Enterprise Products

ENTERPRISE PRODUCTS PARTNERS L.P.
ENTERPRISE PRODUCTS HOLDINGS LLC
(General Partner)

ENTERPRISE PRODUCTS OPERATING LLC

November 28, 2018

7015 3010 0000 3041 4944
Return Receipt Requested

New Mexico Environment Department
Air Quality Bureau
Permits Section
525 Camino de los Marquez, Suite 1
Santa Fe, New Mexico 87505

Subject: **Title V P264-M1 Permit Significant Modification and Renewal Application**
Enterprise Field Services, LLC
Chaparral Gas Plant
Eddy County, New Mexico
AIRS No. 350158066

Dear Sir/Madame:

Enterprise Field Services, LLC ("Enterprise") is submitting a Title V Permit Significant Modification and Renewal Application for the Chaparral Gas Plant (the Plant) located near Loco Hills, Eddy County, New Mexico. The enclosed application is being submitted in accordance with New Mexico Administrative Code (NMAC) 20.2.70. The Station is a major source of nitrogen oxides (NOx), carbon monoxide (CO), and volatile organic compounds (VOC). The Plant currently operates under Title V Operating Permit No. P264-M1 and New Source Review (NSR) Permit No. 3662-M7.

Enterprise would like to thank you in advance for your review and concurrence with this Title V Permit Significant Modification and Renewal Application. If you have any questions regarding the information presented in this letter and attachments, please do not hesitate to contact me at (713) 381-5766 or via email at jli@eprod.com.

Sincerely,
Enterprise Field Services, LLC

Jing Li
Senior Engineer, Environmental

Brad J. Cooley
Senior Manager, Environmental

/mbp
Enclosure

P.O. BOX 4324
HOUSTON, TEXAS 77210-4324
713.381.6500

1100 LOUISIANA STREET
HOUSTON, TEXAS 77002-5227
www.enterpriseproducts.com

Mail Application To:		**For Department use only:**
New Mexico Environment Department Air Quality Bureau Permits Section 525 Camino de los Marquez, Suite 1 Santa Fe, New Mexico, 87505 Phone: (505) 476-4300 Fax: (505) 476-4375 www.env.nm.gov/aqb		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. For NOI applications, submit the entire UA1, UA2, and UA3 applications on a single CD (no copies are needed). For NOIs, hard copies of UA1, Tables 2A, 2D & 2F, Section 3 and the signed Certification Page are required.

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

Acknowledgements:
☒ I acknowledge that a pre-application meeting is available to me upon request. ☒ Title V Operating, Title IV Acid Rain, and NPR applications have no fees.
☐ $500 NSR application Filing Fee enclosed OR ☐ The full permit fee associated with 10 fee points (required w/ streamline applications).
☐ Check No.: in the amount of $500
☒ I acknowledge the required submittal format for the hard copy application is printed double sided 'head-to-toe', 2-hole punched (except the Sect. 2 landscape tables is printed 'head-to-head'), numbered tab separators. Incl. a copy of the check on a separate page.
☐ 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: **20.2.70.404.C 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.):26896	Updating Permit/NOI #: P264-M1
1	Facility Name: Chaparral Gas plant	Plant primary SIC Code (4 digits): 1311	
		Plant NAIC code (6 digits):211130	
a	Facility Street Address (If no facility street address, provide directions from a prominent landmark): Follow NM360 south 5.0 miles to Schugart Road (HWY-222). Follow HWY 222 for 4.5 miles to North-bound Lease Road. Follow the lease road 0.25 miles to the facility.		
2	Plant Operator Company Name: Enterprise Products Operating LLC	Phone/Fax: (713) 381-5766 / (281) 887-8086	

a	Plant Operator Address: PO Box 4324 Houston, TX 77210-4324	
b	Plant Operator's New Mexico Corporate ID or Tax ID: 328 9188	
3	Plant Owner(s) name(s): Enterprise Field Services, LLC	Phone/Fax: (713) 381-5766 / (281) 887-8086
a	Plant Owner(s) Mailing Address(s): PO Box 4324 Houston, TX 77210-4324	
4	Bill To (Company): Enterprise Field Services, LLC	Phone/Fax: (713) 381-5766 / (281) 887-8086
a	Mailing Address: PO Box 4324 Houston, TX 77210-4324	E-mail: environmental@eprod.com
5	☒ Preparer: Jing Li ☐ Consultant:	Phone/Fax: (713) 381-5766
a	Mailing Address: PO Box 4324 Houston, TX 77210-4324	E-mail: jli@eprod.com
6	Plant Operator Contact: Alena Miro	Phone/Fax: (575) 706-4926 / (281) 887-7012
a	Address: 3008 East Greene Street, Carlsbad, NM 88220-9772	E-mail: ammiro@eprod.com
7	Air Permit Contact: Jing Li	Title: Senior Engineer – EHS Air Permitting
a	E-mail: jli@eprod.com	Phone/Fax: (713) 381-5766 / (713) 759-3931
b	Mailing Address: PO Box 4324, Houston TX 77210-4324	

Section 1-B: Current Facility Status

1.a	Has this facility already been constructed? ☒ Yes ☐ No	1.b If yes to question 1.a, is it currently operating in New Mexico? ☒ 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 ☒ 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 ☐ No
3	Is the facility currently shut down? ☐ Yes ☒ No	If yes, give month and year of shut down (MM/YY): N/A
4	Was this facility constructed before 8/31/1972 and continuously operated since 1972? ☐ Yes ☒ 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 ☒ N/A	
6	Does this facility have a Title V operating permit (20.2.70 NMAC)? ☒ Yes ☐ No	If yes, the permit No. is: P264-M1
7	Has this facility been issued a No Permit Required (NPR)? ☐ Yes ☒ No	If yes, the NPR No. is: N/A
8	Has this facility been issued a Notice of Intent (NOI)? ☐ Yes ☒ No	If yes, the NOI No. is: N/A
9	Does this facility have a construction permit (20.2.72/20.2.74 NMAC)? ☒ Yes ☐ No	If yes, the permit No. is: 3662-M7
10	Is this facility registered under a General permit (GCP-1, GCP-2, etc.)? ☐ Yes ☒ No	If yes, the register No. is: N/A

Section 1-C: Facility Input Capacity & Production Rate

1	What is the facility's maximum input capacity, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: 2.9 MMscf/hour	Daily: 70 MMscf/day	Annually: 25,550 MMscf/year
b	Proposed	Hourly: 2.9 MMscf/hr	Daily: 70 MMscf/day	Annually: 25,550 MMscf/year
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: 2.9 MMscf/hour	Daily: 70 MMscf/day	Annually: 25,550 MMscf/year

b	Proposed	Hourly: 2.9 MMscf/hour	Daily: 70 MMscf/day	Annually: 25,550 MMscf/year

Section 1-D: Facility Location Information

1	Section: 17	Range: 31E	Township: 19S	County: Eddy	Elevation (ft): 3,431
2	UTM Zone: ☐ 12 or ☒ 13			Datum: ☐ NAD 27 ☐ NAD 83 ☒ WGS 84	
a	UTM E (in meters, to nearest 10 meters): 603,640 m E			UTM N (in meters, to nearest 10 meters): 3,613,490 m N	
b	**AND** Latitude (deg., min., sec.): 32°39'15.06"N			Longitude (deg., min., sec.): 103°53'41.54"W	
3	Name and zip code of nearest New Mexico town: Loco Hills, NM 88255				
4	Detailed Driving Instructions from nearest NM town (attach a road map if necessary): Follow NM 360 south 5.0 miles to Schugart Road (HWY-222). Follow HWY 222 for 4.5 miles to North-bound Lease Road. Follow the lease road 0.25 miles to the facility				
5	The facility is 12 miles southwest of Loco Hills, NM.				
6	Status of land at facility (check one): ☐ 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: **Municipalities:** None. **Indian tribes:** None. **Counties:** Eddy County, Lea County				
8	**20.2.72** NMAC applications **only**: Will the property on which the facility is proposed to be constructed or operated be closer than 50 km (31 miles) to other states, Bernalillo County, or a Class I area (see www.env.nm.gov/aqb/modeling/class1areas.html)? ☐ Yes ☐ No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers:				
9	Name nearest Class I area: Carlsbad Caverns National Park				
10	Shortest distance (in km) from facility boundary to the boundary of the nearest Class I area (to the nearest 10 meters): 67.7 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: 19,593 m				
12	Method(s) used to delineate the Restricted Area: Fence "**Restricted Area**" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area.				
13	Does the owner/operator intend to operate this source as a portable stationary source as defined in 20.2.72.7.X NMAC? ☐ Yes ☒ No A portable stationary source is not a mobile source, such as an automobile, but a source that can be installed permanently at one location or that can be re-installed at various locations, such as a hot mix asphalt plant that is moved to different job sites.				
14	Will this facility operate in conjunction with other air regulated parties on the same property? ☒ No ☐ Yes If yes, what is the name and permit number (if known) of the other facility? **N/A**				

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

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

Section 1-F: Other Facility Information

1	Are there any current Notice of Violations (NOV), compliance orders, or any other compliance or enforcement issues related to this facility? ☐ Yes ☒ No If yes, specify:		
a	If yes, NOV date or description of issue: N/A		NOV Tracking No: N/A
b	Is this application in response to any issue listed in 1-F, 1 or 1a above? ☐ Yes ☒ No If Yes, provide the 1c & 1d info below:		
c	Document Title: N/A	Date:N/A	Requirement # (or page # and paragraph #): N/A
d	Provide the required text to be inserted in this permit: N/A		
2	Is air quality dispersion modeling or modeling waiver being submitted with this application? ☐ Yes ☒ 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 ☒ No		
4	Will this facility be a source of federal Hazardous Air Pollutants (HAP)? ☒ 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** ☒ **Minor** (☒ <10 tpy of any single HAP **AND** ☒ <25 tpy of any combination of HAPS)		
5	Is any unit exempt under 20.2.72.202.B.3 NMAC? ☐ Yes ☒ No		
a	If yes, include the name of company providing commercial electric power to the facility: N/A 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."	☒ 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.): Graham Bacon (20.2.70.300.D.2 NMAC):	Phone: (713) 381-6595
a	R.O. Title: Executive Vice President-EHS&T	R.O. e-mail: environmental@eprod.com
b	R. O. Address: P.O. Box 4324, Houston, TX 77210-4324	
2	Alternate Responsible Official: Ivan W Zirbes (20.2.70.300.D.2 NMAC):	Phone: (713) 381-6595
a	A. R.O. Title: Vice President-EHS&T	A. R.O. e-mail: environmental@eprod.com
b	A. R. O. Address: P.O. Box 4324, Houston, TX 77210-4324	
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): Enterprise Field Services LLC and Enterprise Products Operating LLC	
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.): Enterprise Product Partners, LP	
a	Address of Parent Company: 1100 Louisiana St., Houston, TX 77002	
5	Names of Subsidiary Companies ("Subsidiary Companies" means organizations, branches, divisions or subsidiaries, which are owned, wholly or in part, by the company to be permitted.): N/A	
6	Telephone numbers & names of the owners' agents and site contacts familiar with plant operations: Daryl Arredondo (575) 628-6819 / Jing Li (713) 381-5766 / (713) 759-3931	

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: Texas, 73 Km.

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 does not need to be 2-hole punched, but **must be double sided**. 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 on compact disk(s) (CD). For 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.

4) If **air dispersion modeling** is required by the application type, include the **NMED Modeling Waiver OR** one additional electronic copy of the air dispersion modeling including the input and output files. The dispersion modeling ***summary report only*** should be submitted as hard copy(ies) unless otherwise indicated by the Bureau. The complete dispersion modeling study, including all input/output files, should be submitted electronically as part of the electronic submittal.

5) If 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.

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

1) All required electronic documents shall be submitted in duplicate (2 separate CDs). 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 with the number of additional hard copies corresponding to the number of CD copies required. 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 3 electronic files (2 MSWord docs: Universal Application section 1 and Universal Application section 3-19) and 1 Excel file of the tables (Universal Application section 2) on the CD(s). 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 # (0 for original, 1, 2, etc.; which will help keep track of subsequent partial update(s) to the original submittal. The footer information should not be modified by the applicant.

Table of Contents

Table 2-A: Regulated Emission Sources

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

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufacturer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] / Date of Construction/ Reconstruction[2]	Controlled by Unit # / Emissions vented to Stack #	Source Classification Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
E-1000	Compressor Engine	Caterpillar	G3516 TALE	WPW02043	1151 hp	1151 hp	15-Feb-08 21-Jun-17	E-1000 E-1000	31000203	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
E-2000	Compressor Engine	Caterpillar	G3516 TALE	WPW01845	1151 hp	1151 hp	26-Nov-07 13-Feb-09	E-2000 E-2000	31000203	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
E-3000	Compressor Engine	Waukesha	7042 GL	296656	1547 hp	1547 hp	23-May-79 1-Dec-07	E-3000 E-3000	31000203	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
E-4000	Compressor Engine	Waukesha	7042 GL	335197	1547 hp	1547 hp	11-Sep-81 1-Dec-07	E-4000 E-4000	31000203	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
E-5000	Compressor Engine	Caterpillar	G3516 TALE	04EK01789	1151 hp	1151 hp	24-Jun-94 1-Jan-08	E-5000 E-5000	31000203	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
E-6000	Compressor Engine	Caterpillar	G3516 TALE	4EK03970	1340 hp	1340 hp	1-Nov-04 Jan-14	E-6000 E-6000	31000203	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
E-7000	Compressor Engine	Caterpillar	G3516 TALE	TBD	1340 hp	1340 hp	TBD TBD	E-7000 E-7000	31000203	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
AMINE-1 & 2**	Amine Flash Tank & Still Vent	OPD	N/A	08040-1 08040-3	19.9 gpm	19.9 gpm	1-Jul-08 May-09	FLARE FLARE	31000305	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
CRYO[5]	Cryogenic Unit (NGL, Distillation Train)	LA Turbine	N/A	10034ESC	70 MMscfd	70 MMscfd	1-Jan-88 May-09	N/A N/A	31000199	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
DEHY-1a (Reboiler)	Glycol Dehy Reboiler Burner	Hanover	N/A	3418	2.0 MMbtu/hr (Reboiler)	2.0 MMbtu/hr (Reboiler)	1-Feb-06 May-09	DEHY-1 DEHY-1a (Reboiler)	31000302	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
DEHY-1b (Still Vent)	Glycol Dehy Still Vent/Flash Tank	Smith	N/A	CR5097	70 MMscfd (Vent/Flash Tank)	70 MMscfd (Vent/Flash Tank)	Apr-06 May-09	BTEX Buster/ Glow Plug BTEX Buster/ Glow Plug	31000301	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
DEHY-2a (Reboiler)	Glycol Dehy Reboiler Burner	Flame Co	N/A	1310-72K	1.0 MMbtu/hr (Reboiler)	1.0 MMbtu/hr (Reboiler)	2014 2014	DEHY-2 DEHY-2	31000302	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
DEHY-2b (Still Vent)	Glycol Dehy Still Vent/Flash Tank	Valerus	N/A	P3908	70 MMscfd (Vent/Flash Tank)	70 MMscfd (Vent/Flash Tank)	2014 2015	BTEX Buster/Flare BTEX Buster/Flare	31000301	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
MOLE-1	Molecular Sieve Regenerator Heater	Power Flame Inc.	C4-F-25	028944665	2.8 MMbtu/hr	2.8 MMbtu/hr	1-Jan-88 May-09	N/A MOLE-1	31000404	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
TK-1	Condensate Tank	Permian Tank	N/A	48396	300 bbl	300 bbl	Jan-09 Dec-07	N/A TK-1	40400311	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
TK-2	Condensate Tank	Permian Tank	N/A	41892	300 bbl	300 bbl	Apr-06 Dec-07	N/A TK-2	40400311	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
TK-3	Condensate Tank	N/A	N/A	N/A	300 bbl	300 bbl	5-Jan-09 5-Jan-09	N/A TK-3	40400311	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufacturer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] / Date of Construction/ Reconstruction[2]	Controlled by Unit # / Emissions vented to Stack #	Source Classification Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
LOAD-1	Truck Loading of Condensate	N/A	N/A	N/A	30,000 bpy	30,000 bpy	1-Jan-08 Jan-08	N/A N/A	31000199	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
FLARE[5]	Process Flare	Flare Industries	N/A	8416	0.024 MMscf/hr	0.024 MMscf/hr	1-Jan-09 1-Jan-09	N/A FLARE	31000215	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
FLARE[5]	Emergency Flare	Flare Industries	N/A	8416	1.4 MMscf/hr	1.4 MMscf/hr	1-Jan-09 1-Jan-09	N/A FLARE	31000215	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
FUG-1	Sitewide Fugitives - NSPS KKK	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	31088811	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
FUG-2	Sitewide Fugitives - NSPS OOOO	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	31088811	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
HAUL	Unpaved Haul Road Emissions	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	31088811	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
SSM/M1	Startup, Shutdown, Maintenance and Malfunction Emissions	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	31088811	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
MRU[6]	Mechanical Refrigeration Unit (MRU)	TBD	TBD	TBD	70 MMscfd	70 MMscfd	9-Apr-15 TBD	N/A N/A	31000199	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
P24A	Centrifugal Pump	Schlumberger	100330179	H12T23870147-11 1	125 bbl/hr	125 bbl/hr	10-Jan-11 22-Dec-15	N/A N/A	31000309	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
P24B	Centrifugal Pump	Schlumberger	100330179	H12T638628 61-11 1	125 bbl/hr	125 bbl/hr	1-Oct-11 22-Dec-15	N/A N/A	31000309	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
E-VRU-1	VRU Compressor Engine	Caterpillar	G3508 LE	9TG0045	515	515	6-Mar-95 TBD	E-VRU-1 E-VRU-1	31000203	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A

** Amine -1 emissions will be controlled by the Unit FLARE.

[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

[5] This facility has a single flare unit that operates as a Process Flare with a rating of 0.024 MMscf/hr, but also as an Emergency Flare with an operational rating of 1.4 MMscf/hr.

