circ}) for the cooling tower. This is usually dependent on the capacity of the circulation pumps and the plant cooling system and should be reported as gallons per minute (gpm). The circulation rate is the sum of the circulation rates for each cell in the tower and thus represents the total flow for the tower.

Step 2 – Establish Drift rate (Q_{drift}) of the cooling tower. This information is dependent on the drift eliminator design and is usually supplied by the tower manufacturer. If manufacturer data is unavailable, the standard drift of 0.02 percent, listed in AP-42, should be used.

Step 3 – Establish maximum Total Dissolved Solids concentration (TDS) in the circulating cooling water. This is dependent on the facility's operations. TDS should be reported as parts per million (ppm) or mg/l.

Step 4 – Calculate total potential hourly particulate emissions (PM_{total}) in pounds per hour (lbs/hr).

$$PM_{total} = TDS(mg/l) \times \frac{1(lbs/mg)}{453{,}600} \times 3.785(l/gal) \times Q_{circ}(gpm) \times \frac{Q_{drift}(\%Q_{circ})}{100} \times 60(min/hr)$$

Example: TDS = 3000 ppm or mg/l, Q_{circ} = 50,000 gpm, Q_{drift} = 0.004%

$$PM_{total} = 3000 \times (1/453{,}600) \times 3.785 \times 50{,}000 \times (0.004/100) \times 60$$

$$PM_{total} = 3.0 \text{ lbs/hr}$$

Step 5 – Estimate particulate size distribution of the PM_{total} to determine potential emissions of TSP/PM, PM_{10} and $PM_{2.5}$.

The current estimating technique used in References 1 and 2 employs a formula for determining a potential particulate size (i.e. diameter) for a given set of variables. The variables are:

d_d = Drift droplet diameter, microns
C_{TDS} = Concentration of TDS in the circulating water, ppm
ρ_w = Density of Drift droplet, g/cm^3
ρ_{salt} = Density of particle, g/cm^3

The equation for determining particle size/diameter (d_p), in microns is:

$$d_p = \frac{d_d}{(\rho_{salt} / \rho_w C_{TDS})^{1/3}}$$

The tables below list particle size related to droplet size for various concentrations (1000 ppm to 12,000 ppm) of TDS in the circulating cooling water. The density of the water droplet (ρ_w) is assumed to be 1.0 g/cm3 (based on density of pure water) and the average density of the TDS salts is assumed to be 2.5 g/cm3. This assumed density is selected based on the average density of common TDS constituents, $CaCO_3$, $CaSO_4$, $CaCl_2$ NaCl, Na_2SO_4, and Na_2CO_3. If actual circulating water constituents are available, that data may be used to estimate the dissolved solids average density.

To determine the droplet size that generates particulate matter of the applicable regulated diameters, TSP/PM (defined as 30 microns or less per NM AQB policy[1]), PM10 and PM2.5, find the column in the table that matches the maximum circulating water TDS concentration and read the values associated with the PM2.5, PM10 and TSP/PM boxes. Boxed values are not exactly equal to the applicable sizes, but are the values closest to the applicable sizes given the listed water droplet values from Reference 1.

The far right column of each table provides mass distribution data from Reference 1. The values indicate what percent of the total particulate mass emission, calculated in Step 4, is associated with the applicable particulate size. Read the value that is on the same line (same color) as the applicable particulate size associated with the specified TDS concentration column.

Example: Continuing from Step 4,

PM_{total} = 3.0 lbs/hr
C_{TDS} = 3000 ppm

From Table:

$PM_{2.5}$: d_d = 20 %Mass = 0.196%

PM_{10}: $d_d = 90$ %Mass = 49.812%
TSP/PM: $d_d = 270$ %Mass = 94.689%

The mass emission of each applicable particulate size is:

$PM_{2.5} = PM_{total}(\%Mass/100) = 3.0(0.00196) = 0.006$ lbs/hr
$PM_{10} = 3.0(.49812) = 1.494$ lbs/hr
$TSP/PM = 3.0(.94689) = 2.841$ lbs/hr

[1]Definition of TSP for purposes of permitting emission sources, 11/2/09, see P:\AQB-Permits-Section\NSR-TV-Common\Permitting-Guidance-Documents – Index & Links document

Size Distribution									
1000 ppm (TDS)			2000 ppm			3000 ppm			% Mass
d_d	d_p		d_d	d_p		d_d	d_p		≤
10	0.73873		10	0.930527		10	1.065044		0
20	1.477461		20	1.861054		20	2.130087	PM2.5	0.196
30	2.216191	PM2.5	30	2.791581	PM2.5	30	3.195131		0.226
40	2.954922		40	3.722108		40	4.260174		0.514
50	3.693652		50	4.652635		50	5.325218		1.816
60	4.432382		60	5.583162		60	6.390261		5.702
70	5.171113		70	6.513689		70	7.455305		21.348
90	6.648574		90	8.374743		90	9.585392	PM10	49.812
110	8.126035		110	10.2358	PM10	110	11.71548		70.509
130	9.603495	PM10	130	12.09685		130	13.84557		82.023
150	11.08096		150	13.9579		150	15.97565		88.012
180	13.29715		180	16.74949		180	19.17078		91.032
210	15.51334		210	19.54107		210	22.36591		92.468
240	17.72953		240	22.33265		240	25.56104		94.091
270	19.94572		270	25.12423		270	28.75618	TSP/PM30	94.689
300	22.16191		300	27.91581	TSP/PM30	300	31.95131		96.288
350	25.85556		350	32.56844		350	37.27652		97.011
400	29.54922	TSP/PM30	400	37.22108		400	42.60174		98.34
450	33.24287		450	41.87371		450	47.92696		99.071
500	36.93652		500	46.52635		500	53.25218		99.071
600	44.32382		600	55.83162		600	63.90261		100

Size Distribution									
4000 ppm (TDS)			5000 ppm			6000 ppm			% Mass
d_d	d_p		d_d	d_p		d_d	d_p		≤
10	1.17212		10	1.262534		10	1.341561		0
20	2.344239	PM2.5	20	2.525067	PM2.5	20	2.683121	PM2.5	0.196
30	3.516359		30	3.787601		30	4.024682		0.226
40	4.688479		40	5.050135		40	5.366243		0.514
50	5.860598		50	6.312669		50	6.707804		1.816
60	7.032718		60	7.575202		60	8.049364		5.702
70	8.204838		70	8.837736	PM10	70	9.390925	PM10	21.348
90	10.54908	PM10	90	11.3628	PM10	90	12.07405		49.812
110	12.89332		110	13.88787		110	14.75717		70.509
130	15.23756		130	16.41294		130	17.44029		82.023
150	17.5818		150	18.93801		150	20.12341		88.012
180	21.09815		180	22.72561		180	24.14809		91.032
210	24.61451		210	26.51321		210	28.17278	TSP/PM30	92.468
240	28.13087		240	30.30081	TSP/PM30	240	32.19746		94.091
270	31.64723	TSP/PM30	270	34.08841		270	36.22214		94.689
300	35.16359		300	37.87601		300	40.24682		96.288
350	41.02419		350	44.18868		350	46.95463		97.011
400	46.88479		400	50.50135		400	53.66243		98.34
450	52.74539		450	56.81402		450	60.37023		99.071
500	58.60598		500	63.12669		500	67.07804		99.071
600	70.32718		600	75.75202		600	80.49364		100

Size Distribution									
7000 ppm (TDS)			8000 ppm			9000 ppm			% Mass
d_d	d_p		d_d	d_p		d_d	d_p		≤
10	1.412224		10	1.476437		10	1.535496		0
20	2.824448	PM2.5	20	2.952874	PM2.5	20	3.070992	PM2.5	0.196
30	4.236672		30	4.429311		30	4.606488		0.226
40	5.648896		40	5.905748		40	6.141985		0.514
50	7.061121		50	7.382185		50	7.677481		1.816
60	8.473345		60	8.858622		60	9.212977		5.702
70	9.885569	PM10	70	10.33506	PM10	70	10.74847	PM10	21.348
90	12.71002		90	13.28793		90	13.81947		49.812
110	15.53447		110	16.24081		110	16.89046		70.509
130	18.35891		130	19.19368		130	19.96145		82.023
150	21.18336		150	22.14656		150	23.03244		88.012
180	25.42003		180	26.57587		180	27.63893		91.032
210	29.65671	TSP/PM30	210	31.00518	TSP/PM30	210	32.24542	TSP/PM30	92.468
240	33.89338		240	35.43449		240	36.85191		94.091
270	38.13005		270	39.8638		270	41.4584		94.689
300	42.36672		300	44.29311		300	46.06488		96.288
350	49.42784		350	51.6753		350	53.74237		97.011
400	56.48896		400	59.05748		400	61.41985		98.34
450	63.55009		450	66.43967		450	69.09733		99.071
500	70.61121		500	73.82185		500	76.77481		99.071
600	84.73345		600	88.58622		600	92.12977		100

Size Distribution									
10,000 ppm (TDS)			11,000 ppm			12,000 ppm			% Mass
d_d	d_p		d_d	d_p		d_d	d_p		≤
10	1.590325		10	1.641609		10	1.68987	PM2.5	0
20	3.180651	PM2.5	20	3.283218	PM2.5	20	3.37974		0.196
30	4.770976		30	4.924827		30	5.06961		0.226
40	6.361301		40	6.566436		40	6.759481		0.514
50	7.951627		50	8.208045		50	8.449351		1.816
60	9.541952	PM10	60	9.849654	PM10	60	10.13922	PM10	5.702
70	11.13228		70	11.49126		70	11.82909		21.348
90	14.31293		90	14.77448		90	15.20883		49.812
110	17.49358		110	18.0577		110	18.58857		70.509
130	20.67423		130	21.34092		130	21.96831		82.023
150	23.85488		150	24.62414		150	25.34805		88.012
180	28.62586	TSP/PM30	180	29.54896	TSP/PM30	180	30.41766	TSP/PM30	91.032
210	33.39683		210	34.47379		210	35.48727		92.468
240	38.16781		240	39.39862		240	40.55688		94.091
270	42.93878		270	44.32344		270	45.62649		94.689
300	47.70976		300	49.24827		300	50.6961		96.288
350	55.66139		350	57.45632		350	59.14545		97.011
400	63.61301		400	65.66436		400	67.59481		98.34
450	71.56464		450	73.87241		450	76.04416		99.071
500	79.51627		500	82.08045		500	84.49351		99.071
600	95.41952		600	98.49654		600	101.3922		100

References

1. Calculating Realistic PM10 Emissions from Cooling Towers, Abstract No. 216 Session No. AS-1b, J. Reisman and G. Frisbie, Greyston Environmental Consultants, Inc.
2. Cooling Tower Particulate Matter and Drift Rate Emissions Testing Using the Cooling Technology Institute Test Code – CTI ATC-140, August 2003 EPRI Cooling Tower Technology Conference, K. Hennnon, P.E., D. Wheeler, P.E., Power Generation Technology.
3. Effects of Pathogenic and Toxic Materials Transported Via Cooling Device Drift, Vol. 1 Technical Report, EPA-600/7-79-251a, H.D. Freudenthal, J.E. Rubinstein, and A. Uzzo, November 1979.

A-XXXX-7-NCASI-TB973

ncasi

NATIONAL COUNCIL FOR AIR AND STREAM IMPROVEMENT

COMPILATION OF 'AIR TOXIC' AND TOTAL HYDROCARBON EMISSIONS DATA FOR PULP AND PAPER MILL SOURCES – A SECOND UPDATE

TECHNICAL BULLETIN NO. 973

FEBRUARY 2010

by

Arun V. Someshwar, Ph.D.

NCASI Southern Regional Center

Newberry, Florida

9.5 Kraft Lime Kilns

Lime kilns in kraft pulp mills burn fossil fuels such as gas or oil in order to calcine lime mud (mainly $CaCO_3$) to produce reburned lime (CaO) product. During this process, trace amounts of PCDD/Fs are inadvertently manufactured and released to the environment via air emissions. Table 9.9 provides mean, median and range emissions of the 17 dioxin isomers from four kraft lime kilns (NCASI file information).

Table 9.9 PCDD/F Emissions from Four Kraft Lime Kilns

	ng/lb CaO[1]				ng/lb CaO[1]		
CDD Isomer	mean	median	range	CDF Isomer	mean	median	range
2,3,7,8-TCDD	0.000	0.000	0.000	2,3,7,8-TCDF	0.008	0.008	0.00 - 0.018
1,2,3,7,8-PeCDD	0.000	0.000	0.000	1,2,3,7,8-PeCDF	0.002	0.002	0.00 - 0.006
1,2,3,4,7,8-HxCDD	0.001	0.000	0.000 - 0.002	2,3,4,7,8-PeCDF	0.002	0.000	0.00 - 0.006
1,2,3,6,7,8-HxCDD	0.002	0.001	0.000 - 0.006	1,2,3,4,7,8-HxCDF	0.009	0.009	0.00 - 0.018
1,2,3,7,8,9-HxCDD	0.001	0.000	0.000 - 0.004	1,2,3,6,7,8-HxCDF	0.003	0.002	0.00 - 0.008
1,2,3,4,6,7,8-HpCDD	0.027	0.028	0.000 - 0.052	1,2,3,7,8,9-HxCDF	0.003	0.000	0.00 - 0.011
1,2,3,4,6,7,8,9-OCDD	0.294	0.256	0.000 - 0.665	2,3,4,6,7,8-HxCDF	0.003	0.000	0.00 - 0.010
				1,2,3,4,6,7,8-HpCDF	0.007	0.000	0.00 - 0.029
				1,2,3,4,7,8,9-HpCDF	0.000	0.000	0.00 - 0.001
				1,2,3,4,6,7,8,9-OCDF	0.005	0.000	0.00 - 0.021
Total CDDs	0.325	0.302[2]	0.000 - 0.729	Total CDFs	0.043	0.045[2]	0.00 - 0.128

	Range	Mean	Median
Total CDD/Fs, ng/lb CaO[1]	0.00 – 0.857	0.367	0.378[2]

[1]CaO=lime product; ng/dscm converted using 166,468 & 185,968 scf @ 12% CO_2/ton CaO for gas & oil-fired kilns, respectively (based upon assuming 6 x 10^6 Btu/ton CaO & F_c factor of 1,040 & 1,430 scf $CO_2/10^6$ Btu for gas & oil, respectively. Note that one mole CO_2 (385.3 scf) is generated for every mole of CaO lime product). [2]Note that unlike for means, the sum of the medians for each isomer across a given population will not equal the median of the sums of all isomers for each source. The total shown here represents the median of the sums.

Detailed emissions of all 17 congeners of the PCDD/Fs for the 15 wood/bark-fired boilers (10 U.S. and five Canadian), five hog fuel boilers burning deinked WWTP residuals (all Canadian), 11 kraft and two sulfite recovery furnaces (all U.S.), and four lime kilns (all U.S.) are available in two documents prepared by Paprican for Environment Canada (Paprican 2002, 2008).

10.0 NON-CHEMICAL PULPING

This section deals with organic air toxic emissions from pulping, bleaching and papermaking in relation to non-chemical pulping operations. The non-chemical pulp and papermaking operations include those at deinking mills, mills recycling old corrugated containers (OCC), non-integrated papermaking mills, and mechanical pulp mills, the latter including stone groundwood, pressurized groundwood and thermomechanical pulp (TMP) mills. During NCASI's MACT III testing program, significant amounts of data for various HAPs and organic air toxics were generated on several non-chemical pulping and papermaking sources. The data generated during this test program, summarized in this section, are provided in more detail in NCASI Technical Bulletins 737, 738, 739, and 740 (NCASI 1997a, b, c, d). The 20 pulp mill study in Canada (FPAC 2003) also included testing on several non-chemical pulping and papermaking sources. It included testing for organic air toxic emissions from six TMP operations, three groundwood operations, one deinking repulper, and seven paper machines processing mechanical pulps (five producing newsprint, one linerboard, one making printing and writing papers from groundwood furnish, and one BCTMP pulp dryer). Additional organic emission data were generated during the FPAC study (FPAC 2003) for several miscellaneous sources at non-chemical pulp mills including a dye room, a paper machine coating preparation room, and a sludge press vent, all at TMP mills, and a paper coater at a newsprint mill. These miscellaneous data are summarized in Table A5 of NCASI Special Report No. 05-03 (NCASI 2005b). In the following, the emissions from paper machines processing non-chemical pulps (recovered fiber and mechanical pulps) are first presented, followed by emissions from recovered fiber pulping/bleaching (OCC and deinking), and finally, the emissions from mechanical pulping operations (groundwood and TMP).

10.1 Paper Machines Processing Mainly Non-Chemical Pulps

10.1.1 *Emissions from Paper Machines Processing 100% Recovered Fiber*

Table 10.1 summarizes the organic air toxic emission data corresponding to seven 100% recovered fiber furnish machines tested during the NCASI MACT III study. Also shown in Table 10.1 are total VOC emissions (as C) for these paper machines. Details such as the type of product made on the machine, the areas of the machine that were tested, number of vents tested, and production rate are provided in Table B-1 of Appendix B. The detail data for each chemical and each machine are provided in electronic format in Table B-1 that can be downloaded from the NCASI members only website at www.ncasi.org. Methanol is seen to be the most prominent air toxic emission from 100% secondary fiber paper machines with a mean emission of about 0.08 lb/ADTFP, followed by biphenyl (mean = 0.025 lb/ADTFP) and acetaldehyde (mean = 0.017 lb/ADTFP).

For the category of 100% recovered fiber furnish paper machines, no additional data beyond that presented in Technical Bulletin No. 858 (NCASI 2003) for seven paper machines were available. The one exception was with respect to methanol emissions. All but one of the seven 100% recovered fiber furnish machines tested during MACT III was of the Fourdrinier type, with one being of the cylinder type (NCASI 1997d). A linear relationship developed between the methanol emissions from all 13 non-chemical pulp mill paper machines (12 Fourdrinier, one cylinder) measured during the MACT III testing and the corresponding white water methanol contents showed very good correlation except in the case of the one cylinder paper machine, for which the actual methanol emissions were much higher than predicted. More recently, NCASI conducted a study to investigate whether something was fundamentally different about the way cylinder machines operated compared with Fourdrinier machines which could have caused this anomaly. Three uncoated and one coated cylinder machines processing 100% recycled fiber furnish were tested for methanol and total VOC emissions (NCASI 2004). The results of this latter study, as seen from the average emissions for methanol from 6 Fourdrinier and 5 cylinder machines presented in Table 10.1, showed that methanol emissions from the four cylinder machines tested were in line with those obtained for the 12 Fourdrinier machines that processed non-chemical pulp during the MACT III testing. The anomaly with the single cylinder machine tested during MACT III was hypothesized as resulting from a lengthy residence time in the dryer section of the machine. However, Table 10.1 also shows that the mean total VOC emissions measured from five Fourdrinier machines were much lower (0.295 lb/ADTFP) than the mean emissions measured from the five cylinder machines (1.05 lb/ADTFP). The reasons for this difference are presently unclear.