[6] The CRYO and MRU are not sources of regulated pollutants other than fugitives. Fugitives from the CRYO and MRU units are encompassed in the facility fugitive emissions calculation.

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 One
TK-Misc	Slop Tank	N/A	N/A N/A	N/A N/A	20.2.72.202.B.5 N/A	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
P24A	Centrifugal pump	Schlumberger	G3A1B XDB2I23982	125 bbl/hr	20.2.72.202.B.5 N/A	Oct. 2011 TBD	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
P24B	Centrifugal pump	Schlumberger	G3A1B XDB2I21574	125 bbl/hr	20.2.72.202.B.5 N/A	Oct. 2011 TBD	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
C-1000	Reciprocating Compressor	Unknown	Unknown Unknown	Unknown Unknown	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
C-2000	Reciprocating Compressor	Unknown	Unknown Unknown	Unknown Unknown	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
C-3000	Reciprocating Compressor	Unknown	Unknown Unknown	Unknown Unknown	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
C-4000	Reciprocating Compressor	Unknown	Unknown Unknown	Unknown Unknown	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
C-5000	Reciprocating Compressor	Unknown	Unknown Unknown	Unknown Unknown	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
C-6000	Reciprocating Compressor	Unknown	Unknown Unknown	Unknown Unknown	20.2.72.202.B.5 N/A	<8/23/2011 >9/18/2015	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
C-7000	Reciprocating Compressor	Unknown	Unknown Unknown	Unknown Unknown	20.2.72.202.B.5 N/A	>9/18/2015 <8/23/2011	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
C-VRU1	Reciprocating Compressor	TBD	Unknown Unknown	Unknown Unknown	20.2.72.202.B.5 N/A	>8/23/2011 >8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-LO	Lube Oil Tank	N/A	N/A N/A	1020 gallons	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-EC	Engine Coolant Tank	N/A	N/A N/A	1020 gallons	20.2.72.202.B.5 N/A	TBD TBD	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-PC	Booster Pump Coolant Tank	N/A	N/A N/A	750 gallons	20.2.72.202.B.5 N/A	TBD TBD	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-AF	Antifreeze Tank	N/A	N/A N/A	500 gallons	20.2.72.202.B.5 N/A	TBD TBD	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-M2	Methanol Tank	N/A	N/A N/A	1000 gallons	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

Unit Number	Source Description	Manufacturer	Model No. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check One
TK-M3	Methanol Tank	N/A	N/A N/A	1000 gallons	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-M4	Methanol Tank	N/A	N/A N/A	500 gallons	20.2.72.202.B.5 N/A	TBD TBD	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-G1	Glycol Tank	N/A	N/A N/A	100 bbl	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-G2	Glycol Tank	N/A	N/A N/A	3000 gallons	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-TEG1	TEG Tank	N/A	N/A N/A	3000 gallons	20.2.72.202.B.5 N/A	TBD TBD	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-A1	Amine Make-Up Tank	N/A	N/A N/A	210 bbl	20.2.72.202.B.5 N/A	<8/23/2011 <8/23/2011	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TK-Misc	Slop oil tank	N/A	N/A N/A	400 bbl	20.2.72.202.B.5 N/A	TBD TBD	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
LD-Misc	Oil Loading	N/A	N/A N/A	400 bbl	20.2.72.202.B.5 N/A	TBD TBD	☑ 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
E-1000	AFRC and Catalytic Converter	13-Feb-09	CO, VOC, HAPs	E-1000	83% CO, HCHO; 50% VOC	Engineering Est
E-3000	AFRC and Catalytic Converter	1-Dec-07	CO, HAPs	E-3000	80% CO and HAPs	Engineering Est.
E-4000	AFRC and Catalytic Converter	Unknown	CO, HAPs	E-4000	80% CO and HAPs	Engineering Est
E-6000	AFRC and Catalytic Converter	TBD	CO, HAPs	E-6000	80% CO and HAPs	Engineering Est.
E-7000	AFRC and Catalytic Converter	TBD	CO, HAPs	E-7000	80% CO and HAPs	Engineering Est
DEHY-1	Condenser, BTEX Buster	Unknown	VOC, HAPs	DEHY-1b	~88%	GRI-GLYCalc
	Flare, Firebox, Glow Plug	Unknown	VOC, HAPs	DEHY-1b	98%	Engineering Est
DEHY-2	Condenser, BTEX Buster	TBD	VOC, HAPs	DEHY-2b	~90%	GRI-GLYCalc
	Flare, Firebox, Glow Plug	TBD	VOC, HAPs	DEHY-2b	98%	Engineering Est.
FLARE	Flare	Unknown	VOC, HAPs	Various	98%	Engineering Est.
E-VRU-1	AFRC and Catalytic Converter	TBD	CO, VOC, HAPs	VRU-1	83% CO, HCHO, 50% VOC	Engineering Est.
AMINE-1	Flare	Unknown	VOC, H_2S, HAPs	AMINE-1	98%	Engineering Est.

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		TSP[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
E-1000	3.81	16.67	4.57	20.01	1.24	5.45	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	-	-
E-2000	3.81	16.67	4.57	20.01	1.24	5.45	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	-	-
E-3000	5.12	22.41	9.04	39.59	3.41	14.94	0.17	0.75	0.11	0.50	0.11	0.50	0.11	0.50	-	-	-	-
E-4000	5.12	22.41	9.04	39.59	3.41	14.94	0.17	0.75	0.11	0.50	0.11	0.50	0.11	0.50	-	-	-	-
E-5000	3.81	16.67	4.57	20.01	1.24	5.45	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	-	-
E-6000	5.91	25.88	5.49	24.07	0.77	3.36	0.15	0.65	0.10	0.43	0.10	0.43	0.10	0.43	-	-	-	-
E-7000	5.91	25.88	6.85	30.02	1.24	5.43	0.15	0.65	0.10	0.43	0.10	0.43	0.10	0.43	-	-	-	-
DEHY-1a (reboiler)	0.21	0.92	0.18	0.77	0.012	0.051	0.030	0.13	0.016	0.070	0.016	0.070	0.016	0.070	-	-	-	-
DEHY-1b (Still vent)	-	-	-	-	52.35	229.29	-	-	-	-	-	-	-	-	0.027	0.12	-	-
DEHY-2a (reboiler)	0.11	0.46	0.088	0.39	0.0058	0.025	0.015	0.066	0.0080	0.035	0.0080	0.035	0.0080	0.035	-	-	-	-
DEHY-2b (still vent)	-	-	-	-	56.94	249.41	-	-	-	-	-	-	-	-	0.034	0.15	-	-
AMINE 1 and 2	-	-	-	-	2.02	8.84	-	-	-	-	-	-	-	-	0.094	0.41	-	-
MOLE-1	0.28	1.21	0.23	1.01	0.015	0.066	0.042	0.19	0.021	0.092	0.021	0.092	0.021	0.092	-	-	-	-
TK-1 through TK-3	-	-	-	-	*	14.98	-	-	-	-	-	-	-	-	-	-	-	-
LOAD-1	-	-	-	-	*	9.73	-	-	-	-	-	-	-	-	-	-	-	-
FLARE	0.020	0.086	0.039	0.17	-	-	0.0021	0.0094	-	-	-	-	-	-	-	-	-	-
HAUL	-	-	-	-	-	-	-	-	5.52	3.37	1.25	0.77	0.13	0.077	-	-	-	-
FUG-1	-	-	-	-	*	44.58	-	-	-	-	-	-	-	-	*	1.11E-03	-	-
FUG-2	-	-	-	-	*	23.40	-	-	-	-	-	-	-	-	*	5.83E-04	-	-
E-VRU-1	2.27	9.95	2.27	9.95	0.79	3.48	0.058	0.25	0.039	0.17	0.039	0.17	0.039	0.17	-	-	-	-
																		-
Totals	36.35	159.21	46.93	205.57	124.70	638.86	1.17	5.14	6.29	6.72	2.02	4.11	0.89	3.42	0.16	0.68	-	-

[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 TSP unless TSP is set equal to PM10 and PM2.5.

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		TSP[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
E-1000	3.81	16.67	0.78	3.40	0.62	2.72	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	-	-
E-2000	3.81	16.67	4.57	20.01	1.24	5.45	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	-	-
E-3000	5.12	22.41	1.81	7.92	3.41	14.94	0.17	0.75	0.11	0.50	0.11	0.50	0.11	0.50	-	-	-	-
E-4000	5.12	22.41	1.81	7.92	3.41	14.94	0.17	0.75	0.11	0.50	0.11	0.50	0.11	0.50	-	-	-	-
E-5000	3.81	16.67	4.57	20.01	1.24	5.45	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	-	-
E-6000	5.91	25.88	5.49	24.07	0.77	3.36	0.15	0.65	0.10	0.43	0.10	0.43	0.10	0.43	-	-	-	-
E-7000	5.91	25.88	1.37	6.00	1.24	5.43	0.15	0.65	0.10	0.43	0.10	0.43	0.10	0.43	-	-	-	-
DEHY-1a (reboiler)	0.21	0.77	0.18	0.77	0.012	0.051	0.030	0.13	0.016	0.070	0.016	0.070	0.016	0.070	-	-	-	-
DEHY-1b (Still vent)	-	-	-	-	0.34	1.48	0.029	0.13	-	-	-	-	-	-	3.18E-04	1.39E-03	-	-
DEHY-2a (reboiler)	0.11	0.46	0.088	0.39	0.0058	0.025	0.015	0.066	0.0080	0.035	0.0080	0.035	0.0080	0.035	-	-	-	-
DEHY-2b (still vent)	-	-	-	-	0.60	2.61	0.048	0.21	-	-	-	-	-	-	5.17E-04	2.27E-03	-	-
AMINE 1 and 2	-	-	-	-	2.02	8.84	-	-	-	-	-	-	-	-	0.094	0.41	-	-
MOLE-1	0.28	1.21	0.23	1.01	0.015	0.066	0.042	0.19	0.021	0.092	0.021	0.092	0.021	0.092	-	-	-	-
TK-1 through TK-3	-	-	-	-	*	14.98	-	-	-	-	-	-	-	-	-	-	-	-
LOAD-1	-	-	-	-	*	9.73	-	-	-	-	-	-	-	-	-	-	-	-
FLARE	5.27	23.09	10.52	46.09	24.82	108.71	0.065	0.28	-	-	-	-	-	-	6.82E-04	2.99E-03	-	-
HAUL	-	-	-	-	-	-	-	-	5.52	3.37	1.25	0.77	0.13	0.077	-	-	-	-
FUG-1	-	-	-	-	*	44.58	-	-	-	-	-	-	-	-	*	1.11E-03	-	-
FUG-2	-	-	-	-	*	23.40	-	-	-	-	-	-	-	-	*	5.83E-04	-	-
E-VRU-1	2.27	9.95	0.39	1.69	0.40	1.74	0.058	0.25	0.039	0.17	0.039	0.17	0.039	0.17	-	-	-	-
Totals	41.60	182.06	31.80	139.28	40.14	268.51	1.31	5.75	6.29	6.72	2.02	4.11	0.89	3.42	0.10	0.42	-	-

[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 TSP unless TSP is set equal to PM10 and PM2.5.

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

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

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

Unit No.	NOx		CO		VOC		SOx		TSP[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
SSM/M1	230.27	10.00	459.71	10.00	1857.90	10.00	0.95	4.15	-	-	-	-	-	-	0.010	0.045	-	-
Totals	230.27	10.00	459.71	10.00	1857.90	10.00	0.95	4.15	-	-	-	-	-	-	0.010	0.045	-	-

[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 TSP unless TSP is set equal to PM10 and PM2.5.

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

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

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

Stack No.	Serving Unit Number(s) from Table 2-A	NOx		CO		VOC		SOx		TSP		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
N/A - There are no special stacks present at the facility.																	
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	Height Above	Temp.	Flow Rate		Moisture by	Velocity	Inside Diameter (ft)
			(Yes or No)	Ground (ft)	(F)	(acfs)	(dscfs)	Volume (%)	(ft/sec)	
E-1000	E-1000	V	No	24	840	106.9	-	-	100.0	1.20
E-2000	E-2000	V	No	24	840	106.9	-	-	100.0	1.20
E-3000	E-3000	V	No	24	810	153.0	-	-	86.6	1.50
E-4000	E-4000	V	No	24	810	153.0	-	-	86.6	1.50
E-5000	E-5000	V	No	21	840	106.9	-	-	100.0	1.20
E-6000	E-6000	V	No	21	873	127.7	-	-	112.9	1.20
E-7000	E-7000	V	No	21	873	127.7			112.9	1.20
DEHY-1	DEHY-1	V	No	15	212	8.4	-	-	43.0	0.50
DEHY-2	DEHY-2	V	No	15	212	4.3	-	-	21.7	0.50
MOLE-1	MOLE-1	V	No	15	212	12.0	-	-	61.0	0.50
FLARE	FLARE	V	No	100	1832	N/A	-	-	65.6	1.50
E-VRU-1	E-VRU-1	V	No	18	1007	68.8	-	-	195.1	0.67

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		Formaldehyde ☑ HAP or ☐ TAP		Acetaldehyde ☑ HAP or ☐ TAP		Acrolein ☑HAP or ☐ TAP		Benzene ☑ HAP or ☐ TAP		n-Hexane ☑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
E-1000	E-1000	0.10	0.45	0.075	0.33	0.012	0.052	0.0073	0.032	6.25E-04	0.0027	0.0016	0.0069	-	-	-	-		
E-2000	E-2000	0.60	2.65	0.44	1.94	0.070	0.31	0.043	0.19	0.0037	0.016	0.0093	0.041	-	-	-	-		
E-3000	E-3000	0.24	1.06	0.20	0.87	0.019	0.082	0.012	0.051	9.91E-04	0.0043	0.0025	0.011	-	-	-	-		
E-4000	E-4000	0.24	1.06	0.20	0.87	0.019	0.082	0.012	0.05	9.91E-04	0.0043	0.0025	0.011	-	-	-	-		
E-5000	E-5000	0.60	2.65	0.44	1.94	0.070	0.31	0.043	0.19	0.0037	0.016	0.0093	0.041	-	-	-	-		
E-6000	E-6000	0.70	3.08	0.51	2.25	0.081	0.36	0.050	0.22	0.0043	0.019	0.011	0.047	-	-	-	-		
E-7000	E-7000	0.17	0.73	0.13	0.57	0.016	0.071	0.010	0.04	8.58E-04	0.0038	0.0022	0.0095	-	-	-	-		
DEHY-1	DEHY-1	0.15	0.68	0.0017	0.0074	0.0015	0.0065	-	-	0.089	0.39	0.010	0.044	-	-	-	-		
DEHY-2	DEHY-2	0.22	0.96	8.45E-04	0.0037	7.31E-04	0.0032	-	-	0.14	0.61	0.015	0.066	-	-	-	-		
FLARE	AMINE-1&2	0.39	1.71	-	-	-	-	-	-	0.31	1.38	9.20E-04	0.0040	-	-	-	-		
MOLE-1	MOLE-1	0.04	0.18	0.0024	0.010	0.0021	0.0090	-	-	0.0021	0.0092	0.0039	0.017	-	-	-	-		
TK-1 through TK-3	TK-1 through TK-3	*	0.10	-	-	-	-	-	-	*	0.035	*	0.038	-	-	-	-		
N/A	LOAD-1	*	0.07	-	-	-	-	-	-	*	0.023	*	0.024	-	-	-	-		
FLARE	FLARE	1.70	7.43	-	-	-	-	-	-	0.61	2.66	0.88	3.84	-	-	-	-		
N/A	FUG-1	*	0.81	-	-	-	-	-	-	*	0.22	-	0.43	-	-	-	-		
N/A	FUG-2	*	0.42	-	-	-	-	-	-	*	0.12	*	0.23	-	-	-	-		
E-VRU-1	E-VRU-1	0.04	0.18	0.024	0.11	0.0031	0.014	0.0014	0.0063	6.75E-04	0.0030	6.21E-04	0.0027	-	-	-	-		
N/A	SSM/M1	20.61	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Totals:		25.82	24.28	2.03	8.88	0.29	1.29	0.18	0.78	1.17	5.52	0.94	4.86						

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
E-1000	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	9.0 Mscf	78.7 MMscf	5 gr S/ 100 scf	Negligible
E-2000	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	9.0 Mscf	78.7 MMscf	5 gr S/ 100 scf	Negligible
E-3000	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	12.0 Mscf	104.8 MMscf	5 gr S/ 100 scf	Negligible
E-4000	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	12.0 Mscf	104.8 MMscf	5 gr S/ 100 scf	Negligible
E-5000	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	9.0 Mscf	78.7 MMscf	5 gr S/ 100 scf	Negligible
E-6000	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	10.4 Mscf	91.5 MMscf	5 gr S/ 100 scf	Negligible
E-7000	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	10.4 Mscf	91.5 MMscf	5 gr S/ 100 scf	Negligible
DEHY-1	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	2.1 Mscf	18.4 MMscf	5 gr S/ 100 scf	Negligible
DEHY-2	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	1.1 Mscf	9.2 MMscf	5 gr S/ 100 scf	Negligible
FLARE (pilot)	Natural Gas	Pipeline Quality Natural Gas	1816 Btu/scf[1]	150 scf	1.3 MMscf	5 gr S/ 100 scf	Negligible
FLARE (process)	Natural Gas	Pipeline Quality Natural Gas,Facility Offgas	1816 Btu/scf[2]	19.5 Mscf[3]	171.0 MMscf[4]	5 gr S/ 100 scf	Negligible
MOLE-1	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	3.0 Mscf	25.9 MMscf	5 gr S/ 100 scf	Negligible
E-VRU-1	Natural Gas	Pipeline Quality Natural Gas	950 Btu/scf	4.1 Mscf	35.7 MMscf	5 gr S/ 100 scf	Negligible

[1]The Flare's Pilot runs with waste gas.

[2]The Process Flare runs with waste gas.

[3]Pilot Flow + Process Flow = (0.019 MMscf/hr * $1X10^6$ scf/ MMscf) + 150 scf/hr = 19525 scf/hr = 19.5 Mscf/hr

[4]Then, to convert Mscf/hr to MMscf/ yr : (19.5 Mscf/hr) * (8760 hrs/yr) * (1MMscf/1000 Mscf) = 171.0 MMscf/yr

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)
TK-1	40400311	Condensate	Mixed Hydrocarbon Liquids	5.6	67	76.3	6.3	93.2	8.5
TK-2	40400311	Condensate	Mixed Hydrocarbon Liquids	5.6	67	76.3	6.3	93.2	8.5
TK-3	40400311	Condensate	Mixed Hydrocarbon Liquids	5.6	67	76.3	6.3	93.2	8.5

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			
TK-1	Jan-09	Condensate	N/A	FX	300	48	3.7	2.3	OT: Red Primer	OT: Red Primer	Poor	840,000	66.6
TK-2	Apr-06	Condensate	N/A	FX	300	48	3.7	2.3	OT: Red Primer	OT: Red Primer	Poor	840,000	66.6
TK-3	Jan-09	Condensate	N/A	FX	300	48	3.7	2.3	OT: Red Primer	OT: Red Primer	Poor	840,000	66.6

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

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

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)
Natural Gas	Mixed Hydrocarbons	Gas	70 MMscf/day	Natural Gas	Mixed Hydrocarbons	Gas	70 MMscf/day
				Condensate	Mixed Hydrocarbons	Liquid	~164 bbl/day
				NGL	Mixed Hydrocarbons	Liquid	2218 bbl/day

Table 2-N: CEM Equipment

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

Stack No.	Pollutant(s)	Manufacturer	Model No.	Serial No.	Sample Frequency	Averaging Time	Range	Sensitivity	Accuracy
N/A - There is no CEM equipment located at the facility.									

Table 2-O: Parametric Emissions Measurement Equipment

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

Unit No.	Parameter/Pollutant Measured	Location of Measurement	Unit of Measure	Acceptable Range	Frequency of Maintenance	Nature of Maintenance	Method of Recording	Averaging Time
N/A - There is no PEM equipment located at the facility.								

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**								
E-1000	**mass GHG**	4,372.8	0.0082	0.082									4,372.9	
	CO_2e	4,372.8	2.5	2.1										4,377.3
E-2000	**mass GHG**	4,372.8	0.0082	0.082									4,372.9	
	CO_2e	4,372.8	2.5	2.1										4,377.3
E-3000	**mass GHG**	5,825.8	0.011	0.11									5,825.9	
	CO_2e	5,825.8	3.3	2.7										5,831.8
E-4000	**mass GHG**	5,825.8	0.011	0.11									5,825.9	
	CO_2e	5,825.8	3.3	2.7										5,831.8
E-5000	**mass GHG**	4,372.8	0.0082	0.082									4,372.9	
	CO_2e	4,372.8	2.5	2.1										4,377.3
E-6000	**mass GHG**	5,084.0	0.0096	0.10									5,084.1	
	CO_2e	5,084.0	2.9	2.4										5,089.2
E-7000	**mass GHG**	5,084.0	0.010	0.10									5,084.1	
	CO_2e	5,084.0	2.9	2.4										5,089.2
DEHY-1	**mass GHG**	1,142.3	0.0022	0.022									1,142.3	
	CO_2e	1,142.3	0.64	0.5										1,143.5
DEHY-2	**mass GHG**	522.0	0.00098	0.0098									522.0	
	CO_2e	522.0	0.293	0.246										522.6
AMINE-1 and 2	**mass GHG**	1,332.9	-	0.6									1,333.5	
	CO_2e	1,332.9	-	14.8										1,347.7
MOLE-1	**mass GHG**	1,606.6	0.0030	0.030									1,606.7	
	CO_2e	1,606.6	0.90	0.76										1,608.3
TK-1	**mass GHG**	-	-	-										
	CO_2e	-	-	-										
TK-2	**mass GHG**	-	-	-										
	CO_2e	-	-	-										
TK-3	**mass GHG**	-	-	-										
	CO_2e	-	-	-										

LOAD-1	mass GHG	-	-	-										
	CO_2e	-	-	-										
FLARE	mass GHG	52.1	0.037	1,598.2									1,650.3	
	CO_2e	52.1	11.0	39,955.3										40,018.3
HAUL	mass GHG	-	-	-										
	CO_2e	-	-	-										
FUG-1	mass GHG	-	-	-										
	CO2e	-	-	-										
FUG-2	mass GHG	-	-	-										
	CO_2e	-	-	-										
E-VRU-1	mass GHG	1,981.6	0.0037	0.037									1,981.7	
	CO_2e	1,981.6	1.1	0.9										1,983.7
SSM/M1	mass GHG	1,126.3	0.0014	1.7									1,128.1	
	CO_2e	1,126.3	0.4	43.2										1,169.9
Total	mass GHG	42,701.8	0.1	1,601.3									44,303.2	
	CO_2e	42,701.8	33.9	40,031.6										82,767.9

[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).

Routine or predictable emissions during Startup, Shutdown, and Maintenance (SSM): 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.

Enterprise Field Services, LLC (Enterprise) is submitting a Significant Modification and Renewal application (pursuant to 20.2.70.300 and 20.2.70.404.C(1)(a) NMAC) to the current Title V Permit No. P264-M1, issued on February 15, 2017 for the Chaparral Gas Plant (the Plant). Enterprise operates the Plant under the current NSR Construction Permit No. 3662-M7, issued on January 9, 2018.

The Plant is a natural gas processing plant, which currently consists of seven (7) natural gas combustion engines used for natural gas compression, two TEG dehydrators, a molecular sieve dehydrator, an amine sweetening system for liquid treating, a cryogenic natural gas processing train, three (3) 300-barrel condensate tanks, and a flare. Other equipment being included are considered exempt and are not sources of regulated emissions. The Plant is located in Eddy County, New Mexico, approximately 12 miles southeast of Loco Hills, NM.

Enterprise is submitting a NSR revision application in November 2018. The following tables summarizes the proposed changes included in this application, which incorporates the changes made to the NSR permit 3662-M7 and the proposed changes to the NSR in November 2018.

Changes and/or Clarifications included in the NSR 3662-M7, issued on January 9, 2018	
Affected Process/Unit:	**Description of Modification or Clarifications**
Facility inlet flow rate	Increase the maximum facility inlet flowrate from 45 MMscf/day to 70 MMscf/day.
DEHY-1, DEHY-2 Amine 1 & 2, Flare SSM/M	Update emissions of these sources as a result of the proposed inlet flow increase.
E-7000	This unit will be added to the existing six (6) compressor engine units. It will be a Caterpillar G3516 LE TA engine rated at 1,340 hp.
C-7000	This unit will be added to the existing compressor group. It will be connected to E-7000.

Proposed Changes and/or Clarifications included in the NSR Significant Revision in November 2018	
Unit:	**Description of Modification or Clarifications**
FLARE	Previous flare SO_2 emissions were based on combusted H_2S. With this permitting action, this calculation was updated to calculate SO_2 emissions based on uncombusted H_2S.
FUG-1 & FUG-2	Updated fugitive component count by adding light liquid and heavy liquid components
TK-1 through TK-3	Updated condensate tank emissions by using Tanks 4.09 with increased throughput. Throughput increased from 30,000 bbl/yr to 60,000 bbl/yr
HAUL	Increased haul road calculations based on new throughput and increased number of vehicles at the Plant.
LOAD-1	Increased loading emissions based on new throughput
E-5000	E-5000 compressor engine calculations remain the same. However, emissions for the unit were previously represented incorrectly in Part 2 of the Universal Application Form. This has been corrected.
E-2000	E-2000 compressor engine calculations remain the same. However, emissions for the unit were previously represented incorrectly in Part 2 of the Universal Application Form. This has been corrected.

With these permitting actions, only annual VOC emissions have increased. Both hourly and annual emissions for all other units either remain the same or decrease with this permitting action.

Section 4

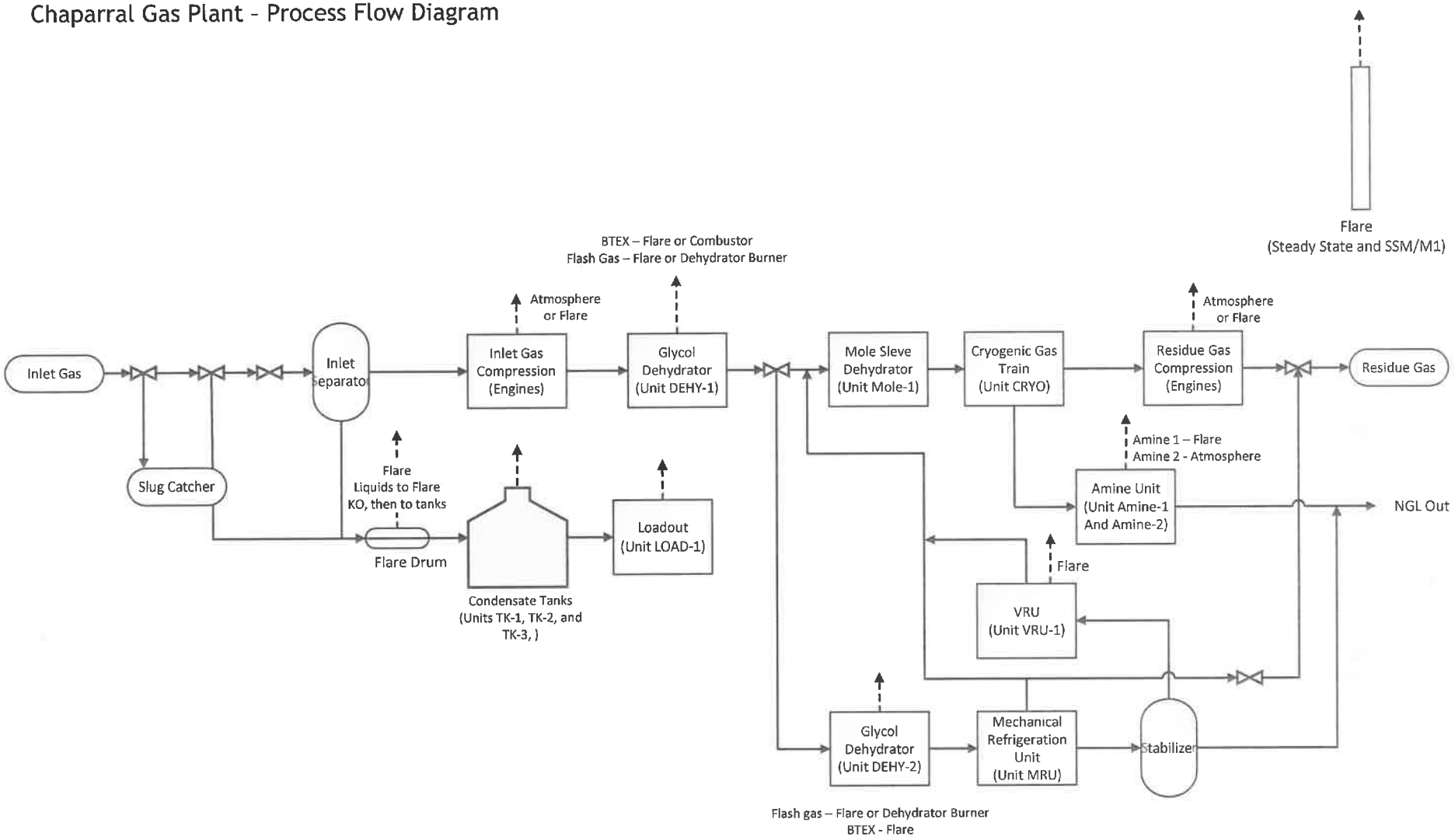
Process Flow Sheet

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.

A process flow sheet is attached.

Enterprise Products

Chaparral Gas Plant - Process Flow Diagram



Section 5

Plot Plan Drawn To Scale

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

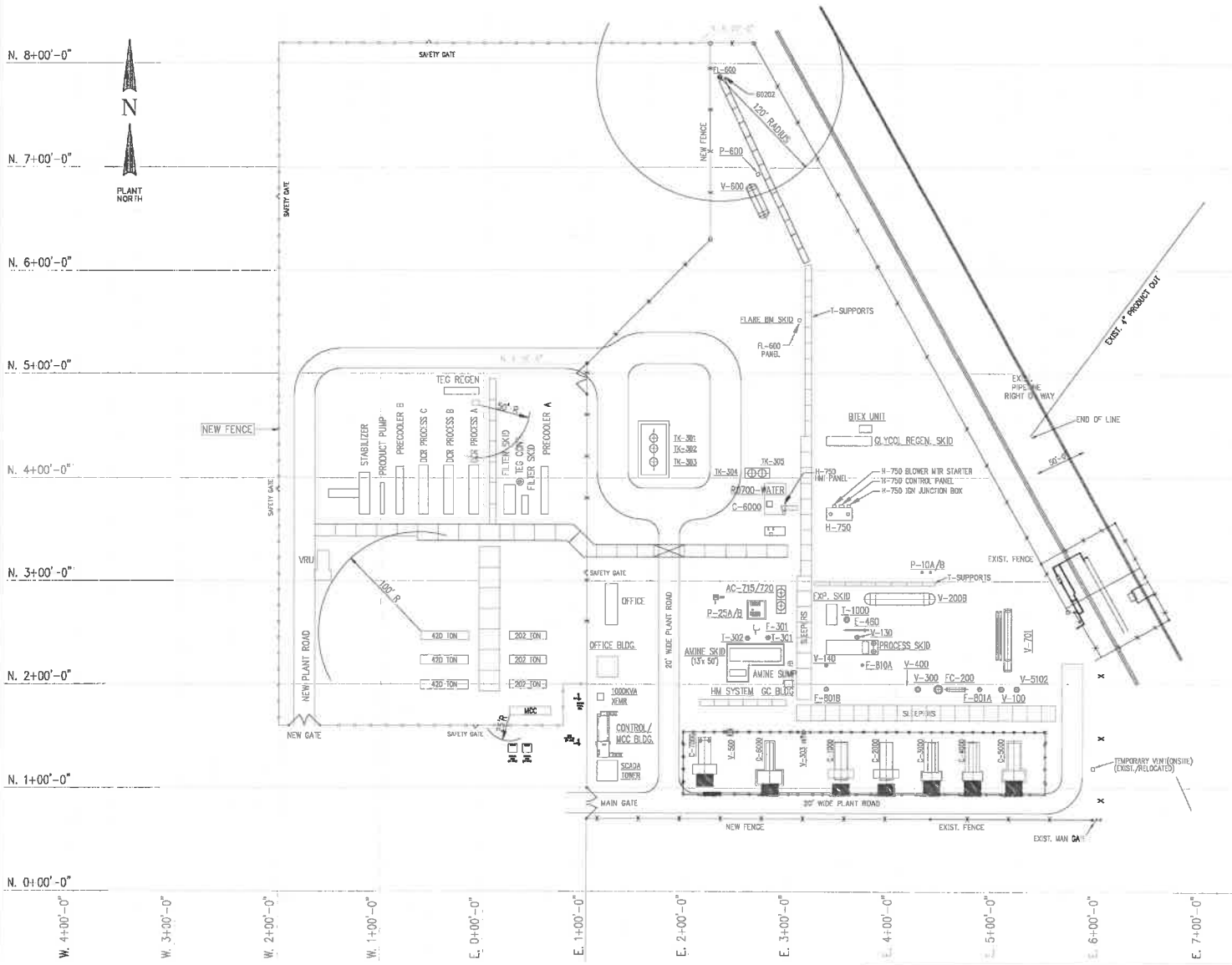
A plot plan is attached.