Table 10.1 Summary of Air Toxic Emissions from 100% Secondary Fiber Furnish Paper Machines (lb/ADTFP)

Compound	No. of Sources		Detects	Min.	Max.	Median	Mean	Std. Dev.	UPL**
	Tested*	Included*							
Acetaldehyde	7	7	7	5.67E-04	3.46E-02	1.33E-02	1.70E-02	1.28E-02	3.81E-02
Biphenyl[b]	7	7	4	3.05E-03	9.78E-02	1.76E-02[a]	2.50E-02	3.56E-02	8.37E-02
Carbon Disulfide[b]	7	6	3	1.93E-03	2.66E-02	2.88E-03	6.44E-03	9.03E-03	2.13E-02
3-Carene	7	1	1	--	--	1.23E-04	1.23E-04	--	--
Chloroform	7	7	5	6.15E-06	1.51E-02	2.29E-03	3.22E-03	9.03E-03	2.62E-02
Cumene	7	2	2	9.28E-05	4.33E-03	2.21E-03	2.21E-03	--	--
p-Cymene	7	3	2	1.23E-04	1.03E-02	5.07E-03	5.15E-03	5.07E-03	1.35E-02
1,2-Dimethoxyethane	7	2	2	1.55E-04	2.38E-03	1.27E-03	1.27E-03	--	--
Formaldehyde	7	7	7	2.84E-05	1.10E-02	7.62E-04	4.63E-03	5.43E-03	1.84E-02
Limonene	7	4	3	2.40E-05	1.42E-02	1.39E-03[a]	3.63E-03	6.11E-03	1.99E-02
Methanol[1, b]	6	6	6	1.56E-04	3.06E-01	4.64E-02	7.96E-02	1.15E-01	2.70E-01
Methanol[2]	5	5	5	1.60E-02	2.34E-01	4.60E-02	7.17E-02	9.17E-02	2.23E-01
Methyl Ethyl Ketone	7	3	3	9.35E-06	7.85E-05	3.49E-05	4.09E-05	3.50E-05	9.87E-05
Methylene Chloride	7	3	3	1.06E-03	4.27E-03	3.09E-03	2.81E-03	1.62E-03	5.49E-03
Naphthalene	7	5	4	1.09E-05	3.69E-02	7.50E-04	2.81E-03	1.33E-03	6.28E-03
Phenol	7	3	3	3.18E-03	2.10E-02	5.61E-03	9.92E-03	9.65E-03	2.58E-02
Alpha-Pinene	7	1	1	--	--	5.38E-04	5.38E-04	--	--
Beta-Pinene	7	2	2	1.47E-04	5.25E-03	2.70E-03	2.70E-03	--	--
Propionaldehyde	7	5	5	2.72E-05	3.05E-03	4.38E-04	1.14E-03	1.17E-03	3.30E-03
Toluene	7	6	4	2.58E-03	5.55E-02	2.59E-03	1.25E-02	1.93E-02	6.21E-02
VOCs as C[1]	5	5	5	2.34E-01	4.07E-01	2.53E-01	2.95E-01	7.66E-02	4.21E-01
VOCs as C [2]	5	5	5	7.74E-01	1.40E+00	9.60E-01	1.05E+00	2.43E-01	1.45E+00

*No. of sources tested represents the total number of sources that were tested. No. of sources included represents the sources for which data were included in the analysis for estimating averages. The difference represents sources whose data were rejected mainly because they yielded non-detects with detection limits exceeding the highest detected observation. Occasionally, an observation confirmed to be a statistical outlier was also rejected.
**UPL=upper prediction limit. Estimated using mean + 1.65 x std. dev. for normally distributed data and the Chebyshev Inequality with 85% confidence coefficient for non-normally distributed data.
ADTFP=air dry ton of finished product
[a] Modified Kaplan-Meier median - 50 percentile value obtained from best curve fit of the quantiles generated by the K-M subroutine. [b] See discussion in Section 10.2.1 for further details
[1]Fourdrinier machines. [2] Cylinder machines.

10.2 Critical Review of Emissions from Paper Machines Processing Non-Chemical Pulps or Purchased Chemical Pulps

This section provides a closer scrutiny of some of the “unexpected” or “suspicious” average emissions presented in Tables 10.1, 10.2, and 10.3. It also includes discussion on how some of the individual mill data may have been discarded before the averages were determined. In cases where certain emissions were determined to be statistical outliers either by the Dixon’s ($n \leq 25$) or Rosner’s ($n > 25$) methods for determining outliers, further information is provided on which outliers were rejected and which were not based upon subsequent graphical analysis and confirmation.

10.2.1 *100% Secondary Fiber Furnish Paper Machines*

Two machines tested for **biphenyl** emissions at one mill (Mill HH) showed rather high levels of this compound (0.06 and 0.098 lb/ADTFP), with the remaining five measuring three NDs and two detects below 0.0037 lb/ADTFP. It is not clear as to what the source of the biphenyl is and why it was high just at this mill. Unbleached towel using 100% deinked pulp furnish was being produced on both machines (NCASI 1997d) at the time of testing. A release agent was used on both machines during the tests, although no known HAPs were believed to be associated with the release agent (biphenyl is a HAP). **Biphenyl** is not a compound expected to be present in paper machine white water from carry-over from pulping/pulp washing or bleaching. It is not clear whether it could be formed during paper drying, although it has been detected repeatedly in vents from mechanical pulping and papermaking operations (see Section 10.5 and Table 10.2).

Carbon disulfide measured in seven machine vent gases yielded 3 detects (0.0029, 0.027 and 0.00019 lb/ADTFP) and four NDs. The statistically derived median/mean are 0.0029 and 0.0064 lb/ADTFP, respectively. CS_2 is not expected to be present in recycled mill furnishes, nor is it expected to be emitted as a result of paper drying. The high emission from the one paper machine of 0.027 lb/ADTFP is suspected to be either a component or a breakdown product of an additive used at this mill (NCASI 1997d).

Methanol emissions from the six Fourdrinier paper machines were as follows: 0.074, 0.0051, 0.071, 0.022, 1.6E-04 and 0.31 lb/ADTFP. The highest emission of 0.31 lb/ADTFP was for a paper machine at a mill where the recycled pulp was first bleached with hydrogen peroxide and sodium hydrosulfite. H_2O_2 bleaching is expected to result in methanol generation which will then be trapped in the pulp going forward to the machine.

There were no other issues with the data for seven 100% recycled furnish paper machines.

10.2.2 *Virgin Mechanical with Chemical Pulp Paper Machines*

Phenol was detected in two of the four machines tested at high levels of 0.07 and 0.075 lb/ADTFP. Phenol was not detected in all seven machines tested during the Canadian study (FPAC 2003) with DLs ranging from 0.0036 to 0.064 lb/ADTFP. Difficulty with phenol measurement methods, often reflected in relatively poor spike recoveries, is well documented. Considering the extreme censoring in the data set (two detects out of 11), and the fact that the production of phenol may be directly related to the wood’s content of p-hydroxybenzoic acid (Shariff et al. 1989), the average emissions given here for phenol (mean = 0.071 and median = 0.013 lb/ADTFP) should be used with caution.

The following **maximum** virgin mechanical with chemical pulp paper machine emissions were determined to be outliers (Dixon’s test). However, after further graphical observation and analysis, they were not rejected for purposes of determining averages.

- 0.056 lb/ADTFP formaldehyde for mill PMCA18 paper machine
- 0.55 lb/ADTFP **limonene** for mill PMCA16 paper machine
- 0.81 lb/ADTFP **alpha-pinene** for mill QQ paper machine
- 1.60 lb/ADTFP **beta-pinene** for mill QQ paper machine

The following **maximum** virgin mechanical with chemical pulp paper machine emissions were determined to be outliers (Dixon's test). After further graphical observation and analysis, they were rejected for purposes of determining averages.

- 7.5 lb/ADTFP **3-carene** for mill PMCA16 paper machine (next highest = 0.15)
- 0.047 lb/ADTFP **chloroform** for mill QQ paper machine (next highest = 0.0022)
- 0.60 lb/ADTFP **p-cymene** for mill PMCA10 paper machine (next highest = 0.099)
- 0.35 lb/ADTFP **1,2-dichloroethane** for mill PMCA16 paper machine (next highest = 1.2E-04)
- 0.052 lb/ADTFP **n-hexane** for mill PMCA16 paper machine (next highest = 4.1E-04)
- 0.30 lb/ADTFP **methylene chloride** for mill PMCA16 paper machine (next highest = 2.1E-03)
- 0.20 lb/ADTFP **styrene** for mill PMCA16 paper machine (next highest = 1.9E-03)

10.3 Recovered Fiber Pulping

The processing of recovered paper has the potential to release air pollutants. Conceivably, these pollutants may be present in the recovered paper or in process additives, or they may be generated through chemical reactions during processing. Emissions can occur through general building ventilation—roof and wall vents, typically fan-assisted. A few pieces of equipment may be ducted directly to the outside. At the typical recycled paperboard mill, pulpers are open vats, and no stock preparation equipment is vented directly to the atmosphere. Pulpers at deinking facilities, however, tend to be hooded or enclosed. Pulper vents are piped to the outside with fan assist. Other equipment that can be enclosed or hooded with direct venting include washers and flotation cells. Pulp storage chests and bleach retention towers may have passive vents. The composition and quantity of emissions can be expected to vary with recovered paper characteristics, usage of processing additives, and operating conditions.

10.3.1 *Emissions from OCC and Recycled Paperboard Stock Preparation*

Table 10.4 presents data on the emissions of total VOCs (as C) and certain organic air toxics from recycled stock preparation at two recycled paperboard mills. Multiple vents were sampled at each mill to estimate emissions for the entire stock preparation area—from pulper operation to finished pulp storage. Detailed mill-specific information for these two recycled paperboard operations such as the type of product made, furnish used, areas tested, number of vents tested, and production rate are presented in Table B-5 of Appendix B. Detail data for each chemical and each stock preparation operation are provided in electronic format in Table B-5 that can be downloaded from the NCASI members only website at www.ncasi.org.

The limited data for recycled stock preparation at two paperboard mills shown in Table 10.4 indicate very low emissions of total VOCs and HAPs with acetaldehyde, methanol, and toluene being the major HAP components.

10.3.2 *Emissions from Deinking (With Bleaching) Operations*

Table 10.5 presents data on emissions of total VOCs (as C) and certain organic air toxics from deinking operations at six mills, one of which was tested during the FPAC study. Once again, multiple vents were sampled at each mill to estimate emissions for the entire stock preparation area—from pulper operation to finished pulp storage. Detailed mill-specific information for these six deinking with bleaching operations such as furnish used, areas tested, number of vents tested, and production rate are presented in Table B-6 of Appendix B. Detail data for each chemical and each deinking operation are provided in Table B-6 that can be downloaded from the NCASI members only website at www.ncasi.org.

Emissions from deinking operations were generally higher than those from the recycled paperboard pulping operations, but formaldehyde levels remained quite low. Although not discernible from the summary data presentation here, higher emissions of methanol, acetaldehyde, and biphenyl were observed at mills that applied 4% peroxide compared to a mill that applied 0.4% for bleaching. Also, chloroform emissions were much higher at deinking mills that utilized hypochlorite for bleaching.

Table 10.4 Air Toxic Emissions from OCC and Recycled Paperboard Stock Preparation (lb/ADTP)

Compound	No. of Sources Tested*	No. of Sources Included*	Detects	Min.	Max.	Median	Mean
1,2-Dimethoxyethane	1	1	1	--	--	3.93E-05	3.93E-05
3-Carene	2	2	0	<3.5E-04	<7.7E-04	--	--
Acetaldehyde	2	2	2	7.04E-04	1.61E-03	1.16E-03	1.16E-03
alpha-Pinene	2	2	0	<5.2E-04	<5.7E-04	--	--
beta-Pinene	2	2	0	<4.1E-04	<6.7E-04	--	--
Biphenyl	2	2	1	<5.5E-04	3.77E-04	3.26E-04	3.26E-04
Carbon Disulfide	2	2	1	<4.3E-04	2.94E-03	1.58E-03	1.58E-03
Chloroform	1	1	1	--	--	4.98E-05	4.98E-05
Cumene	2	2	0	<3.3E-04	<5.8E-04	--	--
Formaldehyde	2	2	2	1.22E-04	1.53E-04	1.38E-04	1.38E-04
Methanol	2	2	2	1.54E-03	3.52E-03	2.53E-03	2.53E-03
Methyl Ethyl Ketone	2	2	0	<2.5E-04	<2.5E-04	--	--
Methylene Chloride	2	2	1	<2.0E-04	2.33E-04	1.68E-04	1.68E-04
Naphthalene	2	2	0	<4.0E-04	<7.4E-04	--	--
p-Cymene	2	2	0	<3.8E-04	<6.2E-04	--	--
Phenol	1	1	1	--	--	3.07E-04	3.07E-04
Propionaldehyde	2	2	2	1.11E-04	1.75E-04	1.43E-04	1.43E-04
Toluene	2	2	2	3.29E-04	2.87E-03	1.60E-03	1.60E-03
VOCs as C	2	2	2	9.18E-03	1.05E-02	9.83E-03	9.83E-03

*No. of sources tested represents the total number of sources that were tested. No. of sources included represents the sources for which data were included in the analysis for estimating averages. The difference represents sources whose data were rejected mainly because they yielded non-detects with detection limits exceeding the highest detected observation. Occasionally, an observation confirmed to be a statistical outlier was also rejected.
NOTES: Averages (median and mean) are not estimated when data set has all non-detects; in such cases, only min and max DLs of NDs are provided.
ADTP=air dry ton of recycled pulp

A-XXXX-7-NCASI-TableB1

Date of Last Update - December 2009

Table B1. Air Toxic Emissions From 100% Secondary Fiber Furnish Paper Machines

Volatile Organic Compound	Mill Code		Emissions, lb/ADTFP	Avg*	**all non-detects are shown italicized at the detection limit* Test Method	Comments	1 = Det.	0 = ND
Acetaldehyde	CC C			3.46E-02	D-P/ATC		1	0
Acetaldehyde	CC F			2.31E-02	D-P/ATC		1	0
Acetaldehyde	HH12			1.33E-02	D-P/ATC		1	0
Acetaldehyde	HH14			3.04E-02	D-P/ATC		1	0
Acetaldehyde	KK			1.21E-02	D-P/ATC		1	0
Acetaldehyde	NN			5.67E-04	D-P/ATC		1	0
Acetaldehyde	DD			5.08E-03	D-P/ATC		1	0
% of non-deteets =	*0%*							
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**
Acetaldehyde	**7**	**7**	**5.67E-04**	**3.46E-02**	**1.33E-02**	**1.70E-02**	**1.28E-02**	**3.81E-02**
normal distribution - UPL estimated using 95% conf. coeff. (mean + 1.65 x SD)								
alpha-Pinene**	CC C			*1.93E-02*	D-P/ATC			
alpha-Pinene**	CC F			*1.32E-02*	D-P/ATC			
alpha-Pinene**	HH12			*4.94E-02*	D-P/ATC			
alpha-Pinene**	HH14			*1.04E-01*	D-P/ATC			
alpha-Pinene**	KK			*1.58E-02*	D-P/ATC			
alpha-Pinene**	NN			*1.37E-02*	D-P/ATC			
alpha-Pinene	DD			5.38E-04				
% of non-Detects =	*0%*							
Compound	**Sources**	**Detects**			**Median**	**Mean**		
alpha-Pinene	**1**	**1**			**5.38E-04**	**5.38E-04**		
**** these ND observations are rejected since their DL is > the highest detected observation**								
beta-Pinene**	CC C			*1.52E-02*	D-P/ATC			
beta-Pinene	CC F			5.25E-03	D-P/ATC			
beta-Pinene**	HH12			*3.88E-02*	D-P/ATC			
beta-Pinene**	HH14			*8.18E-02*	D-P/ATC			
beta-Pinene**	KK			*1.87E-02*	D-P/ATC			
beta-Pinene**	NN			*1.08E-02*	D-P/ATC			
beta-Pinene	DD			1.47E-04				
% of non-Detects =	*0%*							
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**		
beta-Pinene	**2**	**2**	**1.47E-04**	**5.25E-03**	**2.70E-03**	**2.70E-03**		
**** these ND observations are rejected since their DL is > the highest detected observation**								
Biphenyl	CC C			*2.06E-02*	D-P/ATC		0	1
Biphenyl	CC F			*1.41E-02*	D-P/ATC		0	1
Biphenyl	HH12			9.78E-02	D-P/ATC		1	0
Biphenyl	HH14			6.04E-02	D-P/ATC		1	0
Biphenyl	KK			3.68E-03	D-P/ATC		1	0
Biphenyl	NN			*1.46E-02*	D-P/ATC		0	1
Biphenyl	DD			3.05E-03			1	0
% of non-detects =	*43%*							
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**
Biphenyl	**7**	**4**	**3.05E-03**	**9.78E-02**	**3.68E-03**	**2.50E-02**	**3.56E-02**	**8.37E-02**
Kaplan-Meier Statistics; normal distribution - UPL estimated using 95% conf. coeff. (mean + 1.65 x SD)								

Compound	Code			Avg*	Test Method	Comments	1 = Det.	0 = ND		
Carbon Disulfide	CC C			2.88E-03	D-P/ATC		1	0		
Carbon Disulfide	CC F			2.66E-02	D-P/ATC		1	0		
Carbon Disulfide	HH12			*1.94E-02*	D-P/ATC		0	1		
Carbon Disulfide**	HH14			*4.10E-02*	D-P/ATC		0	1		
Carbon Disulfide	KK			1.93E-03	D-P/ATC		1	0		
Carbon Disulfide	NN			*5.28E-03*	D-P/ATC		0	1		
Carbon Disulfide	DD			*4.91E-03*			0	1		
% of non-detects =	*50%*									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**		
Carbon Disulfide	**6**	**3**	**1.93E-03**	**2.66E-02**	**2.88E-03**	**6.44E-03**	**9.03E-03**	**2.13E-02**		
**** these ND observations are rejected since their DL is > the highest detected observation**										
Kaplan-Meier Statistics; normal distribution - UPL estimated using 95% conf. coeff. (mean + 1.65 x SD)										
3-Carene	CC C			*1.31E-02*	D-P/ATC		1	0		
3-Carene	CC F			*8.92E-03*	D-P/ATC		1	0		
3-Carene	HH12			*3.42E-02*	D-P/ATC		0	1		
3-Carene	HH14			*7.20E-02*	D-P/ATC		0	1		
3-Carene	KK			*1.95E-02*	D-P/ATC		1	0		
3-Carene	NN			*9.27E-03*	D-P/ATC		0	1		
3-Carene	DD			1.23E-04			0	1		
% of non-Detects =	*0%*									
Compound	**Sources**	**Detects**			**Median**	**Mean**				
3-Carene	**1**	**1**			**1.23E-04**	**1.23E-04**				
**** these ND observations are rejected since their DL is > the highest detected observation**										
Chloroform	CC C			*1.23E-02*	D-P/ATC		0	1		
Chloroform	CC F			4.19E-05	D-P/ATC		1	0		
Chloroform	HH12			2.65E-03	D-P/ATC		1	0		
Chloroform	HH14			1.51E-02	D-P/ATC		1	0		
Chloroform	KK			*1.36E-02*	D-P/ATC		0	1		
Chloroform	NN			2.28E-03	D-P/ATC		1	0		
Chloroform	DD			6.15E-06			1	0		
% of non-detects =	*29%*									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**		
Chloroform	**7**	**5**	**6.15E-06**	**1.51E-02**	**2.29E-03**	**3.22E-03**	**9.03E-03**	**2.62E-02**		**2.41**
Kaplan-Meier Statistics; non-normal distribution - UPL estimated using Chebyshev Inequality with 85% confid. coeff. {mean + 2.41 x SD}										
Cumene**	CC C			*1.23E-02*	D-P/ATC					
Cumene	CC F			4.33E-03	D-P/ATC					
Cumene**	HH12			*3.13E-02*	D-P/ATC					
Cumene**	HH14			*6.60E-02*	D-P/ATC					
Cumene**	KK			*1.62E-02*	D-P/ATC					
Cumene**	NN			*8.74E-03*	D-P/ATC					
Cumene	DD			9.28E-05						
% of non-Detects =	*0%*									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**				
Cumene	**2**	**2**	**9.28E-05**	**4.33E-03**	**2.21E-03**	**2.21E-03**				
**** these ND observations are rejected since their DL is > the highest detected observation**										

Compound	Code			Avg*	Test Method	Comments	1 = Det.	0 = ND		
p-Cymene**	CC C			*1.43E-02*	D-P/ATC		0	1		
p-Cymene	CC F			1.03E-02	D-P/ATC		1	0		
p-Cymene**	HH12			*4.10E-02*	D-P/ATC		0	1		
p-Cymene**	HH14			*8.65E-02*	D-P/ATC		0	1		
p-Cymene**	KK			*1.75E-02*	D-P/ATC		0	1		
p-Cymene	NN			*1.01E-02*	D-P/ATC		0	1		
p-Cymene	DD			1.23E-04			1	0		
% of non-detects =	***33%***									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**		
p-Cymene	**3**	**2**	**1.23E-04**	**1.03E-02**	**5.07E-03**	**5.15E-03**	**5.07E-03**	**1.35E-02**		
**** these ND observations are rejected since their DL is > the highest detected observation**										
normal distribution - UPL estimated using 95% conf. coeff. (mean + 1.65 x SD)										
1,2-Dimethoxyethane**	CC C			*8.13E-03*	D-P/ATC					
1,2-Dimethoxyethane	CC F			2.38E-03	D-P/ATC					
1,2-Dimethoxyethane**	HH12			*2.08E-02*	D-P/ATC					
1,2-Dimethoxyethane**	HH14			*4.39E-02*	D-P/ATC					
1,2-Dimethoxyethane**	KK			*1.13E-02*	D-P/ATC					
1,2-Dimethoxyethane**	NN			*5.76E-03*	D-P/ATC					
1,2-Dimethoxyethane	DD			1.55E-04						
% of non-Detects =	***0%***									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**				
1,2-Dimethoxyethane	**2**	**2**	**1.55E-04**	**2.38E-03**	**1.27E-03**	**1.27E-03**				
**** these ND observations are rejected since their DL is > the highest detected observation**										
Formaldehyde	CC C			9.80E-03	D-P/ATC		1	0		
Formaldehyde	CC F			1.10E-02	D-P/ATC		1	0		
Formaldehyde	HH12			2.84E-05	D-P/ATC		1	0		
Formaldehyde	HH14			3.48E-05	D-P/ATC		1	0		
Formaldehyde	KK			1.04E-02	D-P/ATC		1	0		
Formaldehyde	NN			7.62E-04	D-P/ATC		1	0		
Formaldehyde	DD			3.46E-04			1	0		
% of non-Detects =	***0%***									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**		
Formaldehyde	**7**	**7**	**2.84E-05**	**1.10E-02**	**7.62E-04**	**4.63E-03**	**5.43E-03**	**1.84E-02**		**2.41**
non-normal distribution - UPL estimated using Chebyshev Inequality with 85% confid. coeff. {mean + 2.41 x SD}										
Limonene**	CC C			*1.44E-02*	D-P/ATC		0	1		
Limonene	CC F			1.42E-02	D-P/ATC		1	0		
Limonene**	HH12			*4.14E-02*	D-P/ATC		0	1		
Limonene**	HH14			*8.73E-02*	D-P/ATC		0	1		
Limonene	KK			2.45E-05	D-P/ATC		1	0		
Limonene	NN			*1.02E-02*	D-P/ATC		0	1		
Limonene	DD			1.76E-04			1	0		
% of non-detects =	***25%***									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**		
Limonene	**4**	**3**	**2.40E-05**	**1.42E-02**	**1.76E-04**	**3.63E-03**	**6.11E-03**	**1.99E-02**		**2.43**
**** these ND observations are rejected since their DL is > the highest detected observation**										
Kaplan-Meier Statistics; non-normal distribution - UPL estimated using Chebyshev Inequality with 85% confid. coeff. {mean + 2.42 x SD}										

Compound	Code			Avg*	Test Method	Comments	1 = Det. 0 = ND	
Fourdrinier Paper Machines								
Methanol	CC F			7.38E-02	D-P/ATC		1	0
Methanol	HH12			5.12E-03	D-P/ATC		1	0
Methanol	HH14			7.10E-02	D-P/ATC		1	0
Methanol	KK			2.17E-02	D-P/ATC		1	0
Methanol	NN			1.56E-04	D-P/ATC		1	0
Methanol	DD			3.06E-01			1	0
% of non-Detects =	***0%***							
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**
Methanol	**6**	**6**	**1.56E-04**	**3.06E-01**	**4.64E-02**	**7.96E-02**	**1.15E-01**	**2.70E-01**
normal distribution - UPL estimated using 95% eonf. eoeff. (mean + 1.65 x SD)								
Cylinder Paper Machines								
Methanol	CC C			2.34E-01	D-P/ATC		1	0
Methanol	AZ			1.60E-02	D-P/ATC	TB 882	1	0
Methanol	BZ			4.70E-02	D-P/ATC	TB 882	1	0
Methanol	CZ			4.60E-02	D-P/ATC	TB 882	1	0
Methanol	DZ			1.60E-02	D-P/ATC	TB 882	1	0
% of non-Detects =	***0%***							
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**
Methanol	**5**	**5**	**1.60E-02**	**2.34E-01**	**4.60E-02**	**7.17E-02**	**9.17E-02**	**2.23E-01**
normal distribution - UPL estimated using 95% eonf. eoeff. (mean + 1.65 x SD)								
Methylene Chloride**	CC C			*7.66E-03*	D-P/ATC		0	1
Methylene Chloride**	CC F			*5.22E-03*	D-P/ATC		0	1
Methylene Chloride	HH12			1.06E-03	D-P/ATC		1	0
Methylene Chloride**	HH14			*4.14E-02*	D-P/ATC		0	1
Methylene Chloride	KK			3.09E-03	D-P/ATC		1	0
Methylene Chloride**	NN			*5.43E-03*	D-P/ATC		0	1
Methylene Chloride	DD			4.27E-03			1	0
% of non-detects =	***0%***							
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**
Methylene Chloride	**3**	**3**	**1.06E-03**	**4.27E-03**	**3.09E-03**	**2.81E-03**	**1.62E-03**	**5.49E-03**
**** these ND observations are rejected since their DL is > the highest detected observation**								
normal distribution - UPL estimated using 95% eonf. eoeff. (mean + 1.65 x SD)								
Methyl Ethyl Ketone**	CC C			*9.37E-03*	D-P/ATC			
Methyl Ethyl Ketone	CC F			9.35E-06	D-P/ATC			
Methyl Ethyl Ketone	HH12			7.85E-05	D-P/ATC			
Methyl Ethyl Ketone**	HH14			*5.47E-02*	D-P/ATC			
Methyl Ethyl Ketone	KK			3.49E-05	D-P/ATC			
Methyl Ethyl Ketone**	NN			*6.64E-03*	D-P/ATC			
Methyl Ethyl Ketone**	DD			*5.22E-03*				
% of non-Detects =	***0%***							
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**
Methyl Ethyl Ketone	**3**	**3**	**9.35E-06**	**7.85E-05**	**3.49E-05**	**4.09E-05**	**3.50E-05**	**9.87E-05**
**** these ND observations are rejected since their DL is > the highest detected observation**								
normal distribution - UPL estimated using 95% eonf. eoeff. (mean + 1.65 x SD)								

Compound	Code			Avg*	Test Method	Comments	1 = Det.	0 = ND		
Naphthalene	CC C			1.28E-02	D-P/ATC		1	0		
Naphthalene	CC F			3.69E-02	D-P/ATC		1	0		
Naphthalene**	HH12			*3.79E-02*	D-P/ATC		0	1		
Naphthalene**	HH14			*7.99E-02*	D-P/ATC		0	1		
Naphthalene	KK			1.09E-05	D-P/ATC		1	0		
Naphthalene	NN			*1.05E-02*	D-P/ATC		0	1		
Naphthalene	DD			7.50E-04			1	0		
% of non-detects =	*20%*									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**		
Naphthalene	**5**	**4**	**1.09E-05**	**3.69E-02**	**7.50E-04**	**2.81E-03**	**1.33E-03**	**6.28E-03**		**2.42**
**** these ND observations are rejected since their DL is > the highest detected observation**										
Kaplan-Meier Statistics; non-normal distribution - UPL estimated using Chebyshev Inequality with 85% confid. coeff. {mean + 2.42 x SD}										
Phenol**	CC C			*2.00E-01*	D-P/ATC					
Phenol**	CC F			*1.36E-01*	D-P/ATC					
Phenol	HH12			2.10E-02	D-P/ATC					
Phenol**	HH14			*2.16E+00*	D-P/ATC					
Phenol	KK			3.18E-03	D-P/ATC					
Phenol**	NN			*1.42E-01*	D-P/ATC					
Phenol	DD			5.61E-03						
% of non-Detects =	*0%*									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**		
Phenol	**3**	**3**	**3.18E-03**	**2.10E-02**	**5.61E-03**	**9.92E-03**	**9.65E-03**	**2.58E-02**		
**** these ND observations are rejected since their DL is > the highest detected observation**										
normal distribution - UPL estimated using 95% eonf. eoeff. (mean + 1.65 x SD)										
Propionaldehyde	CC C			2.19E-04	D-P/ATC		1	0		
Propionaldehyde	CC F			1.95E-03	D-P/ATC		1	0		
Propionaldehyde	HH12			2.72E-05	D-P/ATC		1	0		
Propionaldehyde**	HH14			*3.87E-02*	D-P/ATC		0	1		
Propionaldehyde	KK			3.05E-03	D-P/ATC		1	0		
Propionaldehyde**	NN			*5.07E-03*	D-P/ATC		0	1		
Propionaldehyde	DD			4.38E-04			1	0		
% of non-detects =	*0%*									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**		
Propionaldehyde	**5**	**5**	**2.72E-05**	**3.05E-03**	**4.38E-04**	**1.14E-03**	**1.31E-03**	**3.30E-03**		
**** these ND observations are rejected since their DL is > the highest detected observation**										
Kaplan-Meier Statistics; normal distribution - UPL estimated using 95% eonf. eoeff. (mean + 1.65 x SD)										
Toluene	CC C			5.55E-02	D-P/ATC		1	0		
Toluene	CC F			6.70E-03	D-P/ATC		1	0		
Toluene	HH12			2.59E-03	D-P/ATC		1	0		
Toluene**	HH14			*5.70E-02*	D-P/ATC		0	1		
Toluene	KK			*1.06E-02*	D-P/ATC		0	1		
Toluene	NN			*7.40E-03*	D-P/ATC		0	1		
Toluene	DD			2.58E-03			1	0		
% of non-detects =	*33%*									
Compound	**Sources**	**Detects**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**	**UPL**		
Toluene	**6**	**4**	**2.58E-03**	**5.55E-02**	**2.59E-03**	**1.25E-02**	**1.93E-02**	**6.21E-02**		**2.42**
**** these ND observations are rejected since their DL is > the highest detected observation**										
Kaplan-Meier Statistics; non-normal distribution - UPL estimated using Chebyshev Inequality with 85% confid. coeff. {mean + 2.42 x SD}										

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	

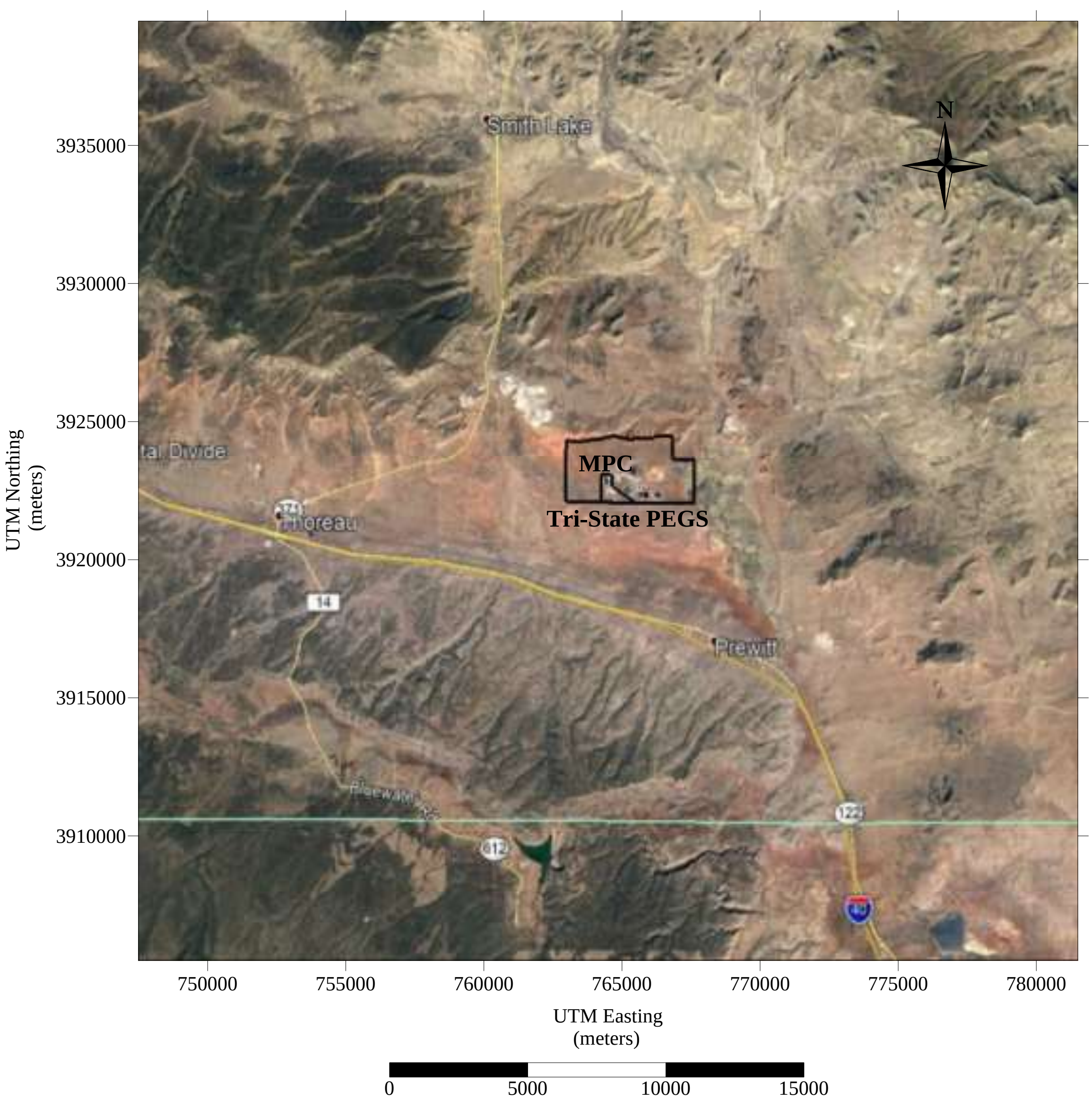


Figure 8-1: Aerial Map Showing MPC Restricted Boundary along with Tri-State PEGS Boundary in Relation to the Surrounding Area

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. X A copy of the certified letter receipts with post marks (20.2.72.203.B NMAC)
2. X 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. X A copy of the property tax record (20.2.72.203.B NMAC).
4. X A sample of the letters sent to the owners of record.
5. X A sample of the letters sent to counties, municipalities, and Indian tribes.
6. X A sample of the public notice posted and a verification of the local postings.
7. X A table of the noticed citizens, counties, municipalities and tribes and to whom the notices were sent in each group.
8. X A copy of the public service announcement (PSA) sent to a local radio station and documentary proof of submittal.
9. X 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. X 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. X 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.

Lists of Government and Tribal Entities Sent a Public Notice

Government Entity	Official	Mail Address	City	State	Zip Code
McKinley County	Harriett K. Becenti, County Clerk	207 West Hill St. #100	Gallup	NM	87301
Cibola County	Michelle Dominguez, County Clerk	PO Box 190	Grants	NM	87020
Navajo Nation	Office of the President	PO Box 7440	Window Rock	AZ	86515
Baca-Prewitt Chapter		PO Box 563	Prewitt	NM	87045
Casamero Lake Chapter		PO Box 549	Prewitt	NM	87045
Crownpoint Chapter		PO Box 336	Crownpoint	NM	87313
Littlewater Chapter		PO Box 1898	Crownpoint	NM	87313
Mariano Lake Chapter		PO Box 164	Smith Lake	NM	87365
Smith Lake Chapter		PO Box 60	Smith Lake	NM	87365
Thoreau Chapter		PO Box 899	Thoreau	NM	87323

Lists of Landowners within 0.5 miles Sent a Public Notice
All landowners located within 0.5 miles of MPC Prewitt Mill.

Account No.	Owner Name	Address	City	State	Zip
R182923	ELKINS, DAVID P. REVOCABLE TRUST	PO BOX 100	GAMERCO	NM	87317-0100
R183032	ELKINS, DONALD J. AND DAVID P.	PO BOX 1326	AZTEC	NM	87410-0000
R211147	SAN ANTONE FLAGSTONE INC.	PO BOX 100	GAMERCO	NM	87317-0100
	STATE OF NEW MEXICO	310 OLD SANTA FE TRAIL	SANTA FE	NM	87501-0000
C216145	TRI-STATE GENERATION & TRANSMISSION ASSOCIATION, INC.	P.O. BOX 33695	DENVER	CO	80233-3695
C216263	TRI-STATE GENERATION & TRANSMISSION ASSOCIATION, INC.	P.O. BOX 33695	DENVER	CO	80233-3695

NOTICE

McKinley Paper Company (MPC) announces its intent to apply to the New Mexico Environment Department (NMED) for a new 20.2.72 NMAC air quality permit for its existing paper recycling and mill facility in Prewitt, New Mexico. MPC currently receives all process steam for its facility from Tri-State's Prewitt Escalante Generating Station (PEGS) existing coal-fired boiler. However, PEGS is scheduled for a permanent shut down in mid-September 2020, when the coal-fired boiler will permanently be taken offline. After mid-September, MPC will supply its own process steam with the existing and new natural-gas fired steam boilers identified in this application. The date the notarized MPC permit application will be submitted to the NMED Air Quality Bureau is estimated to be July 13, 2020.

MPC's paper mill has been in commercial production since June 1, 1994. MPC's physical location latitude 35°, 24', 38.21" N and longitude 108°, 05', 10.79" W, NAD83, which is approximately 3.9 miles northwest of Prewitt, NM in McKinley County. The facility processes a maximum of 900 tons per day of recycled "old corrugated cardboard" (OCC) into new cardboard paper stock. With this application, the facility is applying for construction and operation of the existing OCC processing plant, an existing 190 MMBtu/hr natural gas-fired steam boiler (presently owned and operated by PEGS), a new 166.8 MMBtu/hr natural gas-fired steam boiler, three (3) existing cooling towers, an existing water treatment facility (presently owned and operated by PEGS), and an existing 375 horsepower diesel-fired fire pump engine.

The estimated maximum quantities of any regulated air contaminants 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
PM_{10} (Total Facility)	2.79 pph	7.78 tpy
$PM_{2.5}$ (Total Facility)	2.36 pph	6.69 tpy
Sulfur Dioxide (SO_2)	0.41 pph	1.24 tpy
Nitrogen Oxides (NO_x)	30.6 pph	86.1 tpy
Carbon Monoxide (CO)	31.0 pph	76.8 tpy
Volatile Organic Compounds (VOC)	4.81 pph	17.2 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	3.62 pph	13.4 tpy
Toxic Air Pollutant (TAP)	0.29 pph	0.49 tpy
Green House Gas Emissions as Total CO_2e	n/a	<75,000 tpy

The maximum and standard operating schedule (or "potential to emit") of the MPC plant is 24 hours per day, 7 days a week, and a maximum of 52 weeks per year for annual operating hours of 8760 hours per year.

The owner and operator of the MPC Facility is:

McKinley Paper Company
4600 Williams St SE
Albuquerque, New Mexico 87105

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.

With your comments, please refer to the company name and facility name, or send a copy of this notice along with your comments. This information is necessary since the Department may have not yet received the permit application. Please include a legible return mailing address. Once the Department has completed its 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 Agencia de Calidad de Aire del Departamento de Medio Ambiente de Nuevo México, acerca de las emisiones producidas por un establecimiento en esta área. Si usted desea información en español, por favor de comunicarse con la oficina de Calidad de Aire al teléfono 505-476-5557.

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, you may contact: Kristine Pintado, Non-Discrimination Coordinator, New Mexico Environment Department, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855, nd.coordinator@state.nm.us. If you believe that you have been discriminated against with respect to a NMED program or activity, you may contact the Non-Discrimination Coordinator identified above or visit our website at https://www.env.nm.gov/NMED/EJ/index.html to learn how and where to file a complaint of discrimination.