Enterprise Field Services, LLC
Chaparral Gas Plant
November 2018

Apex TITAN, Inc.
2100 Ford Road, Suite 401
Dallas, Texas, 75234
Phone (469) 365-1100
www.apexcos.com
A Subsidiary of Apex Companies, LLC

FIGURE 5-1

Area Map



EQUIPMENT LIST:

OFFSKID EQUIPMENT(NEW):

- C-4000 ~ RESIDUE COMPRESSOR
- C-5000 ~ RESIDUE COMPRESSOR
- F-810A ~ DRY GAS FILTER
- AC-715 ~ EXPANDER/COMPRESSOR DISCHARGE COOLER
- AC-720 ~ PRODUCT COOLER
- P-10 A/B ~ DEMETHANIZER BOTTOMS PUMPS
- T-301 ~ AMINE CONTACTOR
- F-301 ~ PRODUCT COALESCER
- T-302 ~ AMINE STILL
- V-600 ~ FLARE K.O. DRUM
- P-600 ~ FLARE K.O. DRUM PUMP
- FL-600 ~ FLARE STACK
- S-301 ~ AMINE SUMP
- P-304 ~ AMINE SUMP PUMP
- V-140 ~ FUEL GAS SCRUBBER
- C-6000 ~ CSI BOOSTER GAS COMPRESSOR
- V-500 ~ GAS INLET SCRUBBER

SKIDS(NEW):

AMINE REGEN SKID(13'x 50')
- P-303 A/B ~ AMINE CIRCULATION PUMPS
- V-301 ~ AMINE FLASH TANK
- AC-303 ~ LEAN AMINE COOLER
- F-302 ~ RICH AMINE FILTER
- F-303 ~ AMINE CHARCOAL FILTER
- F-304 ~ AMINE CHARCOAL AFTER FILTER
- E-301 A/B ~ LEAN/RICH AMINE EXCHANGERS
- P-302 A/B ~ AMINE REFLUX PUMPS
- P-301 A/B ~ AMINE BOOSTER PUMPS
- AC-302 ~ AMINE STILL REFLUX CONDENSER
- V-302 ~ AMINE STILL REFLUX ACCUMULATOR
- E-302 ~ AMINE REBOILER
- GC ~ GAS CHROMATOGRAPH

EQUIPMENT & SKIDS ~ DPC RENTAL

- INLET FILTER/SEPARATOR SKID
- TREATED GAS FILTER/SEPARATOR SKID
- PRECOOLER SKID "A"
- PRECOOLER SKID "B"
- DC-R-JT PROCESS SKID "A"
- DC-R-JT PROCESS SKID "B"
- DC-R-JT PROCESS SKID "C"
- 420T REFRIGERATION SKID "A"
- 420T REFRIGERATION SKID "B"
- 420T REFRIGERATION SKID "C"
- 202T REFRIGERATION SKID "D"
- 202T REFRIGERATION SKID "E"
- 202T REFRIGERATION SKID "F"
- V-702 TEG CONTACTOR
- TEG REGENERATION SKID
- BTEX ELIMINATION SKID
- VRU RECOMPRESSION SKID
- P-701 PRODUCT PUMP

VENDOR PACKAGES:

- H-301 ~ HEAT MEDIUM SKID
- R.O. SYSTEM
- C-6000 ~ INSTRUMENT AIR COMPRESSOR

OFFSKID EQUIPMENT(EXIST./REUSED):

- V-100 ~ INLET SEPARATOR(EXIST. RELOCATED FROM PECOS)
- C-1000 ~ INLET COMPRESSOR(EXIST. IN PLACE)
- C-2000 ~ INLET COMPRESSOR(EXIST. RELOCATED FROM SILSBEE)
- C-3000 ~ INLET/RESIDUE COMPRESSOR(EXIST. RELOCATED FROM SILSBEE)
- FC-200 ~ INLET COMPRESSOR DISCHARGE FILTER SEPARATOR(EXIST. RELOCATED FROM PECOS)
- V-300 ~ TEG CONTACTOR(EXIST. RELOCATED FROM PECOS)
- V-400 ~ GLYCOL OVHD. DISCHARGE SCRUBBER(EXIST. RELOCATED FROM PECOS)
- F-801A ~ RESIDUE COMPRESSOR DISCHARGE FILTER SEPARATOR(EXIST. RELOCATED FROM VIDOR)
- F-801B ~ TEG DISCHARGE FILTER SEPARATOR(EXIST. RELOCATED FROM VIDOR)
- F-800 ~ INLET GAS FILTER SEPARATOR(EXIST. RELOCATED FROM VIDOR)
- V-130 ~ REGENERATION GAS SCRUBBER(EXIST. RELOCATED FROM VIDOR)
- H-750 ~ REGENERATION GAS HEATER(EXIST. RELOCATED FROM VIDOR)
- T-1000 ~ DEMETHANIZER(EXIST. RELOCATED FROM VIDOR)
- E-460 ~ DEMETHANIZER TRIM REBOILER(EXIST. RELOCATED FROM VIDOR)
- V-200B ~ PRODUCT SURGE TANK(EXIST. RELOCATED FROM VIDOR)
- P-25 A/B ~ PRODUCT PIPELINE PUMPS(EXIST. RELOCATED FROM VIDOR)

- V-701 ~ SLUG CATCHER
- C-7000 ~ RESIDUE COMPRESSOR

- TK-302 ~ DRAIN/SLOP TANK
- TK-301 ~ AMINE STORAGE TANK
- P-305 ~ AMINE MAKE-UP PUMP
- TK-1 ~ CONDENSATE TANK
- TK-303 ~ GLYCOL STORAGE TANK
- TK-304 ~ WASTE WATER STORAGE TANK
- TK-305 ~ MAKE-UP WATER STORAGE TANK
- P-204 ~ GLYCOL MAKE-UP PUMP

SKIDS(EXIST./REUSED):

- GLYCOL REGEN. SKID ~ (EXIST. RELOCATED FROM PECOS)
- PROCESS SKID ~ (EXIST. RELOCATED FROM VIDOR)
- EXPANDER SKID ~ (EXIST. RELOCATED FROM VIDOR)
- BTEX REMOVAL UNIT ~ (EXIST. RELOCATED FROM PECOS)

REFERENCE DRAWINGS

NUMBER	TITLE

No.	REVISION	BY	DATE	CHK
7	MOVED BP 20' NORTH- RELOCATE MCC & XFMRS w/ P.O.F.	MSS	11/19/14	MG
6	ISSUED AS BUILT ~ OPD JOB #14030	MSS	5/28/15	MG
1	MOVE I/A & RO 700 WATER INTO BUILDING	SPA	11/25/08	DM
2	AS-BUILT	JDE	4/27/09	BH
3	AS-BUILT PER C-6000 CSI BOOSTER GAS COMPRESSOR & ELECTRICAL & INSTRUMENTATION INSTALLATION (TS)	AG	2/2/14	DMR
4	ISSUED FOR APPROVAL ~ OPD JOB #14030	MSS	8-27-14	MG
5	ISSUED FOR HAZOP ~ OPD JOB #14030	MSS	9-03-14	MG
6	ISSUED FOR CONSTRUCTION ~ OPD JOB #14030	MSS	10/02/14	MG

Enterprise Products Operating L.P.
Houston, Texas

LOCATION: CHAPARRAL GAS PLANT, EDDY COUNTY, NEW MEXICO
SCALE: 1"=50'
DRAWN BY: JSC
CHECKED BY: DM

EQUIPMENT LOCATION KEY PLOT PLAN

DATE: 5/4/08
APPROVED:
DRAWING NUMBER: 08407-930-P000
REV.: 8
PROJECT No.: OPD-14030

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.

Dehydrator (unit DEHY-1) **Unit Affected by this Permit Application**
Dehy-1 emissions are based on the higher input flowrate. Regenerator and flash tank emissions are re-calculated using Promax® simulations at the higher flowrate proposed in this application. Since the flash tank gas stream is being recycled and compressed, flash tank emissions are assumed to be zero.

Dehydrator (unit DEHY-2) **Unit Affected by this Permit Application**
Dehy-2 emissions are based on the higher input flowrate. Regenerator and flash tank emissions are re-calculated using Promax® simulation at the higher flowrate proposed in this application. Since the flash tank gas stream is being recycled and compressed, flash tank emissions are assumed to be zero

Condensate Tanks TK-1, TK-2, and TK-3 (unit TK-1 through TK-3) **Unit Affected by this Permit Application**
Working and breathing VOC and HAP emissions are calculated using TANKS 4.0.9d. Flash emissions are fully captured by the flare gas stream leaving from the flare knockout; hence, there is no flashing potential for any of the tanks. 100% of condensate facility throughput (60,000 bbl/yr) was used to calculate emissions. With this application, it is requested that individual emissions for these three tanks are combined into a single emission limit.

Flare (unit FLARE) **Unit Affected by this Permit Application**
Flare emissions of NO_x, CO, VOC, and Total HAPs were calculated based on Promax® simulation at the higher flowrate proposed in this application and TNRCC RG-109 emission factors. The mass flow for H_2S was calculated using the above mentioned Promax® simulation. SO_2 emissions are calculated using the mass flow of H_2S and an estimated 98% conversion of H_2S to SO_2.

Caterpillar G3516 LE Engines (E-1000) **Unit Not Affected by this Permit Application**
Uncontrolled Emissions of NO_x, CO and VOC from the unit were calculated using manufacturer's data. Emissions of SO_2 were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and assumed 100% conversion of fuel elemental sulfur to SO_2. Particulate emissions were calculated based on AP-42 Table 3.2-2 emission factors. GRI-HAPCalc was used to estimate HAP emissions. GHG emissions were calculated according with 40 CFR 98 Subpart C.

Controlled emissions were calculated assuming an 83% control on CO and formaldehyde and 50% control of VOCs.

Caterpillar G3516 LE Engines (E-2000, E-5000, E-6000 and E-7000) **Unit Affected by this Permit Application**
Uncontrolled Emissions of NO_x, CO and VOC from these units were calculated using manufacturer's data. Emissions of SO_2 were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and assumed 100% conversion of fuel elemental sulfur to SO_2. Particulate emissions were calculated based on AP-42 Table 3.2-2 emission factors. GRI-HAPCalc was used to estimate HAP emissions. GHG emissions were calculated according with 40 CFR 98 Subpart C.

Waukesha 7042 GL Engines (E-3000, E-4000) **Unit Not Affected by this Permit Application**
Emissions of NO_x, CO, VOC and formaldehyde from these units were calculated using manufacturer's data. Units E-3000 and E-4000 are equipped with AFRC and catalytic converters that control CO and HAP emissions by 80%. Emissions of SO_2 were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and an assumed 100% conversion of fuel elemental sulfur to SO_2. Particulate emissions were calculated based on AP-42 Table 3.2-2 emission factors. GRI-HAPCalc was used to estimate HAP emissions, other than formaldehyde. GHG emissions were calculated according with 40 CFR 98 Subpart C.

Amine Units (AMINE-1, AMINE-2) **Unit Affected by this Permit Application**
Emissions of VOC, H_2S and HAPs were calculated using ProMax. All pollutants have a 25% safety factor applied. Fugitive emissions from the sweetening unit are included in the facility fugitive emission estimates. Flare emission rates have been revised to allow control of amine flash emissions to the flare. GHG were calculated using Promax®. AMINE-1 emissions will be controlled by the Flare.

Molecular Sieve Regenerator Heater (MOLE-1) **Unit Not Affected by this Permit Application**
Emissions of NO_x, CO, VOC and particulates were calculated using emission factors from AP-42 Tables 1.4-1 and 1.4-2. Emissions of SO_2 were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and assumed 100% conversion of fuel

elemental sulfur to SO_2. GRI-HAPCalc was used to estimate HAP emissions. In addition, the emission factors were updated to adjust for heat content (Btu/scf). GHG emissions were calculated according with 40 CFR 98 Subpart C.

Truck Loading (LOAD-1) **Unit Affected by this Permit Application**
Emissions of VOCs were estimated using the calculation methodology outlined in AP-42 Section 5.2. Loading emissions were re-calculated based on the increased facility throughput of 60,000 bbl/yr for the three (3) tanks (TK-1, TK-2, and TK-3).

Facility Fugitive Emissions (FUG-1) **Unit Affected by this Permit Application**
Fugitive emissions are based on updated component counts for gas/vapor, light liquid and heavy liquid. Emission factors for fugitive emissions are based on Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates (1995).

Natural Gas Liquids Distillation Train (CRYO) **Unit Not Affected by this Permit Application**
The CRYO unit is not a source of regulated pollutants other than fugitives. Fugitives from the CRYO are encompassed in the facility fugitive emissions calculation.

SSM/M1 Emissions **Unit Not Affected by this Permit Application**
Following the "Implementation Guidance for Permitting SSM Emissions and Excess Emissions" document issued June 7, 2012, Enterprise has requested that emissions from both SSM and upset/malfunction be consolidated in the permit with a total limit of 10 tons per year for each pollutant.

Flaring emissions during SSM/M1 were calculated using maximum expected hourly and annual blowdown volumes. Emissions for NO_x, CO, VOC, and SO_2 were consolidated into a maximum annual emission rate of 10 tons/yr per pollutant. The VOC emissions are intended authorize both VOC emissions from flaring and venting (non-flaring) events.

In addition, the calculations were updated to correct the specific volume based on mass fraction instead of mole fraction.

Haul Road Emissions **Unit Affected by this Permit Application**
This application proposes to increase the truck round trips per day to twenty four with a maximum of six per hour. The haul roads at the facility are gravel roads. It was assumed the silt content of the gravel was 40% less than the silt content of the dirt, based on the average silt contents for dirt and gravel roads given by the background documentation for AP-42 13.2.2. The previous application used a silt content of 4.5% for the dirt road. This was reduced by 40% for a silt content of 2.7% for the gravel.

CAT G3508 LE Engine (E-VRU-1) **Unit Not Affected by this Permit Application**
Uncontrolled Emissions of NO_x, CO and VOC from this unit were calculated using manufacturer's data. Emissions of SO_2 were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and assumed 100% conversion of fuel elemental sulfur to SO_2. Particulate emissions were calculated based on AP-42 Table 3.2-2 emission factors. GRI-HAPCalc was used to estimate HAP emissions. GHG emissions were calculated according with 40 CFR 98 Subpart C.

Controlled emissions were calculated assuming an 83% control on CO and formaldehyde and 50% control of VOCs.

Flare emissions were updated to allow flare control during VRU downtime.

Facility Fugitive Emissions (FUG-2) **Unit Affected by this Permit Application**
Fugitive VOC and HAP emissions from the MRU equipment were estimated assuming 50% of the emissions for the fugitives from the existing equipment. These emissions are associated with equipment monitored under NSPS OOOO.

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)

Uncontrolled Emissions for Significant Revision

	NOx		CO		VOC		SO_2		TSP		PM-10		PM-2.5		H_2S		CO_2e
Unit	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
E-1000	3.81	16.67	4.57	20.01	1.24	5.45	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	4377.34
E-2000	3.81	16.67	4.57	20.01	1.24	5.45	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	4377.34
E-3000	5.12	22.41	9.04	39.59	3.41	14.94	0.17	0.75	0.11	0.50	0.11	0.50	0.11	0.50	-	-	5831.78
E-4000	5.12	22.41	9.04	39.59	3.41	14.94	0.17	0.75	0.11	0.50	0.11	0.50	0.11	0.50	-	-	5831.78
E-5000	3.81	16.67	4.57	20.01	1.24	5.45	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	4377.34
E-6000	5.91	25.88	5.49	24.07	0.77	3.36	0.15	0.65	0.10	0.43	0.10	0.43	0.10	0.43	-	-	5089.24
E-7000	5.91	25.88	6.85	30.02	1.24	5.43	0.15	0.65	0.10	0.43	0.10	0.43	0.10	0.43	-	-	5089.24
DEHY-1a (reboiler)	0.21	0.92	0.18	0.77	0.012	0.051	0.030	0.13	0.016	0.070	0.016	0.070	0.016	0.070	-	-	1142.29
DEHY-1b (Still vent)	-	-	-	-	52.35	229.29	-	-	-	-	-	-	-	-	0.027	0.12	-
DEHY-2a (reboiler)	0.11	0.46	0.088	0.39	0.0058	0.025	0.015	0.066	0.0080	0.035	0.0080	0.035	0.0080	0.035	-	-	522.56
DEHY-2b (still vent)	-	-	-	-	56.94	249.41	-	-	-	-	-	-	-	-	0.034	0.15	-
AMINE 1&2	-	-	-	-	2.02	8.84	-	-	-	-	-	-	-	-	0.094	0.41	1347.66
MOLE-1	0.28	1.21	0.23	1.01	0.015	0.066	0.042	0.19	0.021	0.092	0.021	0.09	0.021	0.092	-	-	1608.29
TK-1 through TK-3	-	-	-	-	*	14.98	-	-	-	-	-	-	-	-	-	-	-
LOAD-1	-	-	-	-	*	9.73	-	-	-	-	-	-	-	-	-	-	-
FLARE (Pilot Only)	0.020	0.086	0.039	0.17	-	-	0.0021	0.0094	-	-	-	-	-	-	-	-	-
HAUL	-	-	-	-	-	-	-	-	5.52	3.37	1.25	0.77	0.13	0.077	-	-	-
FUG-1	-	-	-	-	*	44.58	-	-	-	-	-	-	-	-	*	0.0011	-
FUG-2	-	-	-	-	*	23.40	-	-	-	-	-	-	-	-	*	5.83E-04	-
E-VRU-1	2.27	9.95	2.27	9.95	0.79	3.48	0.058	0.25	0.039	0.17	0.039	0.17	0.039	0.17	-	-	1983.68
SSM/M1	230.27	10.00	459.71	10.00	1857.9	10.00	0.95	4.15	-	-	-	-	-	-	0.010	0.045	1169.91
Totals	**266.62**	**169.21**	**506.65**	**215.57**	**1982.60**	**648.86**	**2.12**	**9.29**	**6.29**	**6.72**	**2.02**	**4.11**	**0.89**	**3.42**	**0.17**	**0.73**	**42748.4**