General Posting of Notices – Certification

I, __Michael W. Hooker________________________________, the undersigned, certify that on **07.02.2020,** posted a true and correct copy of the attached Public Notice in the following publicly accessible and conspicuous places in the Prewitt, Thoreau, and Grants of McKinley County, State of New Mexico on the following dates:

1. MPC's Facility entrance {07.01.2020}
2. US Post Office in Prewitt, NM at 1692 State Highway 122 {07.01.2020}
3. US Post Office in Thoreau, NM at 3 Prewitt St {07.01.2020}
4. Grants City Administration in Grants, NM at 600 W Sante Fe Ave {07.02.2020}

Signed this __06__ day of ____July________, ___2020____,

_______________________________ 07.06.2020
Signature Date

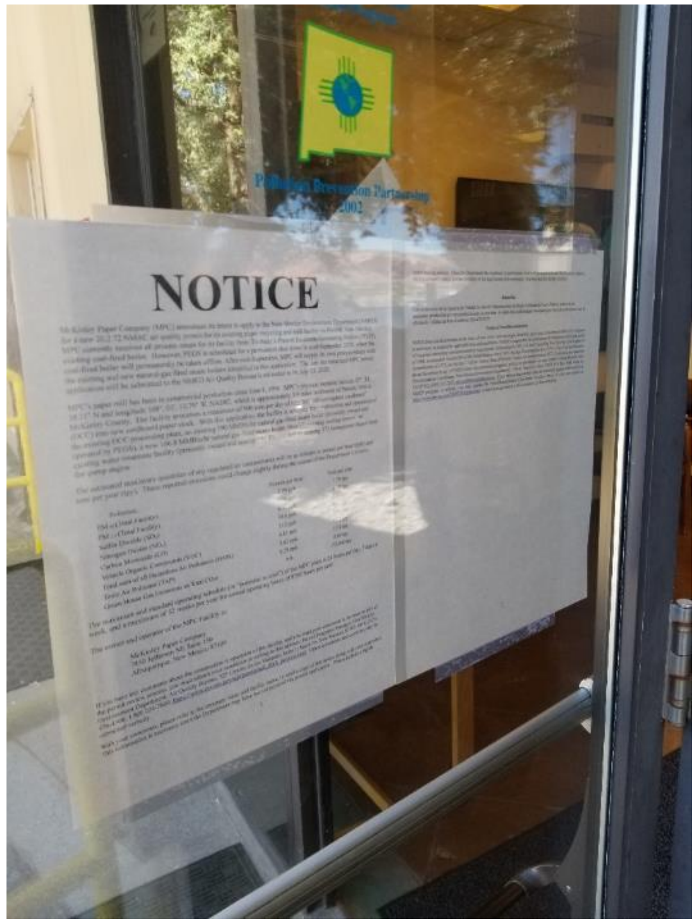
Michael W. Hooker
Printed Name

TES MANAGER - MPC
Title {APPLICANT OR RELATIONSHIP TO APPLICANT}

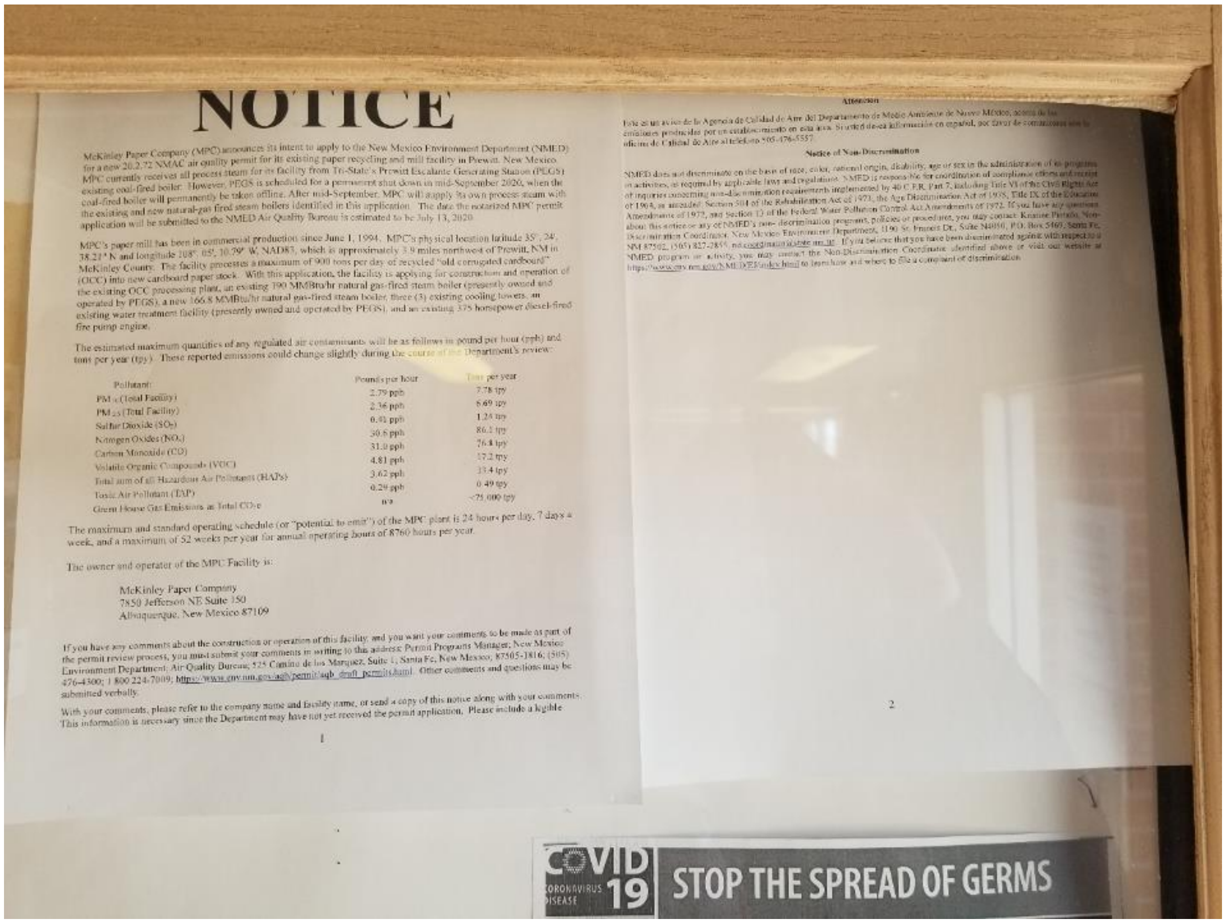
Air Quality Permit Public Notices

Documentation of Public Notice

Front Entrance – Prewitt Mill
County Road 19
Prewitt NM 87045



Prewitt Post Office
1692 NM-122,
Prewitt, NM 87045



NOTICE

McKinley Paper Company (MPC) announces its intent to apply to the New Mexico Environment Department (NMED) for a new 20.2.72 NMAC air quality permit for its existing paper recycling and mill facility in Prewitt, New Mexico. MPC currently receives all process steam for its facility from Tri-State's Prewitt Escalante Generating Station (PEGS) existing coal-fired boiler. However, PEGS is scheduled for a permanent shut down in mid-September 2020, when the coal-fired boiler will permanently be taken offline. After mid-September, MPC will supply its own process steam with the existing and new natural-gas fired steam boilers identified in this application. The date the notarized MPC permit application will be submitted to the NMED Air Quality Bureau is estimated to be July 13, 2020.

MPC's paper mill has been in commercial production since June 1, 1994. MPC's physical location latitude 35°, 24', 38.21" N and longitude 108°, 05', 10.79" W, NAD83, which is approximately 3.9 miles northwest of Prewitt, NM in McKinley County. The facility processes a maximum of 900 tons per day of recycled "old corrugated cardboard" (OCC) into new cardboard paper stock. With this application, the facility is applying for construction and operation of the existing OCC processing plant, an existing 190 MMBtu/hr natural gas-fired steam boiler (presently owned and operated by PEGS), a new 166.8 MMBtu/hr natural gas-fired steam boiler, three (3) existing cooling towers, an existing water treatment facility (presently owned and operated by PEGS), and an existing 375 horsepower diesel-fired fire pump engine.

The estimated maximum quantities of any regulated air contaminants 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
PM_{10} (Total Facility)	2.79 pph	7.78 tpy
$PM_{2.5}$ (Total Facility)	2.36 pph	6.69 tpy
Sulfur Dioxide (SO_2)	0.41 pph	1.24 tpy
Nitrogen Oxides (NO_x)	30.6 pph	86.1 tpy
Carbon Monoxide (CO)	31.0 pph	76.8 tpy
Volatile Organic Compounds (VOC)	4.81 pph	17.2 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	3.62 pph	13.4 tpy
Toxic Air Pollutant (TAP)	0.29 pph	0.49 tpy
Green House Gas Emissions as Total CO_2e	n/a	<75,000 tpy

The maximum and standard operating schedule (or "potential to emit") of the MPC plant is 24 hours per day, 7 days a week, and a maximum of 52 weeks per year for annual operating hours of 8760 hours per year.

The owner and operator of the MPC Facility is:

McKinley Paper Company
7850 Jefferson NE Suite 150
Albuquerque, New Mexico 87109

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.

With your comments, please refer to the company name and facility name, or send a copy of this notice along with your comments. This information is necessary since the Department may have not yet received the permit application. Please include a legible

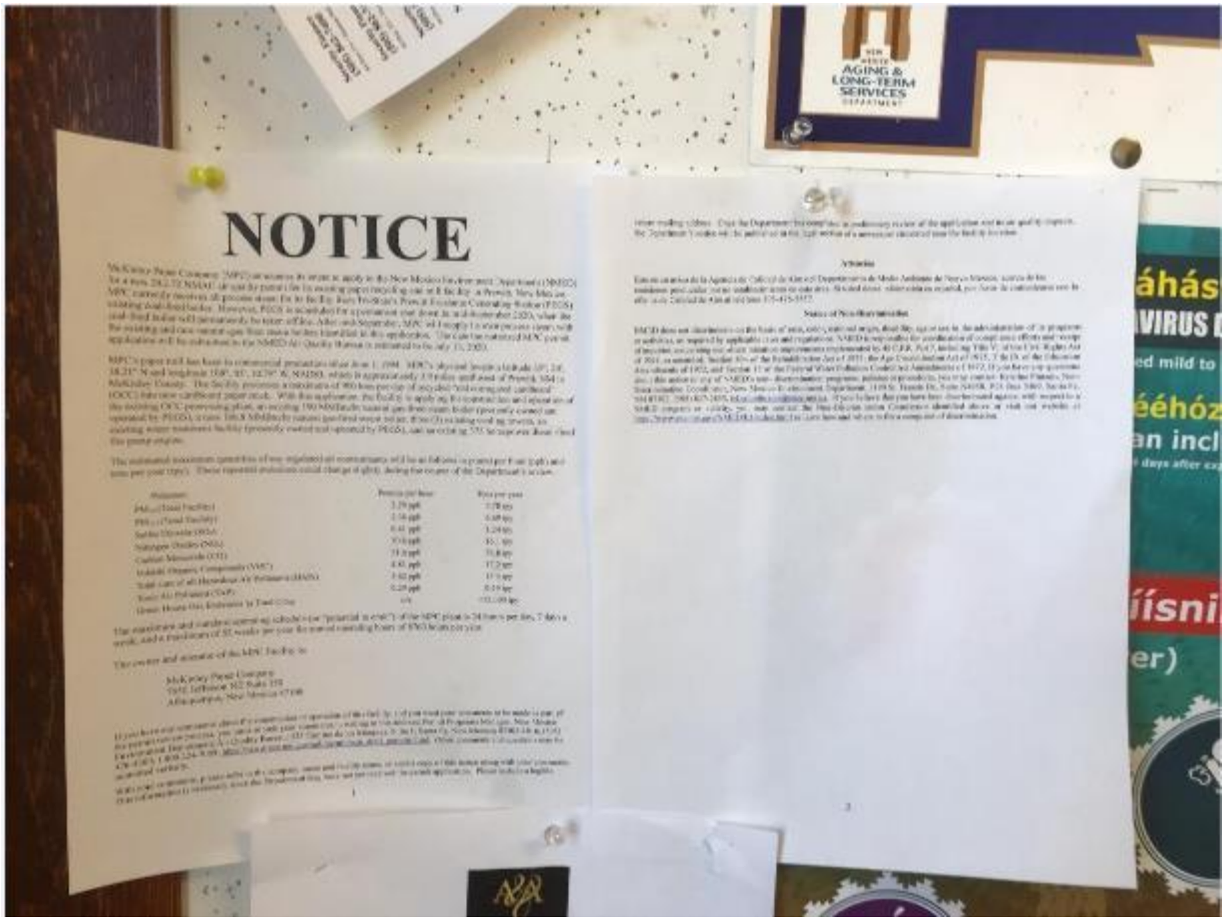
1

Attention

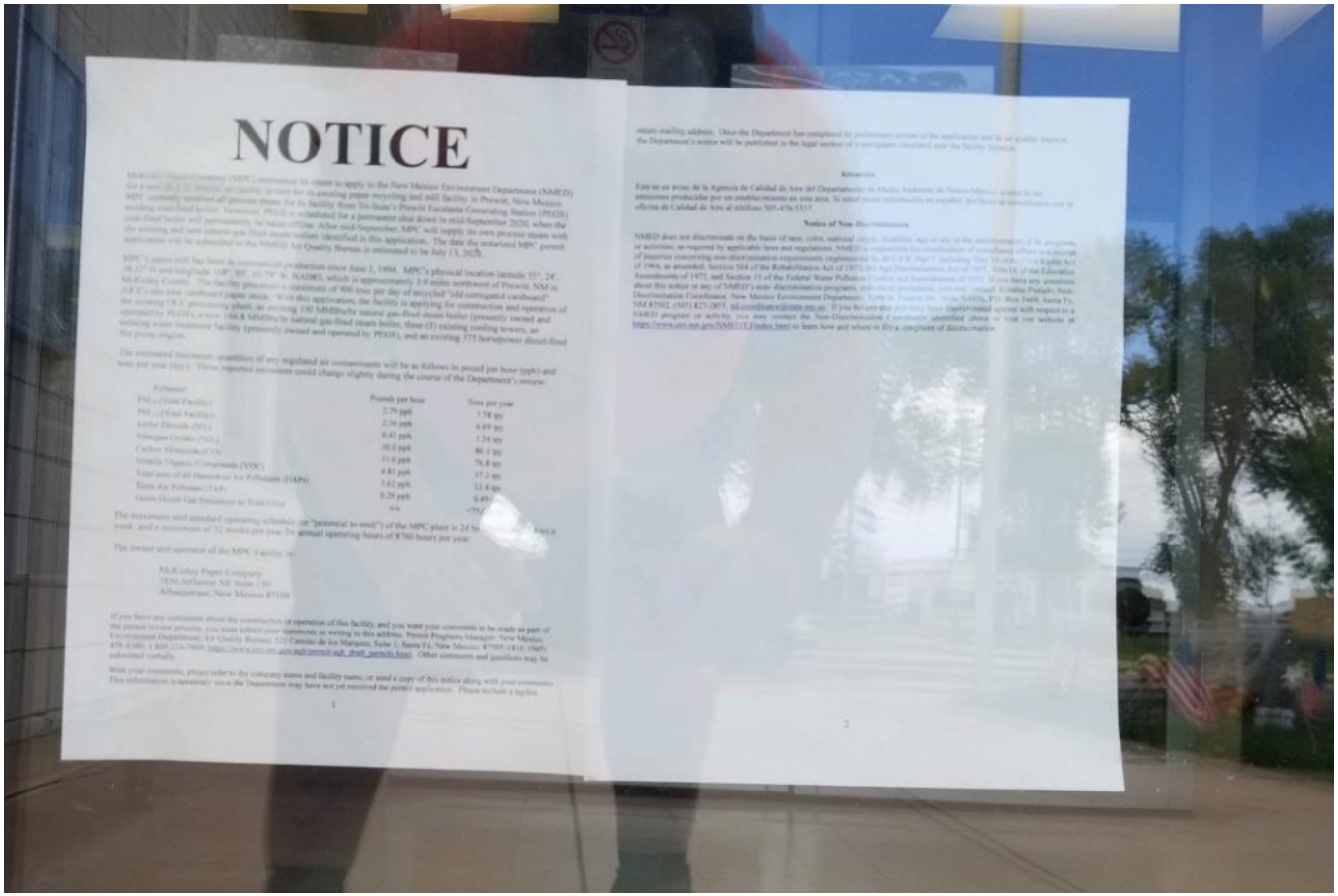
Notice of Non-Discrimination

2

Thoreau Post Office
3 Prewitt St
Thoreau, NM 87323



Grants City Hall
600 W Santa Fe
Grants, NM 87020



NOTICE OF AIR QUALITY PERMIT APPLICATION

McKinley Paper Company (MPC) announces its intent to apply to the New Mexico Environment Department (NMED) for a new 20.2.72 NMAC air quality permit for its existing paper recycling and mill facility in Prewitt, New Mexico. MPC currently receives all process steam for its facility from Tri-State's Prewitt Escalante Generating Station (PEGS) existing coal-fired boiler. However, PEGS is scheduled for a permanent shut down in mid-September 2020, when the coal-fired boiler will permanently be taken offline. After mid-September, MPC will supply its own process steam with the existing and new natural-gas fired steam boilers identified in this application. The date the notarized MPC permit application will be submitted to the NMED Air Quality Bureau is estimated to be July 13, 2020.

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The estimated maximum quantities of any regulated air contaminants 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
PM_{10} (Total Facility)	2.79 pph	7.78 tpy
$PM_{2.5}$ (Total Facility)	2.36 pph	6.69 tpy
Sulfur Dioxide (SO_2)	0.41 pph	1.24 tpy
Nitrogen Oxides (NO_x)	30.6 pph	86.1 tpy
Carbon Monoxide (CO)	31.0 pph	76.8 tpy
Volatile Organic Compounds (VOC)	4.81 pph	17.2 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	3.62 pph	13.4 tpy
Toxic Air Pollutant (TAP)	0.29 pph	0.49 tpy
Green House Gas Emissions as Total CO_2e	n/a	<75,000 tpy

The maximum and standard operating schedule (or "potential to emit") of the MPC plant is 24 hours per day, 7 days a week, and a maximum of 52 weeks per year for annual operating hours of 8760 hours per year.

The owner and operator of the Pinon Energy Center is:

McKinley Paper Company
4600 Williams St SE
Albuquerque, New Mexico 87105

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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PROOF OF PUBLICATION AFFIDAVIT

County of McKinley

Raenona Harvey being duly sworn,

testifies that he/she is Office Manager

of the Gallup Sun, a weekly newspaper circulated in the above county and that he/she is familiar with the facts and that the notice, a copy of which is attached, was published in said newspaper one week for one consecutive week (one publication) prior to the time fixed for the hearing thereof, and that the publication was made on the:

3rd day of July

20 20

Dated 7/6/2020

Signature of Affiant

State of New Mexico)
County of Mckinley) ss

On the 6 day of July 20 20,

the foregoing instrument was acknowledged

before me by Raenona Harvey.

Notary Public

My Commission expires 5-6-24

OFFICIAL SEAL
MARISA A. SOTO
NOTARY PUBLIC STATE OF NEW MEXICO
My Commission Expires: 5-6-24

NOTICE OF AIR QUALITY PERMIT APPLICATION

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Toxic Air Pollutant (TAP)	0.29 pph	0.49 tpy
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FREE

Gallup Sun

VOL 6 | ISSUE 274 | JULY 3, 2020

CONNECTED

Bringing technology to the Navajo Nation

By Beth Blakeman
Associate Editor

John Badal saw a need and has spent the past sixteen years filling it. Badal is the founder and president of Sacred Wind Communications, a local telephone company and broadband provider for the Navajo Nation.

He was in the telephone business for 30 years, first Mountain Bell in Albuquerque, and later AT&T. He retired from AT&T in 1998 and started a consultancy. In 2000 he was invited to run Qwest for the state of New Mexico. He was the state president for the company for four years.

In 2004 Badal's attention turned to the Navajo Nation and other Tribal peoples. Though he is not Native American himself, he was moved by the high poverty of one of the largest tribes in the country, the Navajo. He felt it was an entity that could never achieve equality of educational, economic or health care opportunity with urban areas in its current state.

He saw broadband as somewhat of an equalizer, particularly to the elderly and to children, giving more direct access to information systems and other services.

"I was an advocate of tribal ownership of their own telecom systems and as a matter of their economic and cultural survival," he said. "When I couldn't find a company that was willing to focus on the needs of the Navajo people, I decided to do this myself.

"I started with the business plan in 2004. We opened in Dec. 2006," he said.

Sacred Wind, which employs a significant number of Navajo people in its ranks, says it is currently providing the highest speed broadband service to homes, of any company operating on Navajo lands.

Badal said his company has telephone dial-up service and hi-speed Wi-Fi with a mix of fiber, broadband and fixed wireless, which allows people to put an antenna on their home and attach it to a modem inside.

Badal said Sacred Wind acquired all of Qwest/Century Link's telephone assets on Navajo lands in New Mexico, which represent 15 percent of Navajo reservation lands.

"We have more than 5K customers in an area with the total household count of over 8K homes," he said.

Badal said it took a little while for employees of Sacred Wind to understand the significance of what they were creating together. But now, when his employees describe the company, they say, "We provide a voice to the people who are voiceless. And we provide a new level of opportunity to our customers."

Badal said customer service is tremendously important at Sacred Wind. He got choked up when he told some of the stories about the things the company has done for people on the Navajo Nation.

"We've had adults come into our customer service office signing up their grandmother … It was the first time they'd ever been able to talk to their grandmother on the telephone," he said.

In 2017 Sacred Wind started a solar program to provide customers with electricity. Badal said it had some of the employees and customers in tears, because they had electric power for the first time.

He also told the story of a Navajo family, a husband and

CONNECTED | SEE PAGE 19

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CLASSIFIEDS
| FROM PAGE 21

STATE OF NEW MEXICO

In the Matter of the Estate of PRAJERES CANDELERIA, Deceased

No. D-1333-PB-2020-00006

NOTICE TO CREDITORS

ARTURO CANDELERIA has been appointed Personal Representative of the Estate of PRAJERES CANDELERIA, deceased. All persons having claims against this estate are required to present their claims within four (4) months after the date of the first publication of this Notice or the claims will be forever barred. Claims must be presented either to the Personal Representative at the offices of Mason & Isaacson, P.A., 104 East Aztec Avenue, Gallup, New Mexico, 87301, attorneys for the Personal Representative, or filed with the District Court of McKinley, New Mexico.

Dated: June 23, 2020

PRAJERES CANDELERIA
Personal Representative

Mason & Isaacson, P.A.
James J. Mason
Attorneys for Personal Representative
104 East Aztec Avenue
Gallup, New Mexico 87301
(505) 722-4463

Printed: Gallup Sun
July 3, 2020
July 10, 2020
July 17, 2020

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McKinley

July 8, 2020

Harriett K. Becenti
McKinley County Clerk
207 West Hill St. #100
Gallup NM 87301

Ms Becenti

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McKinley County Governement Entities within 10 Miles
July 2020

McKinley County	Harriett K. Becenti, County Clerk	207 West Hill St. #100	Gallup	NM	87301
Cibola County	Michelle Dominguez, County Clerk	PO Box 190	Grants	NM	87020
Navajo Nation	Office of the President	PO Box 7440	Window Rock	AZ	86515
Baca-Prewitt Chapter		PO Box 563	Prewitt	NM	87045
Casamero Lake Chapter		PO Box 549	Prewitt	NM	87045
Crownpoint Chapter		PO Box 336	Crownpoint	NM	87313
Littlewater Chapter		PO Box 1898	Crownpoint	NM	87313
Mariano Lake Chapter		PO Box 164	Smith Lake	NM	87365
Smith Lake Chapter		PO Box 60	Smith Lake	NM	87365
Thoreau Chapter		PO Box 899	Thoreau	NM	87323

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McKinley County
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Gallup, NM 87301-4715

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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July 8, 2020

ELKINS, DONALD J. AND DAVID P.
PO Box 1326
Aztec NM 87410-0000

To Whom it May Concern

McKinley Paper Company (MPC) announces its intent to apply to the New Mexico Environment Department (NMED) for a new 20.2.72 NMAC air quality permit for its existing paper recycling and mill facility in Prewitt, New Mexico. MPC currently receives all process steam for its facility from Tri-State's Prewitt Escalante Generating Station (PEGS) existing coal-fired boiler. However, PEGS is scheduled for a permanent shut down in mid-September 2020, when the coal-fired boiler will permanently be taken offline. After mid-September, MPC will supply its own process steam with the existing and new natural-gas fired steam boilers identified in this application. The date the notarized MPC permit application will be submitted to the NMED Air Quality Bureau is estimated to be July 13, 2020.

MPC's paper mill has been in commercial production since June 1, 1994. MPC's physical location latitude 35°, 24', 38.21" N and longitude 108°, 05', 10.79" W, NAD83, which is approximately 3.9 miles northwest of Prewitt, NM in McKinley County. The facility processes a maximum of 900 tons per day of recycled "old corrugated cardboard" (OCC) into new cardboard paper stock. With this application, the facility is applying for construction and operation of the existing OCC processing plant, an existing 190 MMBtu/hr natural gas-fired steam boiler (presently owned and operated by PEGS), a new 166.8 MMBtu/hr natural gas-fired steam boiler, three (3) existing cooling towers, an existing water treatment facility (presently owned and operated by PEGS), and an existing 375 horsepower diesel-fired fire pump engine.

The estimated maximum quantities of any regulated air contaminants 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
PM_{10} (Total Facility)	2.79 pph	7.78 tpy
$PM_{2.5}$ (Total Facility)	2.36 pph	6.69 tpy
Sulfur Dioxide (SO_2)	0.41 pph	1.24 tpy
Nitrogen Oxides (NO_x)	30.6 pph	86.1 tpy
Carbon Monoxide (CO)	31.0 pph	76.8 tpy
Volatile Organic Compounds (VOC)	4.81 pph	17.2 tpy
Total sum of all Hazardous Air Pollutants (HAPs)	3.62 pph	13.4 tpy
Toxic Air Pollutant (TAP)	0.29 pph	0.49 tpy
Green House Gas Emissions as Total CO_2e	n/a	<75,000 tpy

The maximum and standard operating schedule (or "potential to emit") of the MPC plant is 24 hours per day, 7 days a week, and a maximum of 52 weeks per year for annual operating hours of 8760 hours per year.

The owner and operator of the MPC Facility is:

McKinley Paper Company
4600 Williams St SE
Albuquerque, New Mexico 87105

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.

With your comments, please refer to the company name and facility name, or send a copy of this notice along with your comments. This information is necessary since the Department may have not yet received the permit application. Please include a legible return mailing address. Once the Department has completed its 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 Agencia de Calidad de Aire del Departamento de Medio Ambiente de Nuevo México, acerca de las emisiones producidas por un establecimiento en esta área. Si usted desea información en español, por favor de comunicarse con la oficina de Calidad de Aire al teléfono 505-476-5557.

Notice of Non-Discrimination

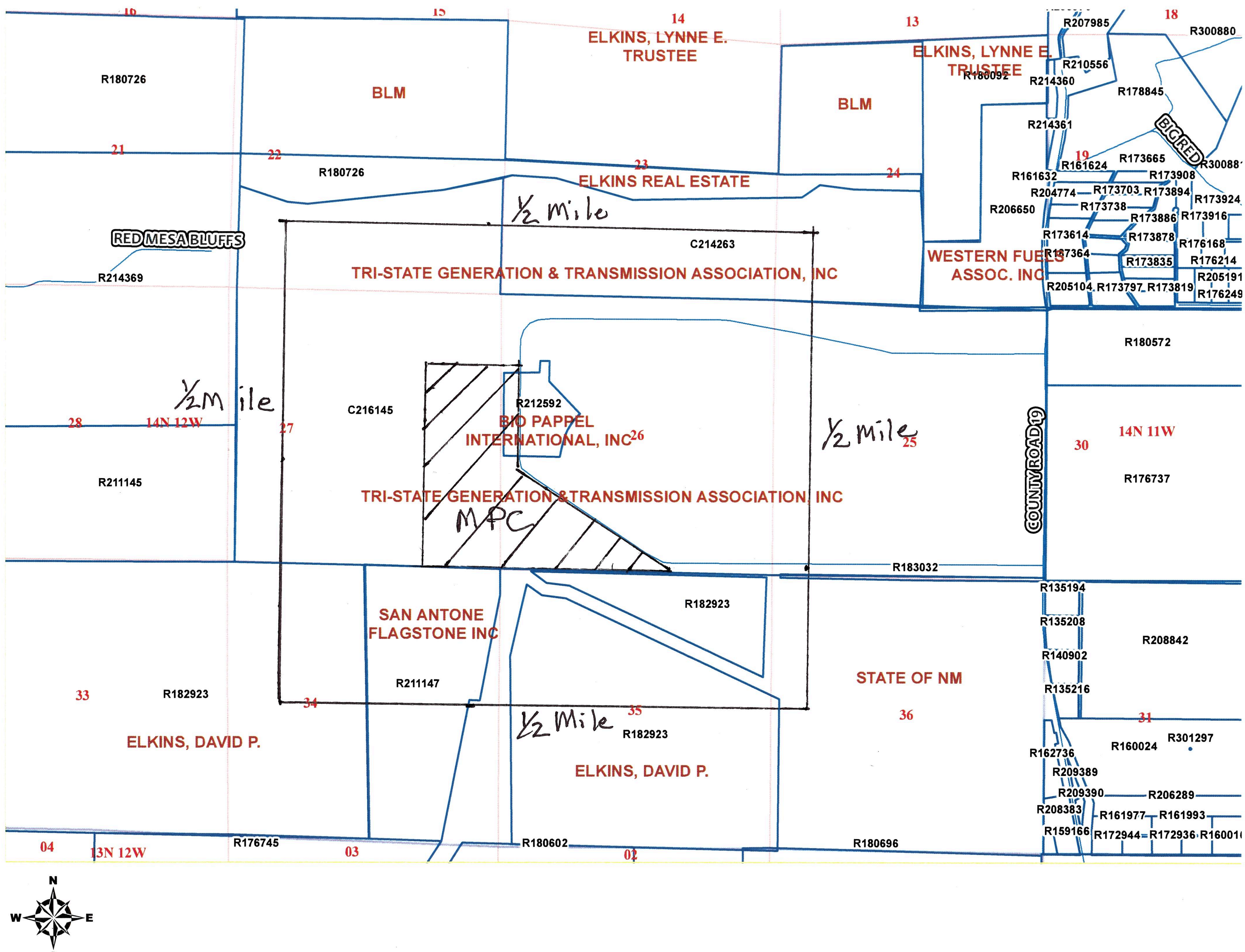
NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination 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, you may contact: Kristine Pintado, Non-Discrimination Coordinator, New Mexico Environment Department, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855, nd.coordinator@state.nm.us. If you believe that you have been discriminated against with respect to a NMED program or activity, you may contact the Non-Discrimination Coordinator identified above or visit our website at https://www.env.nm.gov/NMED/EJ/index.html to learn how and where to file a complaint of discrimination.

Sincerely,

McKinley Paper Company
4600 Williams St SE
Albuquerque, NM 87105

McKinley Paper Company Nearby Property Ownership (within 0.5 miles)
McKinley Co. New Mexico
July 2020

Account No.	Owner Name	Address	City	State	Zip
R182923	ELKINS, DAVID P. REVOCABLE TRUST	PO BOX 100	GAMERCO	NM	87317-0100
R183032	ELKINS, DONALD J. AND DAVID P.	PO BOX 1326	AZTEC	NM	87410-0000
R211147	SAN ANTONE FLAGSTONE INC.	PO BOX 100	GAMERCO	NM	87317-0100
	STATE OF NEW MEXICO	310 OLD SANTA FE TRAIL	SANTA FE	NM	87501-0000
C216145	TRI-STATE GENERATION & TRANSMISSION ASSOCIATION, INC.	P.O. BOX 33695	DENVER	CO	80233-3695
C216263	TRI-STATE GENERATION & TRANSMISSION ASSOCIATION, INC.	P.O. BOX 33695	DENVER	CO	80233-3695



ELKINS, LYNNE E. TRUSTEE
BLM
ELKINS REAL ESTATE
TRI-STATE GENERATION & TRANSMISSION ASSOCIATION, INC
BIO PAPPEL INTERNATIONAL, INC
WESTERN FUELS ASSOC. INC
SAN ANTONE FLAGSTONE INC
STATE OF NM
ELKINS, DAVID P.
RED MESA BLUFFS
BIG RED
COUNTY ROAD 19
14N 12W
14N 11W
13N 12W
½ Mile
MPC
C214263
C216145
R212592
R183032
R182923
R211147
R180726
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City, State, Z Denver, CO 80233-3695

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Street a P. O. Box 33695

City, St Denver, CO 80233-3695

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PUBLIC SERVICE ANNOUNCEMENT

McKinley Paper Company (MPC) announces its intent to apply to the New Mexico Environment Department (NMED) for a new 20.2.72 NMAC air quality permit for its existing paper recycling and mill facility in Prewitt, New Mexico. MPC currently receives all process steam for its facility from Tri-State's Prewitt Escalante Generating Station (PEGS) existing coal-fired boiler. However, PEGS is scheduled for a permanent shut down in mid-September 2020, when the coal-fired boiler will permanently be taken offline. After mid-September, MPC will supply its own process steam with the existing and new natural-gas fired steam boilers identified in this application. The date the notarized MPC permit application will be submitted to the NMED Air Quality Bureau is estimated to be July 13, 2020.

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Public notices have been posted in the following locations for review by the public:

1. At the Thoreau Post Office at 3 Prewitt St;
2. At the Prewitt Post Office at 1692 State Highway 122;
3. At the Grants City Administration in Grants at 600 W Santa Fe Ave; and
4. At the main entrance to McKinley Paper Company

The owner and/or operator of the Facility is:

McKinley Paper Company
4600 Williams St SE
Albuquerque, New Mexico 87105

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
Telephone Number (505) 476-4300 or 1 800 224-7009

July 7, 2020

KYVA Radio
300 W Aztec Ave.
Suite 200
Gallup, NM 87301

CERTIFIED MAIL

Dear KYVA Radio:

SUBJECT: PSA Request - Proposed Air Quality Construction Permit Application for McKinley Paper Company

Attached is a copy of a public service announcement regarding a proposed air quality construction permit application for McKinley Paper Company. This announcement is being submitted by Montrose Air Quality Services, Albuquerque, NM on behalf of McKinley Paper Company.

The announcement request is being made to fulfill the requirements of the New Mexico Environmental Department air quality permitting regulations. Please consider reading the attached announcement as a public service message.

If you have any questions or need additional information, please contact me at (505) 830-9680 ext 6 (voice), (505) 830-9678 (fax) or email at pwade@montrose-env.com. You may also contact Mr. Isaac Rosas, McKinley Paper Company at (505) 972-2146. Thank you.

Sincerely,

Paul Wade

Paul Wade
Senior Project Manager

Montrose Air Quality Services, LLC
3500 Comanche Road NE Suite G
Albuquerque, NM 87107-4546

T: 505.830.9680 ext. 6
F: 505.830.9678
Pwade@montrose-env.com
www.montrose-env.com

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City, State Gallup, NM 87301-6324

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Section 10

Written Description of the Routine Operations of the Facility

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<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.

OCC Pulping, Cleaning, Pressing, and Drying Process (Units 2 and 3)

The mill receives the OCC either by truck (Unit 1) or railcar in the form of bales. At the receiving area of the warehouse, the baling wire is cut off the bales and the bales of OCC are placed on an inclined conveyor. The conveyor carries the bales from the warehouse to the hydrapulper, which is located in the paper machine building.

The hydrapulper is an 18-foot diameter tub filled with water, much like a giant washing machine with an agitator. In addition to water, steam is also added to the pulper. The pulper reduces the OCC to a fiber slurry, also known as stock. Most of the contaminants found in the OCC, such as plastic, strings, and strands of tape, come out of the stock at this point.

The stock is moved into the stock preparation area where it first passes through the coarse cleaning and screening systems, and then through the fine cleaning and screening systems. Here, the stock is cleaned and screened to remove dirt, grit, glue, staples, glass, and other debris collected in the box during its original use.

In the next step of the process, the stock moves through centrifugal cleaners. These cleaners remove very small contaminants from the stock. At this point in the process, the stock is about 99% water and 1% fibers.

After cleaning, the stock is thickened. Water is strained from the stock to increase its consistency from nearly 1% to 12%. The thickened stock is then stored in a large holding tank, called the high-density tank.

From the high-density tank, the stock is diluted with water to a consistency of about 4.75%. The stock is then refined to create the desired fiber properties for making paper.

The cleaned and refined pulp, consisting of 1% fiber and 99% water, is then moved to the paper machine. Here, it flows onto an endless moving screen of woven polyester, which collects the fiber and removes water by gravity and vacuum. During the OCC process from hydrapulper to cleaners, off-gassing of VOC and HAPS are emitted as fugitive emissions (Unit 2).

The fiber is then carried to a press section. Here, the paper is squeezed between large rotating rolls and felts at progressively higher pressures to remove more water. The paper is now 50% water and 50% dry material.

From the presses, the paper goes onto the dryers, which are rotating drums heated by steam. In the dryers, the remaining moisture is evaporated from the sheet.

From the dryers, the paper is wound onto large reel spools. The spools of paper are taken to the winder, which unwinds, then slits the sheet of paper to smaller widths. The smaller widths of paper are rewound onto paper cores. During the furnish paper machine process from press section to paper rolls, off-gassing of VOC and HAPS are emitted as fugitive emissions (Unit 3).

The paper leaves the plant as large rolls, up to 100 inches wide and 58 inches in diameter, weighing between two and four tons.

After processing, about 8% of the raw material remain as solid waste that leaves the mill in two forms:

- Staples, glass, plastic, waxes, and other debris removed from the boxes.
- Paper fines or cellulose fines, which are small particles of fiber that remain in the wastewater. These fines are collected and removed during the water clarification process.

The solid waste from the mill, about 72 tons a day or 21,316 tons a year, are loaded into trucks (Unit 1) and is placed in a landfill at Thoreau in McKinley County.

Water Recovery System (Unit 4)

MPC Prewitt Mill is a zero-discharge facility, so process water is treated and recycled. As part of the recycling process, chemicals are added to maintain the correct chemical properties. These chemicals include biocides, caustic sodas, acids, flocculating agents, aqueous colloidal solutions, bleaches, and microbiocide agents (Unit 4)

Cooling Towers (Units 5, 6, and 7)

There are 3 small cooling towers (Units 5, 6, and 7) located at MPC Prewitt Mill. These cooling towers release heat generated in the facility processes.

Water Treatment System (Units 8, 9, 10, and 11)

The water treatment facility treats water to be sent to the steam boilers to generate steam for the paper recycle process. Additives in the process include soda ash and lime. These materials are delivered to the site and pneumatically loaded to the storage silos (Units 8 and 10). Particulate emissions during silo loading is controlled by silo dust collectors with a control efficiency of 99.5%. Metered unloading of the storage silos (Units 9 and 11) occurs within the water treatment building. Particulate emissions from silo unloading is controlled by being enclosed in a building. Estimated control efficiency for enclosure is 80%.

Natural Gas-Fired Steam Boilers (Unit 12 and 13)

Two natural gas-fired steam boilers are proposed for the site. These boilers (Units 12 and 13) will provide steam for the paper drying process. MPC Prewitt Mill will only operate one steam boiler at a time, as requested in a permit condition.

Fire Pump Engine (Unit 14)

A 375 bhp engine is installed to provide sufficient water in the case of emergency. The engine is defined as an emergency engine that will take a operating limit of 500 hours per year. The engine is tested weekly for ½ hour during the hours of 10 AM to 1 PM.

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)**:** MPC Prewitt Mill and Tri-State Prewitt Escalante Generating Station

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** **X No**

Common Ownership or Control: Surrounding or associated sources are under common ownership or control as this source.

☐ **Yes** **X No**

Contiguous or Adjacent: Surrounding or associated sources are contiguous or adjacent with this source.

X Yes ☐ **No**

C. Make a determination:

X 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):

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:

- X **a minor NSR source.**
- ☐ **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. The project emissions for this project are as follows [see Table 2 in 20.2.74.502 NMAC for a complete list of significance levels]:**

a. **NOx: 86.1 TPY**
b. **CO: 76.8 TPY**
c. **VOC: 6.86 TPY**
d. **SOx: 1.24 TPY**
e. **PM: 8.69 TPY**
f. **PM10: 7.77 TPY**
g. **PM2.5: 6.69 TPY**
h. **Fluorides: 0.0 TPY**
i. **Lead: 0.000080 TPY**
j. **Sulfur compounds (listed in Table 2): 0.0 TPY**
k. **GHG: 97,615 TPY**

C. If this is an existing PSD major source, or any facility with emissions greater than 250 TPY (or 100 TPY for 20.2.74.501 Table 1 – PSD Source Categories), determine whether any permit modifications are related, or could be considered a single project with this action, and provide an explanation for your determination whether a PSD modification is triggered.

This stationary source is not a PSD source, but a minor NSR source.