Note: Still Vent Emission include the Regenerator + Flash Tank emissions

Uncontrolled HAP Emissions for Significant Revision

	HAPs		Formaldehyde		Acetaldehyde		Acrolein		Benzene		n-Hexane	
Unit	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
E-1000	0.10	0.45	0.075	0.33	0.012	0.052	0.0073	0.032	6.25E-04	0.0027	0.0016	0.0069
E-2000	0.60	2.65	0.44	1.94	0.070	0.31	0.043	0.19	0.0037	0.016	0.0093	0.041
E-3000	1.21	5.29	0.99	4.33	0.094	0.41	0.058	0.25	0.0050	0.022	0.012	0.055
E-4000	1.21	5.29	0.99	4.33	0.094	0.41	0.058	0.25	0.0050	0.022	0.012	0.055
E-5000	0.60	2.65	0.44	1.94	0.070	0.31	0.043	0.19	0.0037	0.016	0.0093	0.041
E-6000	0.70	3.08	0.51	2.25	0.081	0.36	0.050	0.22	0.0043	0.019	0.011	0.047
E-7000	0.17	0.73	0.13	0.57	0.016	0.071	0.010	0.044	0.00086	0.0038	0.0022	0.0095
DEHY-1	9.52	41.69	0.0017	0.0074	0.0015	0.0065	-	-	5.78	25.33	1.32	5.761
DEHY-2	11.42	50.02	8.45E-04	0.0037	7.31E-04	0.0032	-	-	7.42	32.52	1.11	4.86
AMINE 1&2	0.39	1.71	-	-	-	-	-	-	0.31	1.38	9.20E-04	0.0040
MOLE-1	0.040	0.18	0.0024	0.010	0.0021	0.0090	-	-	0.0021	0.0092	0.0039	0.017
TK-1 through TK-3	*	0.10	-	-	-	-	-	-	*	0.035	*	0.038
LOAD-1	*	0.065	-	-	-	-	-	-	*	0.023	*	0.024
FLARE	-	-	-	-	-	-	-	-	-	-	-	-
FUG-1	*	0.81	-	-	-	-	-	-	*	0.22	*	0.43
FUG-2	*	0.42	-	-	-	-	-	-	*	0.12	*	0.23
E-VRU-1	0.20	0.86	0.14	0.63	0.019	0.081	0.0084	0.037	0.0040	0.017	0.0037	0.016
SSM/M1[1]	20.61	0.072	-	-	-	-	-	-	-	-	-	-
Totals	**46.77**	**116.05**	**3.73**	**16.34**	**0.46**	**2.02**	**0.28**	**1.22**	**13.55**	**59.75**	**2.49**	**11.63**

* Indicates an hourly emission rate is not appropriate for this unit

[1] Annual HAP emissions for SSM/M1 calculated assuming same HAP/VOC ratio as hourly emission rates [HAP tpy = HAP lb/hr / VOC lb/hr * VOC tpy]

Controlled Emissions for Significant Revision

	NOx		CO		VOC		SO_2		TSP		PM-10		PM-2.5		H_2S		CO_2e
Unit	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
E-1000	3.81	16.67	0.78	3.40	0.62	2.72	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	4377.34
E-2000	3.81	16.67	4.57	20.01	1.24	5.45	0.13	0.56	0.085	0.37	0.085	0.37	0.085	0.37	-	-	4377.34
E-3000	5.12	22.41	1.81	7.92	3.41	14.94	0.17	0.75	0.11	0.50	0.11	0.50	0.11	0.50	-	-	5831.78
E-4000	5.12	22.41	1.81	7.92	3.41	14.94	0.17	0.75	0.11	0.50	0.11	0.50	0.11	0.50	-	-	5831.78
E-5000	3.81	16.67	4.57	20.01	1.24	5.45	0.13	0.56	0.085	0.37	0.085	0.37	0.09	0.37	-	-	4377.34
E-6000	5.91	25.88	5.49	24.07	0.77	3.36	0.15	0.65	0.10	0.43	0.10	0.43	0.10	0.43	-	-	5089.24
E-7000	5.91	25.88	1.37	6.00	1.24	5.43	0.15	0.65	0.10	0.43	0.10	0.43	0.10	0.43	-	-	5089.24
DEHY-1a (reboiler)	0.21	0.77	0.18	0.77	0.012	0.051	0.030	0.13	0.016	0.070	0.016	0.070	0.016	0.070	-	-	1143.47
DEHY-1b (Still vent)	-	-	-	-	0.34	1.48	0.029	0.13	-	-	-	-	-	-	3.18E-04	0.0014	-
DEHY-2a (reboiler)	0.11	0.46	0.088	0.39	0.0058	0.025	0.015	0.066	0.0080	0.035	0.0080	0.035	0.0080	0.035	-	-	522.56
DEHY-2b (still vent)	-	-	-	-	0.60	2.61	0.048	0.21	-	-	-	-	-	-	5.17E-04	0.0023	-
AMINE 1&2	-	-	-	-	2.02	8.84	-	-	-	-	-	-	-	-	0.094	0.41	1347.66
MOLE-1	0.28	1.21	0.23	1.01	0.015	0.066	0.042	0.19	0.021	0.092	0.021	0.092	0.021	0.092	-	-	1608.29
TK-1 through TK-3	-	-	-	-	*	14.98	-	-	-	-	-	-	-	-	-	-	-
LOAD-1	-	-	-	-	*	9.73	-	-	-	-	-	-	-	-	-	-	-
FLARE	5.27	23.09	10.52	46.09	24.82	108.71	0.065	0.28	-	-	-	-	-	-	6.82E-04	0.0030	40018.31
HAUL	-	-	-	-	-	-	-	-	5.52	3.37	1.25	0.77	0.13	0.077	-	-	-
FUG-1	-	-	-	-	*	44.58	-	-	-	-	-	-	-	-	*	0.0011	-
FUG-2	-	-	-	-	*	23.40	-	-	-	-	-	-	-	-	*	5.83E-04	-
E-VRU-1	2.27	9.95	0.39	1.69	0.40	1.74	0.058	0.25	0.039	0.17	0.039	0.17	0.039	0.17	-	-	1983.68
SSM/M1	230.27	10.00	459.71	10.00	1857.90	10.00	0.95	4.15	-	-	-	-	-	-	0.010	0.045	1169.91
Totals	**271.87**	**192.06**	**491.51**	**149.28**	**1898.05**	**278.51**	**2.26**	**9.90**	**6.29**	**6.72**	**2.02**	**4.11**	**0.89**	**3.42**	**0.11**	**0.47**	**82767.9**

Note: Still Vent Emission include the Regenerator + Flash Tank emissions

Controlled HAP Emissions for Significant Revision

	HAPs		Formaldehyde		Acetaldehyde		Acrolein		Benzene		n-Hexane	
Unit	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
E-1000	0.10	0.45	0.075	0.33	0.012	0.052	0.0073	0.032	6.25E-04	0.0027	0.0016	0.0069
E-2000	0.60	2.65	0.44	1.94	0.070	0.31	0.043	0.19	0.0037	0.016	0.0093	0.041
E-3000	0.24	1.06	0.20	0.87	0.019	0.082	0.012	0.051	0.0010	0.0043	0.0025	0.011
E-4000	0.24	1.06	0.20	0.87	0.019	0.082	0.012	0.051	0.0010	0.0043	0.0025	0.011
E-5000	0.60	2.65	0.44	1.94	0.070	0.31	0.043	0.19	0.0037	0.016	0.0093	0.041
E-6000	0.70	3.08	0.51	2.25	0.081	0.36	0.050	0.22	0.0043	0.019	0.011	0.047
E-7000	0.17	0.73	0.13	0.57	0.016	0.071	0.010	0.044	8.58E-04	0.0038	0.0022	0.0095
DEHY-1	0.15	0.68	0.0017	0.0074	0.0015	0.0065	-	-	0.089	0.39	0.010	0.044
DEHY-2	0.22	0.96	8.45E-04	0.0037	7.31E-04	0.0032	-	-	0.14	0.61	0.015	0.066
AMINE 1&2	0.39	1.71	-	-	-	-	-	-	0.31	1.38	9.20E-04	0.0040
MOLE-1	0.04	0.18	0.0024	0.010	0.0021	0.0090	-	-	0.0021	0.0092	0.0039	0.017
TK-1 through TK-3	*	0.10	-	-	-	-	-	-	*	0.035	*	0.038
LOAD-1	*	0.07	-	-	-	-	-	-	*	0.023	*	0.024
FLARE	1.70	7.43	-	-	-	-	-	-	0.61	2.66	0.88	3.84
FUG-1	*	0.81	-	-	-	-	-	-	*	0.22	-	0.43
FUG-2	*	0.42	-	-	-	-	-	-	*	0.12	*	0.23
E-VRU-1	0.04	0.18	0.024	0.11	0.0031	0.014	0.0014	0.0063	6.75E-04	0.0030	6.21E-04	0.0027
SSM/M1[1]	20.61	0.07	-	-	-	-	-	-	-	-	-	-
Totals	**25.82**	**24.28**	**2.03**	**8.88**	**0.29**	**1.29**	**0.18**	**0.78**	**1.17**	**5.52**	**0.94**	**4.86**

* Indicates an hourly emission rate is not appropriate for this unit

[1] Annual HAP emissions for SSM/M1 calculated assuming same HAP/VOC ratio as hourly emission rates [HAP tpy = HAP lb/hr / VOC lb/hr * VOC tpy]

Unit(s): E-1000
Description: CAT G3516 LE Natural gas-fired reciprocating compressor engines

Engine Horsepower and RPM

Engine speed:	1200	rpm	Mfg data
Rating:	1151	hp	
Load:	100%		

Fuel Consumption

BSFC:	7415	Btu/hp-hr	Mfg data
Fuel heat value:	950	Btu/scf	Nominal LHV
Heat input:	8.5	MMBtu/hr	BSFC * site hp
Fuel consumption:	9.0	Mscf/hr	Heat input / fuel heat value
Annual fuel usage:	78.7	MMscf/yr	8760 hrs/yr operation

Uncontrolled Emissions

NO_x	CO	NMHC	SO_2[1]	PM[2]		
1.5	1.8	0.49			g/hp-hr	Mfg data
				9.99E-03	lb/MMBtu	AP-42 Table 3.2-2 (7/00)
			5		gr S/100 scf	Pipeline specification
3.8	**4.6**	**1.2**	**0.13**	**0.085**	lb/hr[4]	Hourly emission rate
16.7	**20.0**	**5.4**	**0.56**	**0.37**	tpy[5]	Annual emission rate (8760 hrs/yr)

Controlled Emissions

NO_x	CO	NMHC	SO_2[1]	PM[2]	
0%	83%	50%	0%	0%	%Control
3.8	**0.78**	**0.62**	**0.13**	**0.085**	lb/hr
16.7	**3.4**	**2.7**	**0.56**	**0.37**	tpy

HAP Emissions[3]

HCHO	Methanol	Acetaldehyde	Acrolein	Benzene	Toluene	e-Benzene	Xylene	n-Hexane	Other HAPs	Total HAPs	
0.44	0.021	0.070	0.043	0.0037	0.0034	0.00034	0.0015	0.0093	0.010	0.60	lb/hr
1.9350	0.0916	0.3064	0.1884	0.0161	0.0150	0.0015	0.0067	0.0407	0.044	2.65	tons/yr
83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	%Control
0.0751	0.0036	0.0119	0.0073	0.0006	0.0006	0.0001	0.0003	0.0016	0.0017	0.10	lb/hr
0.3290	0.0156	0.0521	0.0320	0.0027	0.0026	0.0003	0.0011	0.0069	0.0075	0.45	tons/yr

[1] SO_2 calculation assumes 100% converstion of fuel elemental sulfur to SO_2.

[2] TSP = PM-10 = PM2.5 = AP-42 PM10(filterable) + PM Condensable

[3] HAPs calculated using GRI-HAPCalc

[4] NO_x, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr Emission Rate = (5 grains S/100 scf) * (1 lb/7000 grains) * Fuel Consumption (Mscf/hr) * ((64 g/mol SO2) / (32 g/mol S))
PM lb/hr Emission Rate = EF (lb/MMBtu) * Heat Input (MMBtu/hr)

[5] tpy = lb/hr * hours of operation * 1ton/2000lt

Greenhouse Gas Calculations[7]

CO_2	N_2O	CH_4	CO_2e	
53.1	0.0001	0.001		kg/MMBtu
1	298	25		GWP[8]
998.4	0.0019	0.019	999.4	lb/hr[9]
4372.8	0.0082	0.082	4377.3	tpy[6]

[7] Greenhouse gas emission factors are from 40 CFR 98 Subpart C

[8] 40 CFR 98 Subpart A, Table A-1

[9] CO_2, N_2O, CH_4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) * Engine hp * 1MMBtu/10^6Btu
CO_2e lb/hr = CO_2 lb/hr + (CH_4 lb/hr * GWP) + (N_2O lb/hr * GWP)

Exhaust Parameters

Exhaust temp (Tstk):	840	°F	Mfg data
Stack height:	23.5	ft	Eng estimate
Stack diameter:	1.167	ft	Eng estimate
Exhaust flow:	6415	acfm	Mfg data
Exhaust velocity:	100.0	ft/sec	Exhaust flow ÷ stack area

Unit(s): E-2000,E-5000
Description: CAT G3516 LE Natural gas-fired reciprocating compressor engines

Engine Horsepower and RPM

Engine speed:	1200	rpm	Mfg data
Rating:	1151	hp	
Load:	100%		

Fuel Consumption

BSFC:	7415	Btu/hp-hr	Mfg data
Fuel heat value:	950	Btu/scf	Nominal LHV
Heat input:	8.5	MMBtu/hr	BSFC * site hp
Fuel consumption:	9.0	Mscf/hr	Heat input / fuel heat value
Annual fuel usage:	78.7	MMscf/yr	8760 hrs/yr operation

Uncontrolled Emissions

NO_x	CO	NMHC	SO_2[1]	PM^2		
1.5	1.8	0.49			g/hp-hr	Mfg data
				9.99E-03	lb/MMBtu	AP-42 Table 3.2-2 (7/00)
			5		gr S/100 scf	Pipeline specification
3.8	**4.6**	**1.2**	**0.13**	**0.085**	lb/hr[4]	Hourly emission rate
16.7	**20.0**	**5.4**	**0.56**	**0.37**	tpy[5]	Annual emission rate (8760 hrs/yr)

Controlled Emissions

NO_x	CO	NMHC	SO_2[1]	PM^2	
0%	0%	0%	0%	0%	%Control
3.8	**4.57**	**1.24**	**0.13**	**0.085**	lb/hr
16.7	**20.0**	**5.4**	**0.56**	**0.37**	tpy

HAP Emissions[3]

HCHO	Methanol	Acetaldehyde	Acrolein	Benzene	Toluene	e-Benzene	Xylene	n-Hexane	Other HAPs	Total HAPs	
0.44	0.021	0.070	0.043	0.0037	0.0034	0.00034	0.0015	0.0093	0.010	0.60	lb/hr
1.9350	0.0916	0.3064	0.1884	0.0161	0.0150	0.0015	0.0067	0.0407	0.044	2.65	tons/yr
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	%Control
0.4418	0.0209	0.0700	0.0430	0.0037	0.0034	0.0003	0.0015	0.0093	0.010	0.60	lb/hr
1.9350	0.0916	0.3064	0.1884	0.0161	0.0150	0.0015	0.0067	0.0407	0.044	2.65	tons/yr

[1] SO_2 calculation assumes 100% converstion of fuel elemental sulfur to SO_2.

[2] TSP = PM-10 = PM2.5 = AP-42 PM10(filterable) + PM Condensable

[3] HAPs calculated using GRI-HAPCalc

[4] NO_x, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr Emission Rate = (5 grains S/100 scf) * (1 lb/7000 grains) * Fuel Consumption (Mscf/hr) * ((64 g/mol SO2) / (32 g/mol S))
PM lb/hr Emission Rate = EF (lb/MMBtu) * Heat Input (MMBtu/hr)

[5] tpy = lb/hr * hours of operation * 1ton/2000lb

Greenhouse Gas Calculations[7]

CO_2	N_2O	CH_4	CO_2e	
53.1	0.0001	0.001		kg/MMBtu
1	298	25		GWP[8]
998.4	0.0019	0.019	999.4	lb/hr[9]
4372.8	0.0082	0.082	4377.3	tpy[6]

[7] Greenhouse gas emission factors are from 40 CFR 98 Subpart C

[8] 40 CFR 98 Subpart A, Table A-1

[9] CO_2, N_2O, CH_4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) * Engine hp * 1MMBtu/10^6Btu
CO_2e lb/hr = CO_2 lb/hr + (CH_4 lb/hr * GWP) + (N_2O lb/hr * GWP)

Exhaust Parameters

Exhaust temp (Tstk):	840	°F	Mfg data
Stack height:	23.8, 21	ft	Eng estimate
Stack diameter:	1.167	ft	Eng estimate
Exhaust flow:	6415	acfm	Mfg data
Exhaust velocity:	100.0	ft/sec	Exhaust flow ÷ stack area

Unit(s): E-3000, E-4000
Description: Natural gas-fired reciprocating compressor engines
Manufacturer: Wauskesha
Model: L7042 GL
Aspiration: TA
Compression ratio: 10.5:1

Engine Horsepower and RPM

Engine speed:	1200	rpm	Mfg data
Rating:	1547	hp	
Load:	100%		

Fuel Consumption

BSFC:	7350	Btu/hp-hr	Mfg data
Fuel heat value:	950	Btu/scf	Nominal LHV
Heat input:	11.4	MMBtu/hr	BSFC * site hp
Fuel consumption:	12.0	Mscf/hr	Heat input / fuel heat value
Annual fuel usage:	104.8	MMscf/yr	8760 hrs/yr operation

Uncontrolled Emissions

NO_x[2]	CO[2]	NMHC[2]	SO_2[1]	TSP[2]		
1.5	2.65	1.0			g/hp-hr	Mfg data
			5		grains S/100 scf	Pipeline specification
				9.99E-03	lb/MMBtu	AP-42 Table 3.2-2 (7/00)
5.1	**9.0**	**3.4**	**0.17**	**0.11**	lb/hr	Hourly emission rate
22.4	**39.6**	**14.9**	**0.75**	**0.50**	tpy	Annual emission rate (8760 hrs/yr)

Controlled Emissions

NO_x[2]	CO[2]	NMHC[2]	SO_2[1]	TSP[3]		
5.1	9.04	3.4	0.17	0.11	lb/hr	Calculated above
	80%					Catalyst control efficiency
5.1	**1.8**	**3.4**	**0.17**	**0.11**	lb/hr	Hourly emission rate
22.4	**7.9**	**14.9**	**0.75**	**0.50**	tpy	Annual emission rate (8760 hrs/yr)

HAPs	g/hp-hr	tpy[5]	Control	Controlled (tpy)
Formaldehyde[2]	0.29	4.3321	80%	0.87
Methanol		0.1231	80%	0.025
Acetaldehyde		0.4118	80%	0.082
Acrolein		0.2532	80%	0.051
Benzene		0.0217	80%	0.0043
Toluene		0.0201	80%	0.0040
Ethylbenzene		0.0020	80%	0.0004
Xylene		0.0091	80%	0.0018
n-Hexane		0.0547	80%	0.01094
Other HAPs		0.060	80%	0.012
Total HAPs		5.2876	80%	1.06

[1] SO_2 calculation assumes 100% converstion of fuel elemental sulfur to SO_2.
[2] Manufacturer's Data
[3] TSP = PM-10 = AP-42 PM10(filterable) + PM Condensable
[4] PM-2.5 = AP-42 PM2.5(filterable) + PM Condensable
[5] GRI-HAPCalc 3.01
[6] NO_x, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr = (5gr S/100 scf) * (1lb/7000 gr) * Fuel Consumption (Mscf/hr) * 64g/molSO2 / 32g/mol S
PM lb/hr = EF * Fuel Consumption * hp * 1MMBtu/10^6Btu
[7] tpy = lb/hr * hours of operation * 1ton/2000lt

Greenhouse Gas Calculations[8]

CO_2	N_2O	CH_4	CO_2e	
53.1	0.0001	0.001		kg/MMBtu
1	298	25		GWP[9]
1330.1	0.0025	0.025	1331.5	lb/hr[10]
5825.8	0.011	0.11	5831.8	tpy[7]

[8] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[9] 40 CFR 98 Subpart A, Table A-1
[10] CO_2, N_2O, CH_4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) * Engine hp * 1MMBtu/10^6Btu
CO_2e lb/hr = CO_2 lb/hr + (CH_4 lb/hr * GWP) + (N_2O lb/hr * GWP)

Exhaust Parameters

Exhaust temp (Tstk):	810	°F	Mfg data
Exhaust flow	16450	lb/hr	Mfg data
Exhaust flow	9183.1	acfm	Mfg data
Stack diameter:	1.5	ft	Design
Stack height:	24	ft	Design
Exhaust velocity:	86.6	ft/sec	Exhaust flow ÷ stack area

Unit(s): E-6000
Description: CAT G3516LE natural gas-fired reciprocating compressor engine

Engine Horsepower and RPM

Engine speed:	1400	rpm	Mfg data
Rating:	1340	hp	
Load:	100%		

Fuel Consumption

BSFC:	7405	Btu/hp-hr	Mfg data
Fuel heat value:	950	Btu/scf	Nominal LHV
Heat input:	9.9	MMBtu/hr	BSFC * site hp
Fuel consumption:	10.4	Mscf/hr	Heat input / fuel heat value
Annual fuel usage:	91.5	MMscf/yr	8760 hrs/yr operation

Uncontrolled Emissions

NO_x	CO	NMHC	SO_2[1]	TSP[2]		
2.00	1.86	0.26			g/hp-hr	Mfg data
			5		gr S/100scf	Pipeline specification
				9.987E-03	lb/MMBtu	AP-42 Table 3.2-2 (7/00)
5.9	**5.5**	**0.77**	**0.15**	**0.10**	lb/hr[4]	Hourly emission rate
25.9	**24.1**	**3.4**	**0.65**	**0.43**	tpy[5]	Annual emission rate (8760 hrs/yr)

Controlled Emissions

NO_x	CO	NMHC	SO_2[1]	PM[2]	
0%	0%	0%	0%	0%	%Control
5.9	**5.49**	**0.77**	**0.15**	**0.099**	lb/hr
25.9	**24.1**	**3.4**	**0.65**	**0.43**	tpy

HAPs Emissions[3]

HCHO	Methanol	Acetaldehyde	Acrolein	Benzene	Toluene	e-Benzene	Xylene	n-Hexane	Other HAPs	Total HAPs	
0.5143	0.0244	0.0814	0.0501	0.0043	0.0040	0.0004	0.0018	0.0108	0.012	0.7032	lb/hr
2.2528	0.1067	0.3567	0.2193	0.0188	0.0174	0.0017	0.0079	0.0474	0.051	3.0802	tpy
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	%Control
0.5143	0.0244	0.0814	0.0501	0.0043	0.0040	0.0004	0.0018	0.0108	0.012	0.7032	lb/hr
2.2528	0.1067	0.3567	0.2193	0.0188	0.0174	0.0017	0.0079	0.0474	0.051	3.0802	tpy

[1] SO_2 calculation assumes 100% converstion of fuel elemental sulfur to SO_2.

[2] TSP = PM10 = PM2.5 = AP-42 PM10(filterable) + PM Condensable

[3] HAPs calculated using GRI-HAPCalc

[4] NOx, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr Emission Rate = (5 grains S/100 scf) * (1 lb/7000 grains) * Fuel Consumption (Mscf/hr) * ((64 g/mol SO2) / (32 g/mol S))
PM lb/hr Emission Rate = EF * Fuel Consumption * hp * 1MMBtu/106Btu

[5] tpy = lb/hr * hours of operation * 1ton/2000lt

Greenhouse Gas Calculations[7]

CO_2	N_2O	CH_4	CO_2e	
53.1	0.0001	0.001		kg/MMBtu
1	298	25		GWP[8]
1160.7	0.0022	0.022	1161.9	lb/hr[9]
5084.0	0.010	0.10	5089.2	tpy[6]

[7] Greenhouse gas emission factors are from 40 CFR 98 Subpart C

[8] 40 CFR 98 Subpart A, Table A-1

[9] CO2, N2O, CH4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) * Engine hp * 1MMBtu/106Btu
CO2e lb/hr = CO2 lb/hr + (CH4 lb/hr * GWP) + (N2O lb/hr * GWP

Exhaust Parameters

Exhaust temp (Tstk):	873	°F	Mfg data
Stack height:	21	ft	Eng estimate
Stack diameter:	1.20	ft	Eng estimate
Exhaust flow:	7663	acfm	Mfg data
Exhaust velocity:	112.9	ft/sec	Exhaust flow ÷ stack area

Unit(s): E-VRU-1
Description: CAT G3508 LE natural-gas fired engine

Engine Horsepower and RPM

Engine speed:	1400	rpm	Mfg data
Rating:	515	hp	

Fuel Consumption

BSFC:	7510	Btu/hp-hr	Mfg data
Fuel heat value:	950	Btu/scf	Pipeline specification
Heat input:	3.9	MMBtu/hr	BSFC * site hp
Fuel consumption:	4.1	Mscf/hr	Heat input / fuel heat value
Annual fuel usage:	35.7	MMscf/yr	8760 hrs/yr operation

Uncontrolled Emission Calculations

NO_x	CO	VOC	SO_2[1]	PM[2]		
2.0	2.00	0.70			g/hp-hr	Mfg data
			5		gr S/100 scf	Pipeline specification
				9.99E-03	lb/MMBtu	AP-42 Table 3.2-2 (7/00)
2.3	**2.3**	**0.79**	**0.058**	**0.039**	lb/hr[5]	Hourly emission rate
9.9	**9.9**	**3.5**	**0.25**	**0.17**	tpy[6]	Annual emission rate (8760 hrs/yr)

Controlled Emission Calculations

NO_x	CO	VOCs	SO_2[1]	PM[2]		
0%	83%	50%	0%	0%	%Control	
2.3	**0.39**	**0.40**	**0.058**	**0.039**	lb/hr[4]	Hourly emission rate
9.9	**1.7**	**1.7**	**0.25**	**0.17**	tpy[5]	Annual emission rate (8760 hrs/yr)

HAP Emissions Calculations[3]

HCOH	Acetaldehyde	Acrolein	Benzene	Toluene	e-Benzene	Xylenes	n-Hexane	Other HAPs	Total HAPs	
0.14	0.019	0.0084	0.0040	0.0041	0.00037	0.0014	0.0037	0.011	0.20	lb/hr
0.63	0.081	0.037	0.017	0.018	0.0016	0.0063	0.016	0.047	0.86	tpy
83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	%Control
0.024	0.003	0.0014	0.0007	0.0007	0.000	0.0002	0.0006	0.0018	0.042	lb/hr
0.11	0.014	0.006	0.003	0.003	0.0003	0.0011	0.003	0.0080	0.18	tpy

[1] SO_2 calculation assumes 100% converstion of fuel elemental sulfur to SO_2.

[2] TSP = PM10 = PM2.5 = AP-42 PM10(filterable) + PM Condensable

[3] HAPs calculated using GRI-HAPCalc

[5] NO_x, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr Emission Rate = (5 grains S/100 scf) * (1 lb/7000 grains) * Fuel Consumption (Mscf/hr) * ((64 g/mol SO2) / (32 g/mol S))
PM lb/hr Emission Rate = EF (lb/MMBtu) * Heat Input (MMBtu/hr)

[6] tpy = lb/hr * hours of operation * 1ton/2000lt

Greenhouse Gas Calculations[7]

CO_2	N_2O	CH_4	CO_2e	
53.06	0.0001	0.001		kg/MMBtu
1	298	25		GWP[8]
452.4	0.0009	0.009	452.9	lb/hr[9]
1981.6	0.0037	0.037	1983.7	tpy[6]

[7] Greenhouse gas emission factors are from 40 CFR 98 Subpart C

[8] 40 CFR 98 Subpart A, Table A-1

[9] CO_2, N_2O, CH_4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) *
CO_2e lb/hr = CO_2 lb/hr + (CH_4 lb/hr * GWP) + (N_2O lb/hr * GWP)

Exhaust Parameters

Exhaust temp (Tstk):	1007	°F	Mfg data
Stack height:	18	ft	Eng estimate
Stack diameter:	0.67	ft	Eng estimate
Exhaust flow:	4086	acfm	Mfg data
Exhaust velocity:	195.1	ft/sec	Exhaust flow ÷ stack area

Unit Numbers:	E-7000
Source description:	4SLB
Manufacturer:	Caterpillar
Model:	G3516LE
Aspiration:	Turbocharged-Aftercooled

Engine Horsepower and RPM

Engine speed:	1,400.0	rpm	Mfg data
Sea level hp:	1,340.0	hp	Mfg data
	-	%	Per 1,000 ft above 4,000 ft
Elevation	3,431.0	ft	
Derated hp:	1,340.00	hp	
Conversion Factor	1.34	hp/kW	
Conversion Factor	0.0022	g/lb	
Conversion Factor	2,000.00	lb/ton	
Annual Hours of Operation	8,760.00	hr	
Fuel Rate	47.00	L/hr	
Fuel Rate	12.42	gal/hr	

Fuel Consumption

BSFC:	7405.00	Btu/hp-hr	Mfg data
Fuel heat value:	950.00	Btu/scf	Pipeline Specifcation
Heat Input	9.92	MMBtu/hr	BSFC*site hp
Fuel Consumption	10.44	Mscf/hr	Heat Input / fuel heat value
Annual Fuel Usage	91.50	MMscf/yr	8760 hrs operation

Exhaust Parameters

Exhaust Temp	873	F	Mfg Data
Exhaust Flow	7663.0	cfm	Mfg Data

Emission Calculations

Uncontrolled Emissions

NOx	CO	VOC	SO_2[1]	HCHO	TSP[2]		
2.0	2.32	0.42		0.22		g/hp-hr	Mfg Data
			5.0			gr S/100Scf	Pipeline Specification
					0.00991	lb/MMBtu	AP-42 Table 3.2-2(7/00)
5.91	6.85	1.24	0.15	0.65	0.10	lb/hr[3]	Hourly emission rate
25.88	30.02	5.43	0.65	2.85	0.43	tpy[4]	Annual emission rate

Controlled Emissions

NOx	CO	VOC	SO_2	TSP	
5.9	6.9	1.2	0.15	0.10	
0%	80%	0%	0%	0%	% Control
5.91	1.37	1.24	0.15	0.10	lb/hr
25.88	6.00	5.43	0.65	0.43	tpy

HAPs Emissions[5]

HCHO	Methanol	Acetaldehyde	Acrolein	Benzene	Toluene	e-Benzene	Xylene	n-Hexane	Other HAPs	Total HAPs	
0.6499	0.0244	0.0814	0.0501	0.0043	0.0040	0.0004	0.0018	0.0108	0.012	0.8388	lb/hr
2.8467	0.1067	0.3567	0.2193	0.0188	0.0174	0.0017	0.0079	0.0474	0.051	3.6741	tpy
80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	%Control
0.1300	0.0049	0.0163	0.0100	0.0009	0.0008	0.0001	0.0004	0.0022	0.0024	0.1678	lb/hr
0.5693	0.0213	0.0713	0.0439	0.0038	0.0035	0.0003	0.0016	0.0095	0.010	0.7348	tpy

[1] SO_2 calculation assumes 100% converstion of fuel elemental sulfur to SO_2.

[2] TSP = PM10 = PM2.5 = AP-42 PM10(filterable) + PM Condensable

[3] NOx, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp

SO2 lb/hr Emission Rate = (5 grains S/100 scf) * (1 lb/7000 grains) * Fuel Consumption (Mscf/hr) * ((64 g/mol SO2) / (32 g/mol S))

PM lb/hr Emission Rate = EF * Fuel Consumption * hp * 1MMBtu/106Btu

[4] tpy = lb/hr * hours of operation * 1ton/2000lb

[5] HAPs calculated using GRI-HAPCalc

Correction of GRI-HAPCalc, HAPs emissions rates to account for Mfg. HCHO rates

Total HAP	3.0802 tpy	From Gri-HAPCalc
Total HCHO	-2.2528 tpy	From Gri-HAPCalc
Total HAP-HCHO	0.827 tpy	Total Gri-HAP Calc HAP emission rate without HCHO
Mfg HCHO	2.847 tpy	Manufactures HCHO tpy emission rate based on 0.022 g/bhp-hr
Total HAP	3.674 tpy	Corrected Total HAPs emission rate taking into consideration mfg HCHO emission rate

Greenhouse Gas Calculations[6]

CO_2	N_2O	CH_4	CO_2e	
53.1	0.0001	0.001		kg/MMBtu
1	298	25		GWP[7]
1160.7290	0.0022	0.0219	1161.9	lb/hr[8]
5083.9932	0.0096	0.0958	5089.2	tpy

[6] Greenhouse gas emission factors are from 40 CFR 98 Subpart C

[7] 40 CFR 98 Subpart A, Table A-1

[8] CO2, N2O, CH4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) * Engine hp * 1MMBtu/10^6Btu
CO2e lb/hr = CO2 lb/hr + (CH4 lb/hr * GWP) + (N2O lb/hr * GWP)

Exhaust Parameters

Exhaust temp (Tstk):	873	°F	Mfg data
Stack height:	21	ft	Eng estimate
Stack diameter:	1.20	ft	Eng estimate
Exhaust flow:	7663	acfm	Mfg data
Exhaust velocity:	112.9	ft/sec	Exhaust flow ÷ stack area

Unit(s): MOLE-1
Description: Natural gas fired heater
Manufacturer: Power Flame

Fuel Consumption

Total input heat rate:	2.8	MMBtu/hr	
Fuel heat value:	950	Btu/scf	Nominal LHV
Max fuel rate:	3.0	Mscf/hr	Input heat rate / fuel heat value
Max annual fuel usage:	25.9	MMscf/yr	8760 hrs/yr operation

Emission Rates

NO_x	CO	NMHC	SO_2[1]	TSP[2]	
100	84	5.5		7.6	lb/MMscf
93.14	78.24	5.12		7.08	lb/MMscf Convert emission factor based on heat value, divide by 1,020 multiply by 950 Btu/sc
			5		gr S/100scf
0.28	**0.23**	**0.015**	**0.042**	**0.021**	lb/hr[3]
1.2	**1.0**	**0.066**	**0.19**	**0.092**	tpy[4]

HAPs

HCHO	Methanol	Acetaldehyde	Acrolein	Benzene	Toluene	e-Benzene	Xylene	n-Hexane	Total HAPs	
0.0024	0.0027	0.0021	-	0.0021	0.0029	0.0059	0.0037	0.0039	0.0404	
0.0104	0.0118	0.0090	-	0.0092	0.0125	0.0259	0.0162	0.0173	0.1769	tpy GRI-HAPCalc