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 SIP approved regulation that limits the maximum allowable concentration of Total Suspended Particulates, Sulfur Compounds, Carbon Monoxide and Nitrogen Dioxide.
20.2.7 NMAC	Excess Emissions	Yes	Facility	MPC Prewitt Mill will be subject to emissions limits in a permit or numerical emissions standards in a federal or state regulation, after issuance of this new air quality permit.
20.2.33 NMAC	Gas Burning Equipment - Nitrogen Dioxide	No		This facility has new gas fired boilers having a heat input of less than 1,000,000 million British Thermal Units per year per unit 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		This facility will not have oil burning equipment.
20.2.61.109 NMAC	Smoke & Visible Emissions	Yes	14	The MPC Prewitt Mill's fire pump engine must meet opacity limits per 20.2.61 NMAC.
20.2.70 NMAC	Operating Permits	No		MPC Prewitt Mill is not a Title V source.
20.2.72 NMAC	Construction Permits	Yes	Facility	This facility is subject to 20.2.72 NMAC.
20.2.73 NMAC	NOI & Emissions Inventory Requirements	Yes	Facility	MPC Prewitt Mill is a 20.2.72 NMAC permitted sources and is required under 20.2.73.300 NMAC to follow emission inventory reporting requirements.
20.2.74 NMAC	Permits – Prevention of Significant Deterioration (PSD)	No		MPC Prewitt Mill is a minor NSR source.
20.2.75 NMAC	Construction Permit Fees	Yes	Facility	This facility is subject to 20.2.72 NMAC and is in turn subject to 20.2.75 NMAC.
20.2.77 NMAC	New Source Performance	Yes	12, 13	The facility steam boilers are stationary sources subject to the requirements of 40 CFR Part 60, Subpart Db.
20.2.78 NMAC	Emission Standards for HAPS	No		No MPC Prewitt Mill source emits hazardous air pollutants which are subject to the requirements of 40 CFR Part 61.
20.2.80 NMAC	Stack Heights	Yes	12, 13	Steam Boiler stacks will not exceeds good engineering practice.
20.2.82 NMAC	MACT Standards for source categories of HAPS	Yes	14	The fire pump engine is subject to the requirements of 40 CFR Part 63, Subpart ZZZZ.

Table for Applicable FEDERAL REGULATIONS:

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
40 CFR 50	NAAQS		Facility	If subject, this would normally apply to the entire 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		Units subject to 40 CFR 60	Applies if any other Subpart in 40 CFR 60 applies.
NSPS 40 CFR60.40a, Subpart Da	Subpart Da, Performance Standards for **Electric Utility Steam Generating Units**	No		MPC is not an electric utility.
NSPS 40 CFR60.40b Subpart Db	Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units	Yes	12, 13	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). Establishes NOx emission limit for Units 12 and 13. The boiler (unit 12) has a 166.8 MMBtu/hr heat input, which exceeds the 100 MMBtu/hr threshold. The boiler (unit 13) has a 190 MMBtu/hr heat input, which exceeds the 100 MMBtu/hr threshold. Construction commenced after the 6/19/1984 applicability date.
40 CFR 60.40c, Subpart Dc	Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units	No		This facility has steam generating units for which construction, modification or reconstruction is commenced after June 9, 1989 but have a maximum design heat input capacity greater than 29 MW (100 MMBtu/hr).
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		This facility was constructed after July 23, 1984.
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		This facility has no storage vessels with a capacity greater than or equal to 75 cubic meters (m^3) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
NSPS 40 CFR 60 Subpart IIII	Standards of performance for Stationary Compression Ignition Internal Combustion Engines	No		Facility has no Subpart IIII applicable CI engines.
NSPS 40 CFR Part 60 Subpart JJJJ	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines	No		Facility has no Subpart JJJJ applicable CI engines.
NESHAP 40 CFR 61 Subpart A	General Provisions	No		Applies if any other Subpart in 40 CFR 61 applies.
MACT 40 CFR 63 Subpart DDDDD	National Emission Standards for Hazardous Air Pollutants for Major Industrial, Commercial, and Institutional Boilers & Process Heaters	No		MPC is not a major source of HAPS.
MACT 40 CFR 63 Subpart ZZZZ	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (**RICE MACT**)	No		MPC fire pump engine, Unit 14, is an emergency stationary RICE. In order for the engine to be considered an emergency stationary RICE under this subpart, any operation other than emergency operation, maintenance and testing, emergency demand response, and operation in non-emergency situations for 50 hours per year.
40 CFR 68	**Chemical Accident Prevention**	No		MPC stores no chemicals listed no section 112(r) substances.

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.

X 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.

X 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.

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.

No alternative operating scenarios are proposed for this facility.

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.
X 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.

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:	Prewitt Mill
2	Name of company:	McKinley Paper Company (MPC)
3	Current Permit number:	New Permit
4	Name of applicant's modeler:	Paul Wade, Montrose Air Quality Services, LLC
5	Phone number of modeler:	(505) 830-9680 ext 6
6	E-mail of modeler:	pwade@montrose-env.com

16-B: Brief

1	Was a modeling protocol submitted and approved? Approved - Sufi Mustafa – 07/09/2020	Yes☒	No☐
2	Why is the modeling being done?	New Facility	
3	Describe the permit changes relevant to the modeling.		
3	McKinley Paper Company is submitting a new 20.2.72 NMAC air quality permit for its existing paper recycling and mill facility in Prewitt, New Mexico. MPC currently receives all process steam for its facility from Tri-State's Prewitt Escalante Generating Station (PEGS) existing coal-fired boiler or auxiliary boiler. However, PEGS is scheduled for a permanent shut down in mid-September 2020, when the coal-fired boiler will permanently be taken offline. After mid-September, MPC will supply its own process steam with an existing and new natural-gas fired steam boilers identified in this application. Both the existing and new boiler will be located within the same building and will have similar stack exit parameters. MPC will agree to a permit condition that limits the facility to operating only one of the steam boilers at a time. To account for only one boiler operating at a time, the boiler with the greatest emissions was used in the modeling analysis, auxiliary boiler.		

	MPC's paper mill has been in commercial production since June 1, 1994, but has been below 20.2.72 NMAC emission limits requiring them to obtain an NSR air quality permit. The facility processes a maximum of 900 tons per day of recycled "old corrugated cardboard" (OCC) into new cardboard paper stock. With this application, the facility is applying for construction and operation of the existing OCC processing plant, an existing 190 MMBtu/hr natural gas-fired steam boiler (presently owned and operated by PEGS), a new 166.8 MMBtu/hr natural gas-fired steam boiler, three (3) existing cooling towers, an existing water treatment facility (presently owned and operated by PEGS), and an existing 375 horsepower diesel-fired fire pump engine.		
4	What geodetic datum was used in the modeling?	NAD83	
5	How long will the facility be at this location?	Permanent	
6	Is the facility a major source with respect to Prevention of Significant Deterioration (PSD)?	Yes☐	No☒
7	Identify the Air Quality Control Region (AQCR) in which the facility is located	156	

8	List the PSD baseline dates for this region (minor or major, as appropriate).	
	NO2	Not Established
	SO2	Minor – 8/4/1978
	PM10	Minor – 8/4/1978
	PM2.5	Not Established

9	Provide the name and distance to Class I areas within 50 km of the facility (300 km for PSD permits).		
	No Class I Areas within 50 km.		
10	Is the facility located in a non-attainment area? If so describe below	Yes☐	No☒
11	Describe any special modeling requirements, such as streamline permit requirements.		
	None		

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	New Permit		
	NO_2	New Permit		
	SO_2	New Permit		
	H_2S	None		
	PM2.5	New Permit		
	PM10	New Permit		
	TSP	NA		
	Lead	None		
	Ozone (PSD only)	NA		
	NM Toxic Air Pollutants (20.2.72.402 NMAC)	New Permit		

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	☒	☒	☐	☐	☐
	TSP	☐	☐	☐	☐	☐
	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. Sulfuric Acid					
2	List any NMTAPs that are emitted but not modeled because stack height correction factor. Add additional rows to the table below, if required.					
	Pollutant	Emission Rate (pounds/hour)	Emission Rate Screening Level (pounds/hour)	Stack Height (meters)	Correction Factor	Emission Rate/ Correction Factor

	Sulfuric Acid	0.08611	0.06670	Fugitive	1	0.08611

16-F: Modeling options

1	Was the latest version of AERMOD used with regulatory default options? If not explain below.	Yes☒	No☐

The dispersion modeling was conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee Dispersion Model (AERMOD), *Version 19191*. This model is recommended by EPA for determining Class II impacts within 50 km of the facility being assessed. Additionally, AERMOD was developed to handle complex terrain. In this analysis, AERMOD will be used to estimate pollutant concentrations of CO, NO_2, PM_{10}, $PM_{2.5}$ and SO_2 in the ambient air from the MPC facility modeled emission sources.

AERMOD is a Gaussian plume dispersion model that is based on planetary boundary layer principles for characterizing atmospheric stability. The model evaluates the non-Gaussian vertical behavior of plumes during convective conditions with the probability density function and the superposition of several Gaussian plumes. AERMOD modeling system has three components: AERMAP, AERMET, and AERMOD. AERMAP is the terrain preprocessor program. AERMET is the meteorological data preprocessor. AERMOD includes the dispersion modeling algorithms and was developed to handle simple and complex terrain issues using improved algorithms. AERMOD uses the dividing streamline concept to address plume interactions with elevated terrain.

AERMOD CIA modeling will be run using all the regulatory default options including use of:

- Gradual Plume Rise
- Stack-tip Downwash
- Buoyancy-induced Dispersion
- Calms and Missing Data Processing Routine
- Upper-bound downwash concentrations for super-squat buildings
- Default wind speed profile exponents
- Calculate Vertical Potential Temperature Gradient
- No use of gradual plume rise
- Rural Dispersion

These regulatory default options are found in the AERMOD User's Manual. The model will incorporate local terrain into the calculations.

For ROI modeling, the model was run in non-default mode using complex terrain mode. Additionally, for ROI modeling building downwash was included.

NO_2 1-hour and annual modeling includes ARM2 default ratio. Approved by EPA and NMED Modeling Section.

16-G: Surrounding source modeling

1	Date of surrounding source retrieval	07/02/2020 Eric Peters

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.

For Tri-Sate PEGS sources that will be permitted after the coal-fired boiler is shut down, model inputs for these sources were retrieved from the last dispersion modeling anlaysis submitted to the NMED Model Section in July 2013.

AQB Source ID	UTME	UTMN		Description
E74_1	764807.0	3922907.0		PEGS July 2013 Model Submittal
E74_2	764819.0	3922895.0		PEGS July 2013 Model Submittal
E74_3	764832.0	3922883.0		PEGS July 2013 Model Submittal
E74_4	764845.0	3922871.0		PEGS July 2013 Model Submittal
E74_5	764858.0	3922859.0		PEGS July 2013 Model Submittal
E74_6	764870.0	3922847.0		PEGS July 2013 Model Submittal
E81	764794.0	3923077.0		PEGS July 2013 Model Submittal
E22_24	765495.0	3922900.0		PEGS July 2013 Model Submittal
E26	765405.0	3923054.0		PEGS July 2013 Model Submittal
E27_E30	765352.0	3923130.0		PEGS July 2013 Model Submittal
E32_34	764750.8	3923107.1		PEGS July 2013 Model Submittal
E35	764754.0	3923077.0		PEGS July 2013 Model Submittal
E38_E42	765216.0	3923058.0		PEGS July 2013 Model Submittal
E43	765197.0	3923088.0		PEGS July 2013 Model Submittal
E45	765177.0	3923127.0		PEGS July 2013 Model Submittal
E47	764953.0	3923121.0		PEGS July 2013 Model Submittal
E49	764954.0	3923108.0		PEGS July 2013 Model Submittal
E50	764943.0	3923083.0		PEGS July 2013 Model Submittal
E52	764956.0	3923054.0		PEGS July 2013 Model Submittal
E63_E65	765235.0	3922950.0		PEGS July 2013 Model Submittal
E67	764850.0	3923109.0		PEGS July 2013 Model Submittal
RR1_0001-0100	Varies			PEGS July 2013 Model Submittal
RR2_0001-0059	Varies			PEGS July 2013 Model Submittal
RR3_0001-0043	Varies			PEGS July 2013 Model Submittal
RR4_0001-0044	Varies			PEGS July 2013 Model Submittal
RR5_0001-0122	Varies			PEGS July 2013 Model Submittal
RR6_0001-0102	Varies			PEGS July 2013 Model Submittal

16-H: Building and structure downwash

1	How many buildings are present at the facility?	16		
2	How many above ground storage tanks are present at the facility?	4		
3	Was building downwash modeled for all buildings and tanks? If not explain why below.		Yes☒	No☐
4	Building comments	Includes both MPC and PEGS buildings and tanks.		

16-I: Receptors and modeled property boundary

<table>
<tr><td>1</td><td colspan="7">“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.</td></tr>
<tr><td></td><td colspan="7">Fencing, restricted access</td></tr>
<tr><td>2</td><td colspan="5">Receptors must be placed along publicly accessible roads in the restricted area.
Are there public roads passing through the restricted area?</td><td>Yes☐</td><td>No☒</td></tr>
<tr><td>3</td><td colspan="5">Are restricted area boundary coordinates included in the modeling files?</td><td>Yes☒</td><td>No☐</td></tr>
<tr><td>4</td><td colspan="7">Describe the receptor grids and their spacing. The table below may be used, adding rows as needed.</td></tr>
<tr><td></td><td>Grid Type</td><td>Shape</td><td>Spacing</td><td>Start distance from restricted area or center of facility</td><td>End distance from restricted area or center of facility</td><td colspan="2">Comments</td></tr>
<tr><td></td><td>Very fine</td><td>Cartesian</td><td>50 meters</td><td>Model Boundary</td><td>0.5 km</td><td colspan="2"></td></tr>
<tr><td></td><td>Fine</td><td>Cartesian</td><td>100 meters</td><td>0.5 km</td><td>1 km</td><td colspan="2"></td></tr>
<tr><td></td><td>Fine</td><td>Cartesian</td><td>250 meters</td><td>1 km</td><td>3 km</td><td colspan="2"></td></tr>
<tr><td></td><td>Course</td><td>Cartesian</td><td>500 meters</td><td>3 km</td><td>5 km</td><td colspan="2"></td></tr>
<tr><td></td><td>Very Course</td><td>Cartesian</td><td>1000 meters</td><td>5 km</td><td>10 km</td><td colspan="2"></td></tr>
<tr><td></td><td>Very Course</td><td>Cartesian</td><td>2500 meters</td><td>10 km</td><td>20 km</td><td colspan="2"></td></tr>
<tr><td>5</td><td colspan="7">Describe receptor spacing along the fence line.</td></tr>
<tr><td></td><td colspan="7">50 meters</td></tr>
<tr><td>6</td><td colspan="7">Describe the PSD Class I area receptors.</td></tr>
<tr><td></td><td colspan="7">Not Applicable</td></tr>
</table>

16-J: Sensitive areas

<table>
<tr><td>1</td><td>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.</td><td>Yes☐</td><td>No☒</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td>3</td><td>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?</td><td>Yes☐</td><td>No☒</td></tr>
</table>

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).		
	Modeling was performed with maximum emissions for all MPC sources operating continuously. For the steam boilers, only one will be operated at any one time. With similar stack parameters for each steam boiler, the boiler (auxiliary) with the highest emission rate was used in the modeling analysis. The exception is the fire pump engine, which is tested once a week between the hours of 10 AM to 1 PM.		
2	Which scenario produces the highest concentrations? Why?		
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: For FIREP (Fire Pump) weekly testing of fire pump engine assumed test was run between the hours of 10 AM to 1 PM		

5

Hour of Day	Factor	Hour of Day	Factor								
1	0	13	1								
2	0	14	0								
3	0	15	0								
4	0	16	0								
5	0	17	0								
6	0	18	0								
7	0	19	0								
8	0	20	0								
9	0	21	0								
10	0	22	0								
11	1	23	0								
12	1	24	0								

If hourly, variable emission rates were used that were not described above, describe them below.

6	Were different emission rates used for short-term and annual modeling? If so describe below.	Yes☒	No☒
	For the fire pump engine (FIREP), the maximum hourly emission rate was used in the short-term models and the maximum annual emission rate was used in the 24-hour and annual models.		

16-L: NO_2 Modeling

1	Which types of NO_2 modeling were used? Check all that apply.

	☒	ARM2 ROI for All Averaging Periods, CIA 1 hour and Annual
	☐	100% NO_X to NO_2 conversion
	☐	PVMRM
	☐	OLM
	☐	Other:
2	Describe the NO_2 modeling.	
	EPA has a three-tier approach to modeling NO_2 concentrations. • Tier I – total conversion, or all NOx = NO_2 • Tier II – Ambient Ratio Method 2 (ARM2) • Tier III – case-by-case detailed screening methods, such as OLM and Plume Volume Molar Ratio Method (PVMRM) and NO_2/NO_X in-stack ratio Initial ROI modeling and CIA 1-huor and annual averaging periods were performed using Tier II methodologies.	

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☐
4	Describe the design value used for each averaging period modeled.		
	1-hour: 98th percentile as calculated by AERMOD 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.	

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)	$[PM2.5]_{annual}$	$[PM2.5]_{24\text{-hour}}$
	86.1	1.24	0.0055 µg/m^3	0.096 µg/m^3
	Following recent EPA guidelines for conversion of NO_X and SO_2 emission rates to secondary $PM_{2.5}$ emissions, MPC emission rates are compared to appropriate western MERPs values (NO_X 24 Hr – 1155 tpy; NO_X Annual – 3184 tpy; SO_2 24 Hr – 225 tpy; SO_2 Annual – 2289 tpy). The following equation, found in NMED AQB modeling guidance document on MERPs, was used to determine if secondary emission would cause violation with $PM_{2.5}$ NAAQS.			

	$PM_{2.5}$ annual = ((NO_X emission rate (tpy)/3184 + (SO_2 emission rate (tpy)/2289)) x 0.2 µg/m^3 $PM_{2.5}$ 24 hour = ((NO_X emission rate (tpy)/1155 + (SO_2 emission rate (tpy)/225)) x 1.2 µg/m^3 $PM_{2.5}$ Annual 0.0055 µg/m^3 = (86.1/3184 + 1.24/2289) x 0.2 µg/m^3 $PM_{2.5}$ 24 Hour 0.096 µg/m^3 = (86.1/1155 + 1.24/225) x 1.2 µg/m^3

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.
	Permanent Stationary Source
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.
	NA

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		
	5	CT_1		
	6	CT_2		
		CT_3		
	7	CT_4		
	13	AUX		
	8	SODA		
	10	LIME		
	14	FIREP		
	9 and 11	WT		
	1	HR1_		
		HR2_		
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☐
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?			

	Unit ID	NO_2	SO_2	PM10	PM2.5
4	CT_1			X	

	CT_2			X	
	CT_3			X	
	CT_4			X	
	AUX		X	X	
	SODA			X	
	LIME			X	
	FIREP		X	X	
	WT			X	
	HR1_			X	
	HR2_			X	
5	PSD increment description for sources. (for unusual cases, i.e., baseline unit expanded emissions after baseline date).	Increment consuming source			
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			
	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?	Yes☐	No☒
	Volume source is a building where the water treatment plant silos are unloading in to the water treatment plant.		
2	Describe the determination of sigma-Y and sigma-Z for fugitive sources.		
	Sigma-Y is based on the smallest width of the building. Sigma-Z is based on the height of the building.		
3	Describe how the volume sources are related to unit numbers. Or say they are the same.		
	The volume source (WT) is a combined emission source for soda ash silo unloading (Unit 9) and lime silo unloading (Unit 11) inside the building.		
4	Describe any open pits.		
5	Describe emission units included in each open pit.		

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: Del Norte High School (350010023)		
	NO_2: Navajo Dam (350450018)		
	PM2.5: N/A		
	PM10: Bloomfield (350450009)		
	SO_2: Bloomfield(350450009)		
	Other: PM2.5 background data for 4-corners (350450019)		
	Comments: For NO_2 CIA modeling, only significant neighboring sources were included in the model analysis without adding in background into the model results per Modeling Guidelines Table 6C.		
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.	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.		

Meteorological data used for modeling McKinley Paper Company was obtained from two primary sources: an on-site 10-meter meteorological monitoring site operated at Tri-State's Prewitt Escalante Generating Station and both upper air and surface observations from Albuquerque NWS data. This data has been previously used in dispersion modeling analysis for Tri-State's Prewitt Escalante Generating Station (last updated July 2013). For this analysis, the existing data was re-processed using the latest version of AERMET (version 19191). These data sources are described in more detail below.

On-Site 10-Meter Tower Data

Hourly on-site surface (i.e. 10-meter) meteorological data is available for 1999 through 2000. This meteorological tower site is located approximately 1.4 miles east-northeast of the MPC facility. The following parameters were available from this site:

Wind Speed at 10 meters
Wind Direction at 10 meters
Sigma Theta at 10 meters
Temperature at 10 meters
Net Radiation at 2 meters

NWS Albuquerque Data

Two parameters, cloud cover and mixing heights, were not available from the on-site monitoring. Cloud cover data are contained in the NWS "surface" data files and the mixing heights are contained in the "upper air" data files. The NWS upper air data contains two mixing heights per day. These data were obtained from collected meteorological parameters by the NWS at Albuquerque for the same period, 1999 - 2000.