[1] 5 gr S/100scf. SO_2 calculation assumes 100% conversion of fuel elemental sulfur to SO_2.
[2] Assumes PM (Total) = TSP = PM-10 = PM-2.5
[3] lb/hr = Emission Factor (lb/MMscf) x Max Fuel Rate (Mscf/hr) x 10^-3 (MMscf/Mscf)
[4] tpy = lb/hr * hours of operation * 1ton/2000lb
[5] HAPs from GRI-HAPCalc 3.01

Greenhouse Gas Calculations[5]

CO_2	N_2O	CH_4	CO_2e	
53.1	0.0001	0.001		kg/MMBtu
1	298	25		GWP[6]
366.8	0.00069	0.0069	367.2	lb/hr[7]
1606.6	0.0030	0.030	1608.3	tpy[4]

[5] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[6] 40 CFR 98 Subpart A, Table A-1
[7] CO2, N2O, CH4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel Rate (Mscf/hr) * 10^-3 (MMscf/Mscf)*Heating Value (MMBtu/MMscf
CO2e lb/hr = CO2 lb/hr + (CH4 lb/hr * GWP) + (N2O lb/hr * GWP)

Reboiler Stack Exhaust Parameters

Site elevation:	3431	ft MSL	
Standard pressure:	29.92	in Hg	
Pressure at elevation:	26.4	in Hg	Hess, Introduction to Theoretical Meteorology, eqn. 6.8
Standard temperature:	528	R	
Exhaust temp:	212	°F	Eng. estimate
Stack height:	15	ft	Design specification
Stack diameter:	0.5	ft	Design specification
F factor:	10610	wscf/10e6 Btu	40 CFR 60 Appx A Method 19
Exhaust flow:	497	scfm	Heat input * F factor/60
Exhaust flow:	718	acfm	Va = Vs*(Ps/Pa)*(Ta/Ts)
Exhaust velocity:	61	ft/sec	Exhaust flow / stack area

Unit: FLARE
Destruction Efficiency: 98% Manufacturer guarantee

Waste stream flaring

Operating hours:	8760	hr/yr	
Hourly process flow:	0.019	MMscf/hr	Per 'Chaparral Flare List_DEW Pt Running_70MMSCFD_REV2' spreadsheet
Higher Heating Value:	1964.0	Btu/scf	Per 'Chaparral Flare List_DEW Pt Running_70MMSCFD_REV2' spreadsheet
Max hourly heat rate:	38.1	MMBtu/hr	Heating value of flare analysis (Btu/scf) * Volume (Mscf/hr)

Pilot emissions

Pilot gas flow:	150	scf/hr	Based on previous emission calculation
Natural Gas Heat Value	950	Btu/Scf	
Max hourly heat rate:	0.14	MMBtu/hr	

Composition[1]	Mol%	Spec Volume[2] (scf/lb)	Mass Fraction	Mass Flow (lb/hr)
Hydrogen Sulfide	0.0020%	11.14	1.8E-05	0.034
Carbon Dioxide	0.53%	8.62	0.0063	11.88
Nitrogen	0.46%	13.55	0.0034	6.55
Methane	44.49%	23.65	0.1919	364.50
Ethane	17.14%	12.62	0.1385	263.09
Propane	16.07%	8.61	0.1905	361.83
i-Butane	3.14%	6.53	0.0491	93.21
n-Butane	8.60%	6.53	0.1343	255.11
i-Pentane	3.48%	5.26	0.0675	128.23
n-Pentane	3.61%	5.26	0.0700	132.95
2,2-methylpropane	0.08%	4.40	0.0018	3.33
2,2-dimethylbutane	0.05%	4.40	0.0012	2.30
2,3-dimethylbutane	0.30%	4.40	0.0069	13.09
2-methylpentane	0.52%	4.40	0.0121	23.07
3-methylpentane	0.82%	4.40	0.0191	36.18
n-Hexane	0.99%	4.40	0.0231	43.79
Methylcyclopentane	0.63%	4.51	0.0143	27.09
Benzene	0.76%	4.9	0.0160	30.37
Cyclohexane	0.79%	4.51	0.0178	33.77
2-methylhexane	0.14%	3.79	0.0038	7.27
3-methylhexane	0.11%	3.79	0.0031	5.85
n-Heptane	0.17%	3.79	0.0047	8.91
Methylcyclohexane	0.36%	3.87	0.0096	18.14
Toluene	0.21%	4.12	0.0052	9.78
n-Octane	0.08%	3.32	0.0023	4.42
Ethylbenzene	0.00%	3.57	5.5E-05	0.10
m-Xylene	0.01%	3.57	1.9E-04	0.36
p-Xylene	0.01%	3.57	1.9E-04	0.35
o-Xylene	0.00%	3.57	4.9E-05	0.093
n-Nonane	0.01%	2.96	2.1E-04	0.40
n-Decane	0.00%	2.67	1.4E-05	0.027
n-C11	0.00%	2.67	5.6E-07	1.1E-03
n-C12	0.00%	2.67	1.6E-08	3.0E-05
n-C13	0.00%	2.67	4.2E-10	8.1E-07
n-C14	0.00%	2.67	7.8E-12	1.5E-08
n-C15	0.00%	2.67	1.1E-12	2.0E-09
			VOC Total	**1240.03**
			Total	**1886.09**

NO_x	CO	VOC	H_2S	SO_2[3]		
0.138	0.2755	0.14			lb/MMBtu	TNRCC RG-109 (high Btu; other), AP-42, Ch. 13, Table 13.5-1 (VOC)
				98%		Estimated conversion of combusted H_2S to SO_2
0.020	0.039	0.020	-	2.14E-03	lb/hr[4]	Pilot emissions
5.3	10.5	24.8	0.00068	0.0629		Waste stream flaring
0.09	0.17	0.09	-	0.0094	tpy	Pilot emissions
23.0	45.9	108.6	0.0030	0.2756		Waste stream flaring
5.3	**10.5**	**24.8**	**0.00068**	**0.0651**	**lb/hr**	**Total flare emissions**
23.1	**46.1**	**108.7**	**0.0030**	**0.2850**	**tpy**	

n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	Total HAPs	
0.9	**0.61**	**0.20**	**0.0021**	**0.016**	**1.7**	**lb/hr[4]**
3.8	**2.7**	**0.9**	**0.0092**	**0.070**	**7.4**	**tpy**

[1] Per 'Chaparral Flare List_DEW Pt Running_70MMSCFD_REV2' spreadsheet
[2] From "Physical Properties of Hydrocarbons"
[3] Assumed 98% conversion of combusted H_2S to SO_2, Pilot Emissions assume 5 gr S / 100 scf
[4] For NOx and CO, lb/hr = EF (lb/MMBtu) * Heat Input (MMBtu/hr)
For VOC, HAPs, and H_2S lb/hr = Flow (lb/hr) * (1 - Control%)

CO_2	N_2O	CH_4	CO_2e		
897734.573		75514266.4		cf/yr	40 CFR 98 Eqns. W-19, W-20, W-21, W-40
	1.00E-04			kg/MMBtu	40 CFR 98 Eqn. W-40
0.0526		0.0192		kg/cf	40 CFR 98.233(v)
1	298	25		GWP	40 CFR 98 Table A-1
52.1	3.67E-02	1598.2	1650.3	tons/yr	40 CFR 98 Eqns. W-36 and W-40
52.1	10.95	39955.3	40018.3	tons/yr CO_2e	tons/yr * GWP

Unit(s): DEHY-1
Description: 70 MMscf/day natural gas-fired dehydrator with reboiler, condensor and combustion

Fuel consumption:

2	MMBtu/hr	Regen Heater heat input rate	Design specification
950	Btu/scf	Nominal LHV	
2.1	Mscf/hr	Fuel rate	Input heat rate / Fuel heat value
18.4	MMscf/yr	Annual fuel usage	

Emission Rates

Uncontrolled Emissions	NOx	CO	VOC	SO_2	PM	H_2S	Units	
Reboiler (a)	100	84	5.5		7.6		lb/MMscf	AP-42 Table 1.4-1 & 2
				5			gr S/100scf	Nominal
	0.21	0.18	0.012	0.030	0.016	-	lb/hr	EF * Fuel rate (Mscf/hr) * 1000scf/Mscf
	0.92	0.77	0.051	0.13	0.070	-	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
Still Vent (b)			52.3			2.7E-02	lb/hr	Promax Run TEG-1
			229.3			1.2E-01	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
Total dehydrator emissions	0.21	0.18	52.36	0.030	0.016	0.027	lb/hr	
	0.92	0.77	229.3	0.132	0.070	0.119	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb

Controlled Emissions	NOx	CO	VOC	SO_2	PM	H_2S	Units	
Reboiler (a)	100	84	5.5		7.6		lb/MMscf	AP-42 Table 1.4-1 & 2
				5			gr S/100scf	Nominal
	0.21	0.18	0.012	0.030	0.016	-	lb/hr	EF * Fuel rate (Mscf/hr) * 1000scf/Mscf
	0.92	0.77	0.051	0.13	0.070	-	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
Still Vent (b)			0.34	0.029		3.2E-04	lb/hr	Promax Run with 98 % Control Efficiency*
			1.5	0.13		1.4E-03	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
Total dehydrator emissions	0.21	0.18	0.35	0.059	0.016	0.00032	lb/hr	
	0.92	0.77	1.5	0.26	0.070	0.0014	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb

* This unit is controlled by a BTEX Buster, a Firebox and a Glow Plug.

Note: Under the uncontrolled scenario, Still Vent emissions are the result of the BTEX Vent and Flash Gas Emissions. Under the control scenario, only the BTEX Vent emissions contribute to the still vent emissions. Flash gas emissions are routed to the fuel system and not to the still vent.

Process Streams	BTEX Vent	Flash Gas
Composition	Solved	Solved
Phase: Total	VSSL-100	VSSL-100
	--	--
Mass Flow	lb/h	lb/h
H2S	0.0158832	0.0111779
N2	0.00270781	0.259767
CO2	0.931430	2.97662
C1	0.834886	21.3485
C2	1.75485	13.7133
C3	3.09919	13.6700
iC4	0.500457	2.05492
nC4	1.97263	6.21015
2,2-Dimethylpropane	0.00612728	0.0207646
iC5	0.842995	2.03960
nC5	1.01250	2.35115
2,2-Dimethylbutane	0.0157939	0.0396715
Cyclopentane	0	0
2,3-Dimethylbutane	0.143811	0.336791
2-Methylpentane	0.297938	0.758299
3-Methylpentane	0.203849	0.464828
nC6	0.366447	0.946162
Methylcyclopentane	0.938352	0.914335
Benzene	4.37398	1.40788
Cyclohexane	0.807924	1.03161
2-Methylhexane	0.0475313	0.149497
3-Methylhexane	0.0606760	0.178794
2,2,4-Trimethylpentane	0	0
nC7	0.223874	0.731902
Methylcyclohexane	0.384600	0.736833
Toluene	1.43367	0.727310
nC8	0.0744679	0.435285
Ethylbenzene	0	0
m-Xylene	0.0419108	0.0424301
p-Xylene	0.0396539	0.0416148
o-Xylene	0.0381730	0.0295106
n-C9	0.0105773	0.0920824
n-Decane	0	0
H2O	0.880706	0.607789
TEG	3.80709E-08	0.00560366

Unit(s): DEHY-1
Description: 70 MMscf/day natural gas-fired dehydrator with reboiler, condensor and combustion

Uncontrolled Emissions	HCHO	Acetaldehyde	Acrolein	Benzene	Toluene	e-Benzene	Xylenes	n-Hexane	Total HAPs	Units	
Reboiler (a)	0.0017	0.0015	-	0.0015	0.0020	0.0042	0.0026	0.0026	0.029	lb/hr	Unit Emissions w/Safety Factors
	0.0074	0.0065	-	0.0066	0.0089	0.019	0.012	0.012	0.13	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
				0.0066	0.0089	0.0185	0.0116	0.0116	0.1263		
Still Vent (b)	-	-	-	5.8	2.2	-	0.23	1.31	9.5	lb/hr	Promax Run TEG-1
	-	-	-	25.3	9.5	-	1.02	5.75	41.6	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
	0.0017	**0.0015**	**-**	**5.8**	**2.2**	**0.0042**	**0.24**	**1.32**	**9.5**	lb/hr	Total Emission rates (reboiler+regenerator)
	0.0074	**0.0065**	**-**	**25.3**	**9.5**	**0.019**	**1.03**	**5.76**	**41.7**	tpy	lb/hr * 8760 hrs/yr / 2000lb/ton

Controlled Emissions	HCHO	Acetaldehyde	Acrolein	Benzene	Toluene	e-Benzene	Xylenes	n-Hexane	Total HAPs	Units	
Reboiler (a)	0.0017	0.0015	-	0.0015	0.0020	0.0042	0.0026	0.0026	0.029	lb/hr	Unit Emissions w/Safety Factors
	0.0074	0.0065	-	0.0066	0.0089	0.019	0.012	0.012	0.13	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
				0.0066	0.0089	0.0185	0.0116	0.0116	0.1263		
Still Vent (b)	-	-	-	0.087	0.029	-	0.0024	0.0073	0.13	lb/hr	Promax Run with 98 % Control Efficiency*
	-	-	-	0.38	0.13	-	0.010	0.032	0.55	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
	0.0017	**0.0015**	**-**	**0.089**	**0.031**	**0.0042**	**0.0050**	**0.010**	**0.15**	lb/hr	Total Emission rates (reboiler+regenerator)
	0.0074	**0.0065**	**-**	**0.39**	**0.13**	**0.019**	**0.022**	**0.044**	**0.68**	tpy	lb/hr * 8760 hrs/yr / 2000lb/ton

* Regenerator-condenser non-condensable and flash tank vapors combusted in reboiler as fuel, effluent emitted through reboiler stack

Reboiler Stack Exhaust Parameters

Site elevation:	3431 ft MSL	
Standard pressure:	29.92 in Hg	
Pressure at elevation:	26.4 in Hg	Hess, Introduction to Theoretical Meteorology, eqn. 6.8
Standard temperature:	528 R	
Exhaust temp:	212 °F	Eng. estimate
Stack height:	15 ft	Design specification
Stack diameter:	0.5 ft	Design specification
F factor:	10610 wscf/10e6 Btu	40 CFR 60 Appx A Method 19
Exhaust flow:	354 scfm	Heat input * F factor/60
Exhaust flow:	510 acfm	Va = Vs*(Ps/Pa)*(Ta/Ts)
Exhaust velocity:	43 ft/sec	Exhaust flow / stack area

[1] HAPs for reboiler calculated using GRI-HAPCalc; HAPs for regenerator calculated in GRI-GLYCalc

Greenhouse Gas Calculations[2]

CO_2	N_2O	CH_4	CO_2e	
53.1	0.0001	0.001		kg/MMBtu
1	298	25		GWP[3]
260.8	0.0005	0.005	261.1	lb/hr[4]
1142.3	0.0022	0.022	1143.5	tpy[5]

[2] Greenhouse gas emission factors are from 40 CFR 98 Subpart C

[3] 40 CFR 98 Subpart A, Table A-1

[4] CO2, N2O, CH4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel Rate (Mscf/hr) * 10^-3 (MMscf/Mscf)*Heating Value (MMBtu/MMscf)
CO2e lb/hr = CO2 lb/hr + (CH4 lb/hr * GWP) + (N2O lb/hr * GWP)

[5] tpy = lb/hr * hours of operation * 1ton/2000lb

Unit(s): DEHY-2
Description: 70 MMscf/day Natural gas-fired dehydrator with reboiler, condensor and combustion

Fuel consumption:

1	MMBtu/hr	Input heat rate	Design specification
950	Btu/scf	Fuel heat value	Nominal for natural gas
1.1	Mscf/hr	Fuel rate	Input heat rate / Fuel heat value
9.2	MMscf/yr	Annual fuel usage	

Emission Rates

Uncontrolled Emissions	NOx	CO	VOC	SO_2	PM	H_2S	Units	
Reboiler (a)	100	84	5.5		7.6		lb/MMscf	AP-42 Table 1.4-1 & 2
				5			gr S/100scf	Nominal
	0.11	0.088	0.0058	0.015	0.008		lb/hr	EF * Fuel rate (Mscf/hr) * 1000scf/Mscf
	0.46	0.39	0.025	0.07	0.035		tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
Still Vent (b)			56.9			0.034	lb/hr	Promax Run TEG-2
			249.4			0.15	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
Total dehydrator emissions	0.11	0.088	56.95	0.015	0.0080	0.034	lb/hr	Total Emission rates (reboiler+regenerator)
	0.46	0.39	249.43	0.066	0.035	0.15	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb

Controlled Emissions	NOx	CO	VOC	SO_2	PM	H_2S	Units	
Reboiler (a)	100	84	5.5		7.6		lb/MMscf	AP-42 Table 1.4-1 & 2
				5			gr S/100scf	Nominal
	0.11	0.088	0.0058	0.015	0.008		lb/hr	EF * Fuel rate (Mscf/hr) * 1000scf/Mscf
	0.46	0.39	0.025	0.07	0.035		tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
Still Vent (b)			0.60	0.048		0.00052	lb/hr	Promax Run with 98 % Control Efficiency*
			2.6	0.21		0.0023	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
Total dehydrator emissions	0.11	0.088	0.60	0.063	0.0080	0.00052	lb/hr	Total Emission rates (reboiler+regenerator)
	0.46	0.39	2.63	0.27	0.035	0.0023	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb

* This unit is controlled by a BTEX Buster, a Firebox and a Glow Plug.