	The meteorological tower data will be processed using AERMET (version 19191), upper air data from Albuquerque, New Mexico and surface air data from Albuquerque, New Mexico for the same time period.

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?		
	DEM files		

16-U: Modeling Files

1 Describe the modeling files: Modeling includes all applicable MPC sources, applicable PEGS sources and/or applicable background. While the highest concentrations on MPC boundaries which is within the Tri-State PEGS boundary. Cumulative model results for these receptors includes both MPC and PEGS sources even though PEGS sources impacts are within their boundary.

File name (or folder and file name)	Pollutant(s)	Purpose (ROI/SIA, cumulative, culpability analysis, other)
MPC Combustion ROI	NOx, CO, and SO2	ROI
MPC PM ROI	PM10 and PM2.5	ROI
MPC NO2 1hr	NOx	Cumulative 1-Hour
MPC NO2 Annual	NOx	Cumulative Annual
MPC PM25 CIA Model	PM2.5	Cumulative 24-Hour and Annual
MPC PM10 CIA Model	PM10	Cumulative 24-Hour and Class II Increment 24-Hour and Annual
MPC SulfuricAcid Model	Sulfuric Acid	8-Hour Average

16-V: PSD New or Major Modification Applications

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.		
	This permit application is not a new PSD facility or PSD modification.		
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☐
	Secondary PM2.5 was calculated using MERP values then added into model results.		

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☒
	All receptors above SILs for PM10 and PM2.5 are within the boundaries of Tri-State's PEGS facility. The model results for PM10 and PM2.5 include Tri-State PEGS sources within their boundary making the results of the model analysis very conservative.		
2	Identify the maximum concentrations from the modeling analysis. Rows may be modified, added and removed from the table below as necessary.		

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)
NO2 1-hr	117.5	0.1	---		117.6	188	62.6	764568.7	3922943.3	2100.37
NO2 yr	5.0	1.5	---		6.5	94	6.9	764568.7	3922943.3	2100.37
CO 1-hr	156.9	Below SILs				2000	7.8	764568.7	3922943.3	2100.37
CO 8-hr	95.3	Below SILs				500	19.1	764569.6	3922900.4	2100.58
SO2 1-hr	2.49	Below SILs				7.8	31.9	764568.7	3922943.3	2100.37
SO2 yr	0.082	Below SILs				1	8.2	764568.7	3922943.3	2100.37
PM2.5 24-hr	4.0	2.9	0.096	11.77	18.8	35	53.6	764568.7	3922943.3	2100.37
PM2.5 yr	1.3	2.2	0.0055	4.19	7.7	12	64.1	764568.7	3922943.3	2100.37
PM10 24-hr	9.6	10.9	---	55.0	75.5	150	50.3	764568.7	3922943.3	2100.37
Class II PM10 24-hr	9.6	10.9	---	---	20.5	30	68.3	764568.7	3922943.3	2100.37
Class II PM10 yr	4.1	6.9	---	---	11.0	17	64.7	764568.7	3922943.3	2100.37
SulfuricAcid Model	5.88	---	---	---	---	10	58.8	764736.0	3922545.0	2101.24

16-X: Summary/conclusions

1	A statement that modeling requirements have been satisfied and that the permit can be issued.
	Dispersion modeling was performed for the new MPC facility permit application. All facility pollutants with ambient air quality standards and Class II increment standards were modeled to show compliance with those standards. All results of this modeling showed the facility in compliance with applicable ambient air quality standards and PSD Class II increment standards.

MONTROSE ENVIRONMENTAL

Paul Wade <pwade@montrose-env.com>

Model Protocol for McKinley Paper's Prewitt Mill

7 messages

Paul Wade <pwade@montrose-env.com> Wed, Jul 1, 2020 at 3:23 PM
To: Eric Peters <eric.peters@state.nm.us>, Sufi Mustafa <sufi.mustafa@state.nm.us>

Eric and Sufi
Attached is the modeling protocol for McKinley Paper Company's Prewitt Mill. They are taking over the auxiliary boiler from PEGS after shutdown of the coal boiler.

I also need neighboring source information for coordinate
764,580E, 3,922,480N, Zone 12, Nad 83

Let me know if you have any questions or comments on the modeling protocol.

Thanks

--

MEG Logo_Signature

Paul Wade

Sr. Engineer

Montrose Air Quality Services, LLC

3500 G Comanche Rd. NE, Albuquerque, NM 87107

T: 505.830.9680 x6 | F: 505.830.9678

PWade@montrose-env.com

www.montrose-env.com

MPC Modeling Protocol 070120.pdf
423K

Peters, Eric, NMENV <eric.peters@state.nm.us> Thu, Jul 2, 2020 at 5:12 PM
To: Paul Wade <pwade@montrose-env.com>

Paul,

Sufi will assign the protocol review to someone.

Attached are AERMOD input files with the surrounding sources (*.INP) and reference tables (*.XLS) to describe the sources in more detail. Building files are optional.

Sources numbered 0-49,999 belong in the NAAQS/NMAAQS analysis. Sources numbered 10,000 and above belong in the PSD increment analysis. (Notice overlap of two groups). Numbering in the reference tables may not include the 50,… or 10,… prefix for the counting numbers.

The KML file allows the sources to be viewed in Google Earth, and has some QA features built in. The red sources are more likely to cause predicted concentrations above the air quality standards.

Let me know if you have any questions or issues with the formats.

Eric

Eric Peters, Air Dispersion Modeler

New Mexico Environment Department / Air Quality Bureau

525 Camino de Los Marquez - Suite 1 / Santa Fe, NM, 87505

Phone: 505-476-4327 / Fax: 505-476-4375

E-mail: eric.peters@state.nm.us

www.env.nm.gov

From: Paul Wade <pwade@montrose-env.com>
Sent: Wednesday, July 1, 2020 3:23 PM

To: Peters, Eric, NMENV <eric.peters@state.nm.us>; Mustafa, Sufi A., NMENV <sufi.mustafa@state.nm.us>
Subject: [EXT] Model Protocol for McKinley Paper's Prewitt Mill

Eric and Sufi

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Thanks

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Paul Wade

Sr. Engineer

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3500 G Comanche Rd. NE, Albuquerque, NM 87107

T: 505.830.9680 x6 | F: 505.830.9678

PWade@montrose-env.com

www.montrose-env.com

[Quoted text hidden]

9 attachments

Neighboring_Volume_Sources.xls
25K

Nitrogen Dioxide Neighboring_Sources.INP
7K

Particulate Matter (2.5 microns or less) Neighboring_Sources.INP
12K

Particulate Matter (10 microns or less) Neighboring_Sources.INP
13K

Sulfur Dioxide Neighboring_Sources.INP
7K

Carbon Monoxide Neighboring_Sources.INP
7K

Hydrogen sulfide Neighboring_Sources.INP
2K

NearbyFacilities.kml
78K

Neighboring_Point_Sources.xls
20K

Paul Wade <pwade@montrose-env.com> Thu, Jul 2, 2020 at 5:47 PM
To: "Peters, Eric, NMENV" <eric.peters@state.nm.us>

Thanks Eric
[Quoted text hidden]

Mustafa, Sufi A., NMENV <sufi.mustafa@state.nm.us> Thu, Jul 9, 2020 at 3:00 PM
To: Paul Wade <pwade@montrose-env.com>

Paul

In general, your protocol seems fine. I do have few comments.

Since facility never had an air quality permit I did not understand the distinction between existing and new equipment. I am sure discussion with Permitting section will sort it out.

In the section 2.6 you are suggesting ISR of NO2. Please use ISR as suggested in our modeling guidance.

"For the in-stack NO2/NOX ratio, values lower than 0.5 must be justified with data. Combustion involving excess oxygen results in higher in-stack NO2/NOX ratios than do stoichiometric reactions. The facility may use an in-stack ratio of 0.5 without justification. Surrounding sources, if required, may be modeled with an in-stack ratio of 0.3 without justification."

PM2.5 background may be more represented by the four corner region's monitor, Farmington office monitor. Representative PM10 monitor for this region is Bloomfield monitor.

Thank you.

Sufi Mustafa

From: Paul Wade <pwade@montrose-env.com>
Sent: Wednesday, July 1, 2020 3:23 PM
To: Peters, Eric, NMENV <eric.peters@state.nm.us>; Mustafa, Sufi A., NMENV <sufi.mustafa@state.nm.us>
Subject: [EXT] Model Protocol for McKinley Paper's Prewitt Mill

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Let me know if you have any questions or comments on the modeling protocol.

Thanks

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Paul Wade

Sr. Engineer

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www.montrose-env.com

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Paul Wade <pwade@montrose-env.com> Thu, Jul 9, 2020 at 3:21 PM
To: "Mustafa, Sufi A., NMENV" <sufi.mustafa@state.nm.us>

Sufi
Thanks for the comments.

The difference between existing and new has to do with what is going to be acquired from PEGS for McKinley Paper. Prior to this McKinley has not been required to obtain a permit until now, because they will take over the PEGS auxiliary boiler and water treatment facility. Once the coal-fired boiler is shut down the steam it presently provides to McKinley will go away. The backup to the coal-fired boiler is PEGS auxiliary boiler, which McKinley will acquire making it a minor NSR source needing a permit. That is why they are getting a permit and this is considered a new permit with existing sources.

Based on preliminary modeling all NO2 modeling will be performed using the Tier II approach, ARM2.

I will use your recommended background for PM10 and PM2.5.

Thanks again
[Quoted text hidden]
--

MEG Logo_Signature

[Quoted text hidden]

Mustafa, Sufi A., NMENV <sufi.mustafa@state.nm.us> Fri, Jul 10, 2020 at 12:59 PM
To: Paul Wade <pwade@montrose-env.com>

Paul

Please send Angela Raso a copy of the AERMET output files when you work on it.

[Quoted text hidden]

Paul Wade <pwade@montrose-env.com> Sun, Jul 12, 2020 at 3:17 PM
To: "Mustafa, Sufi A., NMENV" <sufi.mustafa@state.nm.us>, "Raso, Angela, NMENV" <Angela.Raso@state.nm.us>

Angela
Here is the meteorological data for McKinley Paper. It is the same meteorological data set that has been used for Tri-State's PEGS facility for at least the last 15 years. It was originally a ISC met set that was converted to AERMET back in 2009. It was developed from one year of onsite data collected from June of 1999 to May of 2000. This update was run with the latest version of AERMET. See the attached files.

Thanks
[Quoted text hidden]
--

MEG Logo_Signature

[Quoted text hidden]

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22 attachments

PEGS STAGE 2 MESSAGES.TXT
1K

PEGS STAGE 1 REPORT.TXT
11K

PEGS STAGE 2 REPORT.TXT
21K

PEGS stage 2 input.txt
1K

PEGS stage 3 input.txt
4K

PEGS.AMT
10K

PEGS STAGE 3 REPORT.TXT
26K

PEGS STAGE 3 MESSAGES.TXT
87K

PEGS1999.WRP
5K

roughness_domain.txt
14K

tiff_debug.txt
697K

PEGS99.os
978K

AERSURFACE.DAT
1K

PEGS1999.PFL

1149K

aersurface.inp
1K

PEGS1999.SFC
1528K

albedo_bowen_domain.txt
330K

Discarded_ISHD_Records.dat
224K

PEGS stage 1 input.txt
2K

PEGS STAGE 1 MESSAGES.TXT
2600K

alb99_00.fsl
3464K

alb99.ISH
4298K

AIR QUALITY
DISPERSION MODEL PROTOCOL
FOR MCKINLEY PAPER COMPANY
PERMIT APPLICATION

McKinley County, New Mexico

PREPARED FOR

Dated July 1, 2020

Prepared by

Montrose Air Quality Services, LLC

CONTENTS

1.0 INTRODUCTION

McKinley Paper Company will be submitting a new 20.2.72 NMAC air quality permit for its existing paper recycling and mill facility in Prewitt, New Mexico. MPC currently receives all process steam for its facility from Tri-State's Prewitt Escalante Generating Station (PEGS) existing coal-fired boiler or auxiliary boiler. However, PEGS is scheduled for a permanent shut down in mid-September 2020, when the coal-fired boiler will permanently be taken offline. After mid-September, MPC will supply its own process steam with the existing and new natural-gas fired steam boilers identified in this application. Both the existing and new boiler will be located at within the same building and will have similar stack exit parameters. MPC will agree to a permit condition that limits the facility to operating only one of the steam boilers at a time. To account for only one boiler operating at a time the boiler with the greatest emissions will be used in the modeling analysis. This document presents a modeling protocol for the Dispersion Model Analysis that will be performed to evaluate potential air quality impacts from McKinley Paper Company (MPC) Prewitt Mill.

MPC's paper mill has been in commercial production since June 1, 1994, but has been below 20.2.72 NMAC emission limits requiring them to obtain an NSR air quality permit. The facility processes a maximum of 900 tons per day of recycled "old corrugated cardboard" (OCC) into new cardboard paper stock. With this application, the facility is applying for construction and operation of the existing OCC processing plant, an existing 190 MMBtu/hr natural gas-fired steam boiler (presently owned and operated by PEGS), a new 166.8 MMBtu/hr natural gas-fired steam boiler, three (3) existing cooling towers, an existing water treatment facility (presently owned and operated by PEGS), and an existing 375 horsepower diesel-fired fire pump engine. Since the proposed sources are both existing and new, an initial modeling analysis with these sources alone will be run to determine an exceedance of significant impact levels (SILs). If initial modeling shows exceedance of SILs for a pollutant and averaging period, refined modeling will be performed including MPC sources, all applicable sources at neighboring Tri-State's PEGS, any applicable neighboring source, and/or background. These determinations will be addressed in the final dispersion modeling analysis submitted with the NSR permit application for the MPC Prewitt Mill. The objective of this evaluation is to determine if ambient air concentrations from the maximum operation of MPC for nitrogen dioxide (NO_2); carbon monoxide (CO); sulfur dioxide (SO_2); particulate matter; both 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$); are below Class II federal and state ambient air quality standards (NAAQS and NMAAQS) found in EPA's 40 CFR part 50 and New Mexico air quality regulation 20.2.3 NMAC. The NAAQS were designed by the Environmental Protection Agency (EPA) to protect public health (Primary NAAQS) and welfare (Secondary NAAQS) from the effects of criteria pollutants. This will be accomplished by determining the radius of impact (ROI) for each pollutant model along with the applicable averaging period. The receptor grids determined from the ROI modeling for each pollutant will then be modeled with a refined grid, complex terrain, building downwash, and appropriate regional background concentrations as discussed in Section 2.9 of this report. The most recent version of AERMOD (*Version 19191*) will be used in the dispersion model analysis.

The exact location of MPC's Prewitt Mill is latitude 35°, 24', 38.21" N and longitude 108°, 05', 10.79" W, NAD83, which is approximately 3.9 miles northwest of Prewitt, NM in McKinley County. MPC is located in Air Quality Control Region (AQCR) 156 where the minor source baseline dates have been triggered for SO_2 (8/4/1978) and PM_{10} (8/4/1978). Figure 1 presents an aerial view of both MPC's Prewitt Mill and Tri-State's PEGS.

Dispersion modeling inputs and settings are presented Section 2.

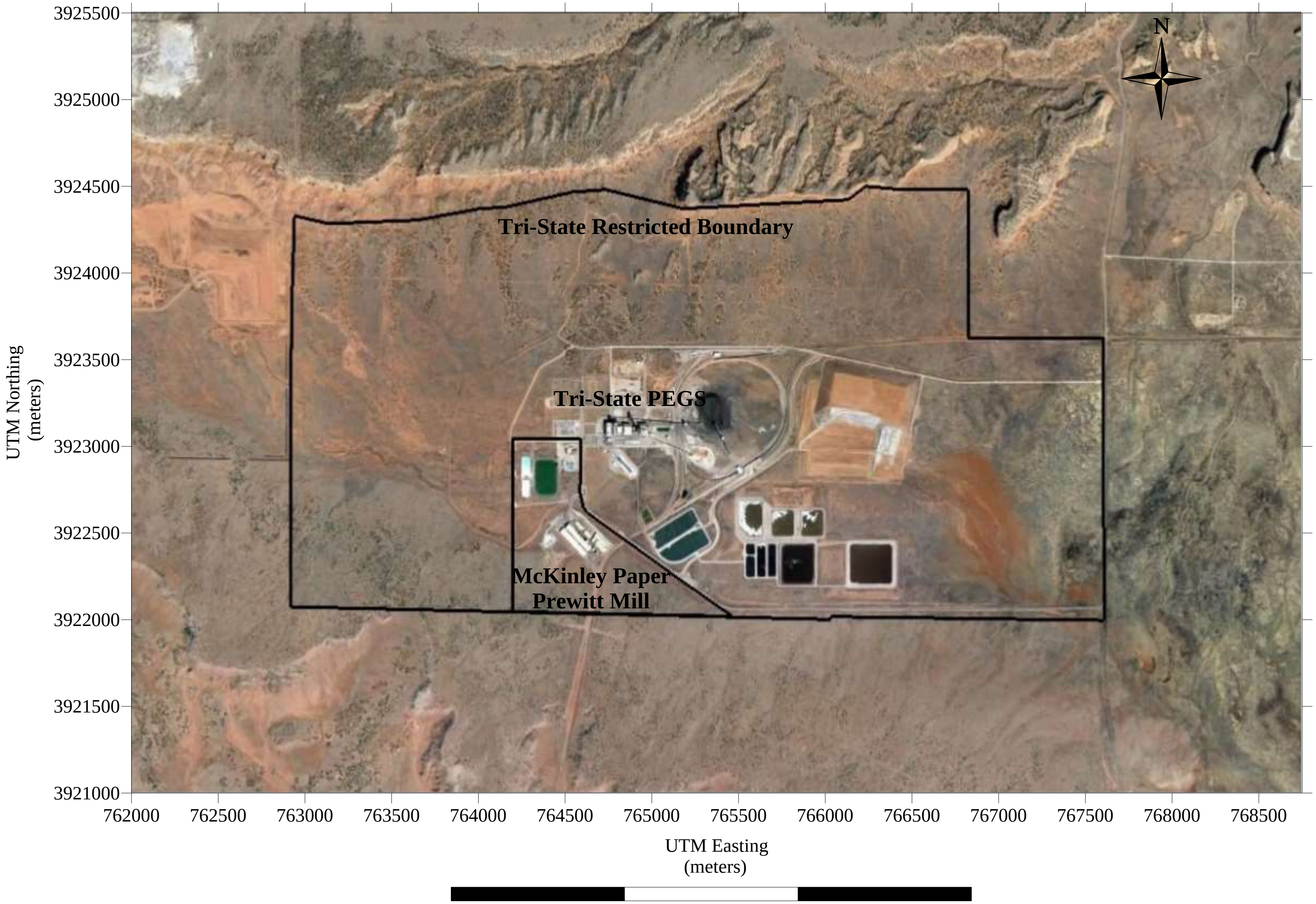

Figure 1: MPC Prewitt Mill and PEGS Location Overview - Aerial View

2.0 SIGNIFICANT MONITORING AIR QUALITY IMPACT ANALYSIS

This section identifies the technical approach proposed for Class II federal and state ambient air quality standards for the facility. New Mexico Environmental Department, Air Quality Bureau requires that all applicable criteria pollutant emissions be modeled using the most recent versions of US EPA approved models and compared with National Ambient Air Quality Standards (NAAQS) and New Mexico Ambient Air Quality Standards (NMAAQS). Table 2-1 shows the NAAQS and NMAAQS that the facility must comply with in order to obtain an air quality permit. Table 2-1 also lists the Class II Significant Impact Levels (SILs) which are used to assess whether a facility has a significant impact at downwind receptors. Table 2-2 lists ambient air quality standards where modeling is not required by the state.

The dispersion modeling analysis will be performed to estimate the total pollutant concentrations resulting from maximum proposed emission rates and hours of operation. The modeling will determine maximum off site concentrations for each criteria pollutant and applicable averaging periods for carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter with aerodynamic diameter less than 10 micrometers (PM_{10}) and particulate matter with aerodynamic diameter less than 2.5 micrometers ($PM_{2.5}$), for comparison with modeling significance impact levels (SILs). For pollutants and averaging periods above the SILs, cumulative impact analysis (CIA) modeling will be performed for those pollutants and averaging periods above the SILs for comparison with national/New Mexico ambient air quality standards (AAQS). The modeling will follow the guidance and protocols outlined in the NMED - AQB "Air Dispersion Modeling Guidelines", and the most up to date EPA's *Guideline on Air Quality Models.*

During CIA modeling, all the Prewitt Mill emission sources will be modeled together to determine worst-case impacts from the facility. Step 1 in the analysis will be determining the ROI. The ROI for each modeled pollutant and averaging period will be compared with the applicable SIL. Once a receptor grid is determined from the ROI modeling, CIA modeling will include; applicable Prewitt Escalante Generating Station sources, applicable neighboring sources within 20 kilometers for particulate sources, and background concentrations for all pollutants over the significant impact levels (SILs).

TABLE 2-1: National and New Mexico Ambient Air Quality Standard Summary

Pollutant	Avg. Period	Sig. Lev. (μg/m³)	Class I Sig. Lev. (μg/m³)	NAAQS	NMAAQS	PSD Increment Class I	PSD Increment Class II
CO	8-hour	500		9,000 ppb(1)	8,700 ppb(2)		
	1-hour	2,000		35,000 ppb(1)	13,100 ppb(2)		
NO_2	annual	1.0	0.1	53 ppb(3)	50 ppb(2)	2.5 μg/m³	25 μg/m³
	24-hour	5.0			100 ppb(2)		
	1-hour	7.52		100 ppb(4)			
$PM_{2.5}$	annual	0.2	0.05	12 μg/m³(5)		1 μg/m³	4 μg/m³
	24-hour	1.2	0.27	35 μg/m³(6)		2 μg/m³	9 μg/m³
PM_{10}	annual	1.0	0.2			4 μg/m³	17 μg/m³
	24-hour	5.0	0.3	150 μg/m³(7)		8 μg/m³	30 μg/m³
SO_2	annual	1.0	0.1		20 ppb(2)	2 μg/m³	20 μg/m³
	24-hour	5.0	0.2		100 ppb(2)	5 μg/m³	91 μg/m³
	3-hour	25.0	1.0	500 ppb(1)		25 μg/m³	512 μg/m³
	1-hour	7.8		75 ppb(8)			

Standards converted from ppb to μg/m³ use a reference temperature of 25° C and a reference pressure of 760 millimeters of mercury.
(1) Not to be exceeded more than once each year.
(2) Not to be exceeded.
(3) Annual mean.
(4) 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
(5) Annual mean, averaged over 3 years.
(6) 98th percentile, averaged over 3 years.
(7) Not to be exceeded more than once per year on average over 3 years.
(8) 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

TABLE 2-2: Standards for Which Modeling Is Not Required by NMED AQB.

Standard not Modeled	Surrogate that Demonstrates Compliance
CO 8-hour NAAQS	CO 8-hour NMAAQS
CO 1-hour NAAQS	CO 1-hour NMAAQS
NO_2 annual NAAQS	NO_2 annual NMAAQS
NO_2 24-hour NMAAQS	NO_2 1-hour NAAQS
O_3 8-hour	Regional modeling
SO_2 annual NMAAQS	SO_2 1-hour NAAQS
SO_2 24-hour NMAAQS	SO_2 1-hour NAAQS
SO_2 3-hour NAAQS	SO_2 1-hour NAAQS

2.1 DISPERSION MODEL SELECTION

The dispersion modeling will be conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee Dispersion Model (AERMOD), *Version 19191*. This model is recommended by EPA for determining Class II impacts within 50 km of the facility being assessed. Additionally, AERMOD was developed to handle complex terrain. In this analysis, AERMOD will be used to estimate pollutant concentrations of CO, NO_2, PM_{10}, $PM_{2.5}$ and SO_2 in the ambient air from the MPC facility modeled emission sources.

AERMOD is a Gaussian plume dispersion model that is based on planetary boundary layer principles for characterizing atmospheric stability. The model evaluates the non-Gaussian vertical behavior of plumes during convective conditions with the probability density function and the superposition of several Gaussian plumes. AERMOD modeling system has three components: AERMAP, AERMET, and AERMOD. AERMAP is the terrain preprocessor program. AERMET is the meteorological data preprocessor. AERMOD includes the dispersion modeling algorithms and was developed to handle simple and complex terrain issues using improved algorithms. AERMOD uses the dividing streamline concept to address plume interactions with elevated terrain.

AERMOD CIA modeling will be run using all the regulatory default options including use of:

- Gradual Plume Rise
- Stack-tip Downwash
- Buoyancy-induced Dispersion
- Calms and Missing Data Processing Routine
- Upper-bound downwash concentrations for super-squat buildings
- Default wind speed profile exponents
- Calculate Vertical Potential Temperature Gradient
- No use of gradual plume rise
- Rural Dispersion

These regulatory default options are found in the AERMOD User's Manual. The model will incorporate local terrain into the calculations.

2.2 BUILDING WAKE EFFECTS

The Prewitt Mill has several buildings and will be located adjacent to PEGS which has multiple buildings. Evaluation of building downwash in CIA modeling on adjacent stack sources is deemed necessary, since most (if not all) of the stack source heights will be below Good Engineering Practice (GEP) heights. The formula for GEP height estimation is:

$H_s = H_b + 1.50L_b$

where: H_s = GEP stack height

H_b = building height

L_b = the lesser building dimension of the height, length, or width

The effects of aerodynamic downwash due to buildings and other structures will be accounted for by using wind direction-specific building parameters calculated by the USEPA-approved Building Parameter Input Program Prime (BPIP-Prime (*Version 04274*)) and the algorithms included in the AERMOD air dispersion model. Based on examination of plot plans for the relationship of sources to the location of facility structures, the locations and dimensions of emission sources and facility structures will be input to the BPIP-Prime software package, which calculates the direction-specific building dimensions for input into the AERMOD model. A downwash analysis will be performed for each point source. MPC and PEGS buildings dimensions will be input into the dispersion model to assess the potential for downwash effects on emissions from nearby point sources. A building downwash analysis, using the latest version of BPIP-Prime, will be conducted and incorporated into the modeling analysis to account for potential effluent downwash due to the tanks and buildings. Output from BPIP-Prime will be incorporated into the AERMOD modeling input files.

2.3 METEOROLOGICAL DATA

Meteorological data used for modeling McKinley Paper Company was obtained from two primary sources: an on-site 10-meter meteorological monitoring site operated at Tri-State's Prewitt Escalante Generating Station and both upper air and surface observations from Albuquerque NWS data. This data has been previously used in dispersion modeling analysis for Tri-State's Prewitt Escalante Generating Station. For this analysis, the existing data was re-processed using the latest version of AERMET (version 19191). These data sources are described in more detail below.

On-Site 10-Meter Tower Data

Hourly on-site surface (i.e. 10-meter) meteorological data is available for 1999 through 2000. This meteorological tower site is located approximately 1.4 miles east-northeast of the MPC facility. The following parameters were available from this site:

Wind Speed at 10 meters
Wind Direction at 10 meters
Sigma Theta at 10 meters
Temperature at 10 meters
Net Radiation at 2 meters

NWS Albuquerque Data

Two parameters, cloud cover and mixing heights, were not available from the on-site monitoring. Cloud cover data are contained in the NWS "surface" data files and the mixing heights are contained in the "upper air" data files. The NWS upper air data contains two mixing heights per day. These data were obtained from collected meteorological parameters by the NWS at Albuquerque for the same period, 1999 - 2000.

The meteorological tower data will be processed using AERMET (version 19191), upper air data from Albuquerque, New Mexico and surface air data from Albuquerque, New Mexico for the same time period.

2.4 RECEPTORS AND TOPOGRAPHY

Modeling will be completed using as many receptor locations necessary to ensure that the maximum estimated impacts are identified. Following EPA guidelines, receptor locations will be identified with sufficient density and spatial coverage to isolate the area with the highest impacts.

ROI model receptor grid will include fence line receptor spacing at 50 meters apart, receptors located 50 meters apart out to 500 kilometer from the property line and 100 meters apart out to 1 kilometers from property line, 250 meters apart out to 3 kilometers from property line, 500 meters apart out to 5 kilometers from property line, and 1000 meters apart out to 10 kilometers from property line. Fence line receptor spacing will be 50 meters.

All refined model receptors will be preprocessed using the AERMAP (*Version 18081*) software associated with AERMOD. The AERMAP software establishes a base elevation and a height scale for each receptor location. The height scale is a measure of the receptor's location and base elevation and its relation to the terrain feature that has the greatest influence in dispersion for that receptor. AERMAP will be run using U.S. Geological Survey (USGS) digital elevation model (DEM) data. Output from AERMAP will be used as input to the AERMOD runstream file for each model run. For fugitive sources of particulate (Volume sources), the CIA model will be run using the "FLAT" source mode option.

2.5 MODELED EMISSION SOURCES INPUTS

NO_2, CO, SO_2, and PM (PM_{10} and $PM_{2.5}$) emissions were estimated using supplier guarantees for the new boiler, presently permitted emission rates for the existing auxiliary boiler and water treatment facility to be transferred to MPC from PEGS, AP-42 Section 3.1 emission factors for the fire pump engine, NMED cooling tower procedure for cooling tower PM emissions, AP-42 emission factors for loading storage silos, AP-42 emission factors for unloading storage silos, and AP-42 emission factors for paved road emissions. The emission sources modeled for this analysis will include all potential emission sources expected from this project. For long-term averaging periods (24-hour and annual), the fire pump will be included in the model at its annual emission rate operating during the hours of 10 AM to 1 PM. For short-term averaging period (1-hour, 3-hour, 8-hour) dispersion modeling analysis, the fire pump engine will be input into the model at its maximum hourly emission rate during the hours of 10 AM to 1 PM. The fire pump engine will be limited to 500 hours per year in the permit. Typical maintenance checks for the engine is 30 minutes per week for less than 100 hours per year.

No startup or shutdown emissions are expected for this facility.

2.6 NO_2 MODELING – MULTI-TIERED SCREENING APPROACH

The AERMOD model predicts ground-level concentrations of any generic pollutant without chemical transformations. Thus, the modeled NO_X emission rate will give ground-level modeled concentrations of NO_X. NAAQS values are presented as NO_2. For NO_X, NAAQS and NMAAQS applicable averaging periods include 1-hour, 24-hour, and annual averages.

EPA has a three-tier approach to modeling NO_2 concentrations.

- Tier I – total conversion, or all NOx = NO_2
- Tier II – Ambient Ratio Method 2 (ARM2)
- Tier III – case-by-case detailed screening methods, such as OLM and Plume Volume Molar Ratio Method (PVMRM) and NO_2/NO_X in-stack ratio

Initial modeling will be performed using both Tier I and Tier II methodologies. If these modeling iterations demonstrate that less conservative methods for determining 1-hour and annual NO_2 compliance would be needed for this project, then ambient impact of 1-hour and annual NOx predicted by the model will use Tier III – OLM or PVMRM.

For PVMRM, three inputs can be selected in the model, the ISR, the NO_2/NO_X equilibrium ratio for the ambient air, and the ambient ozone concentration. The ISR will be determined for each source or group of sources. The NO_2/NO_X equilibrium ratio will be the EPA default of 0.90.

It is evident from modeling experience that at distances close to a modeled source, the modeled NO_2/NO_X ratio (and, thus, the NO_2 concentration) is highly dependent upon the assumed in-stack ratio. The use of the default ratio of 0.5 can result in large over predictions at a facility fence line. Table 8 summarizes the ISR selected for each NO_X source in the NO_2 1-hour modeling.

TABLE 2-3: Summary of Selected ISR

Source Description	Selected ISR
Natural Gas Fired Steam Boiler Stack	0.20
Fire Pump Engine	0.15
Neighboring Sources	0.20

Ozone 1-hour Background data

Ozone 1-hour background data used in the PVMRM NO_2 modeling on the Navajo Lake Monitoring Station.

2.7 $PM_{2.5}$ SECONDARY FORMATION IMPACT ANALYSIS

Particles are made up of different chemical components. The major components, or species, are carbon, sulfate and nitrate compounds, and crustal materials such as soil and ash. The different components that make up particle pollution come from specific sources and are often formed in the atmosphere. Particulate matter includes both "primary" PM, which is directly emitted into the air, and "secondary" PM, which forms indirectly from fuel combustion and other sources. Primary PM consists of carbon (soot)—emitted from cars, trucks, heavy equipment, forest fires, and burning waste—and crustal material from unpaved roads, stone crushing, construction sites, and metallurgical operations. Secondary PM forms in the atmosphere from gases. Some of these reactions require sunlight and/or water vapor. Secondary PM includes:

- Sulfates formed from sulfur dioxide emissions from power plants and industrial facilities;
- Nitrates formed from nitrogen oxide emissions from cars, trucks, industrial facilities, and power plants; and
- Carbon formed from reactive organic gas emissions from cars, trucks, industrial facilities, forest fires, and biogenic sources such as trees.

AERMOD does not account for secondary formation of $PM_{2.5}$ for near-field modeling. Any secondary contribution from MPC's source emissions is not explicitly accounted for in the model results. While representative background monitoring data for $PM_{2.5}$ should adequately account for secondary contribution from existing background sources, if the facility emits significant quantities of $PM_{2.5}$ precursors (NO_X, SO_2, VOC), some assessment of their potential contribution to cumulative impacts as secondary $PM_{2.5}$ is necessary. In determining whether such contributions may be important, keep in mind that peak impacts due to facility primary and secondary $PM_{2.5}$ are not likely to be well-correlated in space or time, and these relationships may vary for different precursors. Total MPC emissions of precursors include:

- Nitrogen Oxides (NO_X) – 86.1 tons per year (exceeds significant emission rates (SER))
- Sulfur Dioxides (SO_2) – 1.24 tons per year (below SER)
- Volatile Organic Carbon (VOC) – 17.2 tons per year (below SER).

$PM_{2.5}$ secondary emission concentration analysis will follow EPA guidelines. Following recent EPA guidelines for conversion of NO_X and SO_2 emission rates to secondary $PM_{2.5}$ emissions, MPC's Prewitt Mill emissions are compared to appropriate western MERPs values (NO_X 24 Hr – 1155 tpy; NO_X Annual – 3184 tpy; SO_2 24 Hr – 225 tpy; SO_2 Annual – 2289 tpy). The following equation, found in NMED AQB modeling guidance document on MERPs, will be used to determine if secondary emission would cause violation with $PM_{2.5}$ NAAQS.

$PM_{2.5}$ annual = ((NO_X emission rate (tpy)/3184 + (SO_2 emission rate (tpy)/2289)) x 0.2 µg/m^3
$PM_{2.5}$ 24 hour = ((NO_X emission rate (tpy)/1155 + (SO_2 emission rate (tpy)/225)) x 1.2 µg/m^3

Results of the secondary formation from the facility will be added to the modeled value.

2.8 REGIONAL BACKGROUND CONCENTRATIONS

Ambient background concentrations represent the contribution of pollutant sources that are not included in the modeling analysis, including naturally occurring sources. If the modeled concentration of a criteria pollutant is above the modeling significance level, the background concentration for each criteria pollutant will be added to the maximum modeled concentration to calculate the total estimated pollutant concentration for comparison with the AAQS. For neighboring sources within 50 kilometers of the MPC, the latest neighboring sources will be obtained from the NMED Air Quality Bureau, Modeling Section.

MPC's Prewitt Mill is located next to Tri-State's PEGS coal-fired boiler, which is going offline in mid-September 2020. Modeling will include MPC's Prewitt Mill and remaining Tri-State's PEGS sources along with neighboring sources or background per NMED Modeling Guidelines Section 4.

The ambient background concentrations listed in the Air Quality Bureau Guidelines for Navajo Lake and Santa Fe will be used. For particulate matter, PM_{10} and $PM_{2.5}$, MPC is proposing using backgrounds from Santa Fe (Monitor ID 3HM). For NO_2 and Ozone, MPC is proposing using backgrounds from Navajo Lake (Monitor ID 1NL). For SO_2, background concentrations from rest of the state of New Mexico (Monitor ID 1ZB) will be used. For CO, the background value will be the default for the rest of the state of New Mexico.

	1 Hour ($\mu g/m^3$)	**3 Hour ($\mu g/m^3$)**	**8 Hour ($\mu g/m^3$)**	**24 Hour ($\mu g/m^3$)**	**Annual ($\mu g/m^3$)**
NO_2	62.2				11.0
CO	2203		1526		
SO_2	8.84				
Ozone	156.9				
$PM_{2.5}$				16.55	4.32
PM_{10}				23.0	

2.9 CLASS II PSD INCREMENT ANALYSIS

If the results of the ROI analysis show an exceedance of the significance levels, Class II PSD increment analysis will be conducted. The PSD analysis will be conducted including all PSD increment consuming sources with the surrounding area within 50 km plus the ROI or 65 km of the facility (whichever is greater). Unlike the CIA, a predicted maximum concentration will be compared with the Class II PSD standards.

2.10 CLASS I AREA ANALYSIS

No Class 1 areas are located within 100 kilometers of the site. The closest Class 1 area is San Pedro Wilderness Area at 127 kilometers. Following this guidance MPC will not demonstrate compliance with Class I PSD standards.

Section 17

Compliance Test History

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

To show compliance with existing NSR permits conditions, you must submit a compliance test history. The table below provides an example.

This is a new NSR permit with no compliance test history. All required compliance tests will be completed in a timely manner.

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.

NA

Section 22: Certification

Company Name: McKinley Paper Company

I, Isaac Rosas, 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 13 day of July, 2020, upon my oath or affirmation, before a notary of the State of

New Mexico.

*Signature

07/13/2020
Date

Isaac Rosas
Printed Name

Operations Director
Title

Scribed and sworn before me on this 13 day of July, 2020

My authorization as a notary of the State of New Mexico expires on the

20th day of May, 2022.

OFFICIAL SEAL
NANCY MATA
Notary Public
State of New Mexico
My Comm. Expires 05/20/22

Notary's Signature

07/13/2020
Date

Nancy Mata
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.

July 13, 2020

New Mexico Environment Department
Air Quality Bureau
Permits Section
525 Camino de los Marquez, Suite 1
Santa Fe, New Mexico 87507-3313

Subject: Permit Application for McKinley Paper Company – Prewitt Mill

To Whom it May Concern:

Attached please find two (2) hardcopies and three (3) electronic (CD) copies of the 20.2.72 NMAC Permit Application for McKinley Paper Company's Prewitt Mill. This letter is attached to the application copy that has the original notarized signature page (Section 22), along with an application submittal fee of $500.

McKinley Paper Company (MPC) Prewitt Mill is a paper mill located north of Prewitt, New Mexico and has been in commercial production since June 1, 1994. MPC's parent company is Bio Pappel S.A.B. de C.V. Since initial startup, estimation of facility potential emission rate of any regulated air contaminant for which there is a National or New Mexico Ambient Air Quality Standard was below thresholds requiring an air quality permit per New Mexico regulation 20.2.72 NMAC. With the planned shutdown of PEGS coal-fired boiler, scheduled for mid-September 2020, steam will be provided to MPC by the auxiliary boiler. Ownership and operation of the auxiliary boiler will eventually both be transferred to MPC from Tri-State. However, there will be a period of time where Tri-State is operating the auxiliary boiler while MPC transitions to taking over the asset. To ensure continued coverage under Tri-State's air permit, Tri-State will separately apply for modification of its PEGS air permit. In additional to acquiring the auxiliary boiler from Tri-State, MPC will be obtaining the water treatment plant, presently operating at PEGS by Tri-State. With the addition of acquiring ownership of the existing auxiliary boiler and water treatment facility, MPC is proposing to installation of a new 166.8 MMBtu per hour natural gas-fired steam boiler. With the addition of these sources, the projected facility emissions will exceed the emission limits requiring a minor source 20.2.72 NMAC air quality permit. Montrose Air Quality Services has been contracted to prepare this 20.2.72.200.A.(2) NMAC permit application. The two (2) natural gas-fired steam boilers will be applicable to EPA regulation 40 CFR 60 Subpart Db.

Montrose Air Quality Services, LLC
3500 Comanche Road NE Suite G
Albuquerque, NM 87107-4546

T: 505.830.9680 ext. 6
F: 505.830.9678
Pwade@montrose-env.com
www.montrose-env.com

Please let me know if you have any questions or need additional information.

Sincerely,

Paul Wade
Sr. Project Manager
Montrose Air Quality Services, LLC

Cc: Isaac Rosas, McKinley Paper Company