Note: Under the uncontrolled scenario, Still Vent emissions are the result of the BTEX Vent and Flash Gas Emissions. Under the control scenario, only the BTEX Vent emissions contribute to the still vent emissions. Flash gas emissions are routed to the fuel system and not to the still vent.

Process Streams Composition Phase: Total	BTEX Vent Solved VSSL-100 --	Flash Gas Solved VSSL-100 --
Mass Flow	**lb/h**	**lb/h**
H2S	0.0258602	0.00831695
N2	0.00352548	0.273376
CO2	1.840645	2.95352
C1	1.330671	23.3218
C2	3.14414	14.2795
C3	5.83906	13.1589
iC4	0.993505	1.92145
nC4	3.98885	5.48377
2,2-Dimethylpropane	0.01264485	0.0186757
iC5	1.678997	1.49343
nC5	1.96386	1.57250
2,2-Dimethylbutane	0.026838011	0.0218043
Cyclopentane	0.000000	0
2,3-Dimethylbutane	0.262883	0.184305
2-Methylpentane	0.534667	0.401879
3-Methylpentane	0.347326	0.226901
nC6	0.652842	0.455406
Methylcyclopentane	1.47358	0.350973
Benzene	6.979161	0.444318
Cyclohexane	1.2138768	0.399971
2-Methylhexane	0.0762048	0.0552776
3-Methylhexane	0.102331166	0.0663851
2,2,4-Trimethylpentane	0.000000	0
nC7	0.370390	0.260888
Methylcyclohexane	0.56841	0.238187
Toluene	1.9445409	0.170868
nC8	0.095966312	0.110419
Ethylbenzene	0.056932	0.0105133
m-Xylene	0.3015059	0.0508805
p-Xylene	0.2873960	0.0505237
o-Xylene	0.0000000	0
n-C9	0.008546262	0.0132369
n-Decane	0.000000	0
H2O	1.56091E+00	0.0961301
TEG	1.8169E-07	0.000513919

Volatile Organic Compounds

Unit(s): DEHY-2
Description: 70 MMscf/day Natural gas-fired dehydrator with reboiler, condensor and combustior

Uncontrolled Emissions	HCHO	Acetaldehyde	Acrolein	Benzene	Toluene	e-Benzene	Xylenes	n-Hexane	Total HAPs	Units	
Reboiler (a)	0.00084	0.00073	-	0.00075	0.0010	0.0013	0.0014	0.0021	0.0144	lb/hr	Unit Emissions w/Safety Factors
	0.0037	0.0032	-	0.0033	0.0045	0.0058	0.0062	0.0093	0.0632	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
	-	-	-	7.4	2.1	0.06745	0.69031	1.10825	11.4	lb/hr	Promax Run TEG Unit 98 wt%
	-	-	-	32.5	9.3	0.2954	3.0235	4.85412	50.0	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
Total dehydrator emissions[2]	**0.00084**	**0.00073**	-	**7.4**	**2.1**	**0.0688**	**0.6917**	**1.110**	**11.4**	lb/hr	Total Emission rates (reboiler+regenerator)
	0.0037	**0.0032**	-	**32.5**	**9.3**	**0.3**	**3.0297**	**4.86**	**50.0**	tpy	lb/hr * 8760 hrs/yr / 2000lb/ton

Controlled Emissions	HCHO	Acetaldehyde	Acrolein	Benzene	Toluene	e-Benzene	Xylenes	n-Hexane	Total HAPs	Units	
Reboiler (a)	0.00084	0.0007	-	0.00075	0.0010	0.0013	0.0014	0.0021	0.014	lb/hr	Unit Emissions w/Safety Factors
	0.0037	0.0032	-	0.0033	0.0045	0.0058	0.0062	0.0093	0.063	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
	-	-	-	0.14	0.039	0.0011	0.012	0.013	0.20	lb/hr	Promax Run with 98 % Control Efficiency*
	-	-	-	0.61	0.17	0.005	0.052	0.0572	0.90	tpy	lb/hr * 8760 hrs/yr * 1ton/2000lb
Total dehydrator emissions	**0.00084**	**0.00073**	-	**0.14**	**0.040**	**0.002**	**0.013**	**0.015**	**0.22**	lb/hr	Total Emission rates (reboiler+regenerator)
	0.0037	**0.0032**	-	**0.61**	**0.17**	**0.011**	**0.058**	**0.066**	**0.96**	tpy	lb/hr * 8760 hrs/yr / 2000lb/ton

Greenhouse Gas Calculations[3]

CO_2	N_2O	CH_4	CO_2e	
53.06	0.0001	0.001		kg/MMBtu
1	298	25		GWP[8]
119.2	0.0002	0.0022		lb/hr[9]
522.0	0.0010	0.010	522.6	tpy[5]

[3] Greenhouse gas emission factors are from 40 CFR 98 Subpart C

Reboiler Stack Exhaust Parameters

Site elevation:	3431 ft MSL	
Standard pressure:	29.92 in Hg	
Pressure at elevation:	26.4 in Hg	Hess, Introduction to Theoretical Meteorology, eqn. 6.8
Standard temperature:	528 R	
Exhaust temp:	212 °F	Eng. estimate
Stack height:	15 ft	Design specification
Stack diameter:	0.5 ft	Design specification
F factor:	10610 wscf/10e6 Btu	40 CFR 60 Appx A Method 19
Exhaust flow:	177 scfm	Heat input * F factor/60
Exhaust flow:	255 acfm	Va = Vs*(Ps/Pa)*(Ta/Ts)
Exhaust velocity:	22 ft/sec	Exhaust flow / stack area

Greenhouse Gas Calculations[2]

CO_2	N_2O	CH_4	CO_2e	
53.0	0.0001	0.001		kg/MMBtu
1	298	25		GWP[3]
130.3	0.0002	0.002	130.4	lb/hr[4]
570.7	0.001	0.01	571.3	tpy[5]

[2] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[3] 40 CFR 98 Subpart A, Table A-1
[4] CO2, N2O, CH4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel Rate (Mscf/hr) * 10^-3 (MMscf/Mscf)*Heating Value (MMBtu/MMscf
CO2e lb/hr = CO2 lb/hr + (CH4 lb/hr * GWP) + (N2O lb/hr * GWP)
[5] tpy = lb/hr * hours of operation * 1ton/2000lb

Unit(s): AMINE-1, AMINE-2
Description: 1109 bbd DEA Amine Liquid-Liquid Treater with Flash Tank and Still Ven

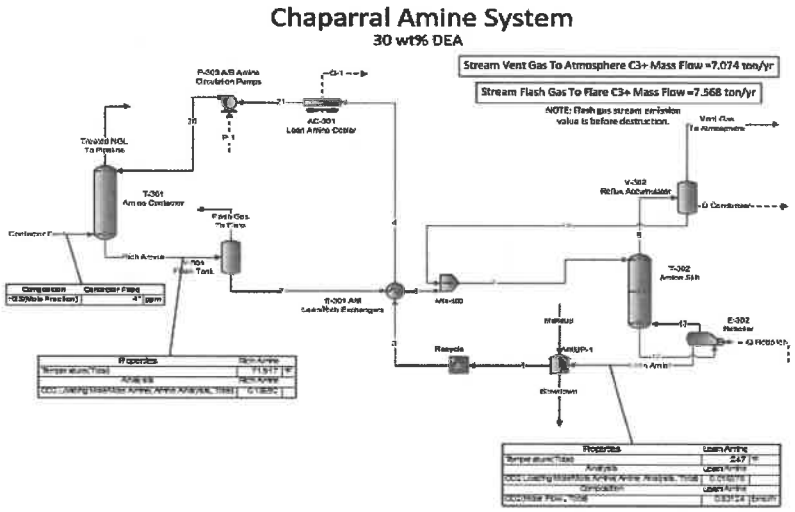
Emission Rates (Based on ProMax run dated 7/18/2017 @ 12:36:15 PM)

	VOC	H_2S	Benzene	Toluene	e-Benzene	Xylenes	n-Hexane	Total HAPs	
	1.6	**0.075**	**0.25**	**0.057**	**2.3E-04**	**2.0E-03**	**7.4E-04**	**0.31**	lb/hr
Flash Tank and Still Vent	7.07	0.33	1.10	0.25	1.0E-03	8.6E-03	3.2E-03	1.37	tpy
	25%	25%	25%	25%	25%	25%	25%	25%	
	8.8	**0.41**	**1.38**	**0.31**	**1.3E-03**	**1.1E-02**	**4.0E-03**	**1.71**	tpy

ProMax

Scale-up and safety factor

	CO_2e			
Still Vent and Flash Tank	1066.32	tpy, CO_2	Promax calculations at 1109 bbd	
	0.47248	tpy, CH_4	Promax calculations at 1109 bbd	
	25%		Scale-up and safety factor	
	1,332.9	tpy, CO_2	tpy w/SF	
	0.6	tpy, CH_4	tpy w/SF	14.76488943
	1347.7	tpy, CO_2e		



ProMax Run (7/18)

Composition	Still Vent (pph)
CO2	243.452
N2	2.36933E-07
C1	0.107871
C2	4.37793
C3	1.09022
iC4	0.0460583
nC4	0.131689
iC5	0.0104068
nC5	0.0111702
2,2-Dimethylpropane	0.000334195
2,2-Dimethylbutane	6.68176E-05
2,3-Dimethylbutane	0.000285653
3-Methylpentane	0.000388905
2-Methylpentane	0.000777727
nC6	0.000735999
Methylcyclopentane	0.00324799
Benzene	0.251702
Cyclohexane	0.00740842
2-Methylhexane	4.03327E-05
3-Methylhexane	3.00314E-05
nC7	4.45437E-05
Methylcyclohexane	0.00120185
Toluene	0.0571222
nC8	6.85961E-06
Ethylbenzene	0.000229667
m-Xylene	0.000776113
p-Xylene	0.000828850
o-Xylene	0.000353451
n-C9	1.01912E-07
n-Decane	0
nC11	0
nC12	0
nC13	0
nC14	0
nC15	0
H2O	4.42959
DEA	1.23780E-11
H2S	0.0753853

VOC = 1.62
HAPs= 0.31

Unit(s): FUG-1
Description: Facility fugitives associated with existing equipment (monitored under NSPS KKK)

Gas Analysis

Components	MW	Inlet Gas Before Dehydration	
		Mol %	Weight %
Nitrogen	28.01	2.0611	2.7992
Methane	16.04	79.7031	61.9991
Carbon Dioxide	44.01	0.4875	1.0404
Hydrogen Sulfide	34.08	0.0010	0.0017
Ethane	30.07	10.1545	14.8053
Propane	44.10	4.5887	9.8114
i-Butane	58.12	0.5395	1.5205
n-Butane	58.12	1.2428	3.5027
2,2-Dimethylpropane	72.15	0.0040	0.0140
i-Pentane	72.15	0.2827	0.9891
n-Pentane	72.15	0.2837	0.9926
2,2-Dimethylbutane	86.17	0.0040	0.0167
Cyclopentane	70.10	0.0000	0.0000
2,3-Dimethylbutane	86.18	0.0300	0.1252
2-Methylpentane	86.18	0.0699	0.2922
3-Methylpentane	86.18	0.0390	0.1628
i-Hexane	86.18	0.0000	0.0000
n-Hexane	86.18	0.0819	0.3423
Methylcyclopentane	84.16	0.0470	0.1916
Benzene	78.11	0.0470	0.1778
CC6	84.16	0.0619	0.2528
2-Methylhexane	100.20	0.0110	0.0534
3-Methylhexane	100.20	0.0120	0.0582
2,2,4-Trimethylpentane	114.22	0.0000	0.0000
i-Heptane	100.21	0.0000	0.0000
n-Heptane	100.21	0.0520	0.2524
Methylcyclohexane	98.19	0.0410	0.1950
Toluene	92.14	0.0230	0.1027
i-Octane	114.23	0.0000	0.0000
n-Octane	114.23	0.0290	0.1605
Ethylbenzene	106.17	0.0000	0.0000
p-m-Xylene	106.16	0.0030	0.0154
o-Xylene	106.16	0.0010	0.0051
i-Nonane	128.20	0.0000	0.0000
n-Nonane	128.20	0.0060	0.0373
i-Decane	142.29	0.0000	0.0000
n-Dexane+	142.29	0.0000	0.0000
i-Undecanes+	156.31	0.0002	0.0015
H2O	18.02	0.0928	0.0810
Total[1]	20.62	100.00	99.92
Total VOC		7.50	19.27
Total H2S		0.0010	0.0017
Total HAP		0.156	0.64

Emission Calculations

Component Type	Service	EF[2] (kg/hr/source)	Count[3]	Weight % VOC[4]	Weight % HAP[4]	Weight % H_2S[4]	VOC Emissions[5] (lb/hr)	HAP Emissions[5] (lb/hr)	H2S Emissions[5] (lb/hr)
Valves	Gas/Vapor	4.50E-03	1257	19.3	0.64	0.00165	2.4	0.080	2.1E-04
	Light Liquid	2.50E-03	1040	99.9	1.00	0.0	5.7	0.06	0.000
	Heavy Liquid	8.40E-06	124	100.0	5.00	0.0	0.0023	0.0001	0.0000
Flanges	Gas/Vapor	3.90E-04	701	19.3	0.64	0.00165	0.12	0.004	1.0E-05
	Light Liquid	1.10E-04	272	99.9	1.00	0.0	0.07	0.001	0.0000
	Heavy Liquid	3.90E-07	41	100	5.00	0	0.0000	0.0000	0.0000
Open End Lines	Gas/Vapor	2.00E-03	0	19.3	0.64	0.00165	0.0000	0.0000	0.0E+00
	Light Liquid	1.40E-03	0	100	1.00	0.0	0.0000	0.0000	0.0000
	Heavy Liquid	1.40E-04	0	100.0	5.00	0.0	0.0000	0.0000	0.0000
PRVs	Gas/Vapor	8.80E-03	51	19.3	0.64	0.00165	0.2	0.006	1.6E-05
	Light Liquid	7.50E-03	9	99.9	1.00	0.0	0.1487	0.0015	0.0000
	Heavy Liquid	3.20E-05	2	100.0	5.00	0.0	0.0001	0.0000	0.0000
Other	Gas/Vapor	8.80E-03	10	19.3	0.64	0.00165	0.037	0.0012	3.2E-06
	Light Liquid	7.50E-03	0	99.9	1.00	0.0	0.0000	0.0000	0.0000
	Heavy Liquid	3.20E-05	0	100.0	5.00	0.0	0.0000	0.0000	0.0000
Pumps	Gas/Vapor	2.40E-03	0	19.3	0.64	0.00165	0.000	0.00000	0.0E+00
	Light Liquid	1.30E-02	9	99.9	1.00	0.0	0.26	0.003	0.00000
	Heavy Liquid	1.30E-02	4	100.0	5.00	0.0	0.1146	0.0057	0.0000
Connectors	Gas/Vapor	2.00E-04	2521	19.3	0.64	0.00165	0.214	0.00715	1.8E-05
	Light Liquid	2.10E-04	1932	99.9	1.00	0.0	0.894	0.0089	0.0000
	Heavy Liquid	7.50E-06	284	100.0	5.00	0.0	0.0047	0.0002	0.0000

Total Criteria Pollutant Emissions

VOC	H_2S	
10.2	2.5E-04	lb/hr[6]
0%	0%	Safety factor
10.2	2.5E-04	lb/hr
44.6	1.1E-03	tpy[7]

HAP Emissions

n-Hexane	Benzene	Toluene	Xylenes	Total HAPs	
0.094	0.049	0.028	0.006	0.18	lb/hr[6]
5%	5%	5%	5%	5%	Safety factor
0.098	0.051	0.029	0.0059	0.185	lb/hr
0.43	0.224	0.129	0.0259	0.81	tpy[7]

Notes

[1] Total MW = Σ MW_i x Mol %$_i$

[2] Emission factors from Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates, 199

[3] Facility component count based on similar facility component count

Safety factor = 5% added to facility component count.

[4] Weight% VOC and HAP of light liquid conservatively assumed to be 100% and 5%, respectively
Weight% of n-hexane, benzene, toluene, xylenes, and ethylbenzene in light liquid conservatively assumed to be 1% for each

[5] Emissions per component type (lb/hr) = EF (kg/hr/source) x Component Count x Weight% (VOC, HAP) x 2.20462 lb/kg

[6] Total Emissions (lb/hr) =Weight %$_{gas}$ (VOC, HAP) x [Σ $Ef_{i,\,gas}$ (kg/hr/source) x Component Count$_{i,\,gas}$]x 2.20462 lb/kg
+ Weight %liquid (VOC, HAP) x [Σ Efi, liquid (kg/hr/source) x Component Counti, liquid] x2.20462 lb/kg

[7] tons/yr = lb/hr * Hours of operation (hr/yr) * 1ton/2000lt

[8] GHG ton/yr =Weight % (CO_2, CH_4) x [Σ $Ef_{i,\,gas}$ (kg/hr/source) * Component Count$_{i,\,gas}$] * 1tonne/1000kg * Hours of operation (hr/yr) * 1.1023ton/tonne

[9] tons/yr CO_2e = ton/yr * GWP

Unit: FUG-2
Description: Facility fugitives associated with MRU equipment
(to be monitored under NSPS OOOO)

Emission Rates

VOC	H_2S	Benzene	Toluene	Xylenes	n-Hexane	Total HAPs	
22.3	5.6E-04	0.112	0.065	0.0129	0.22	0.40	tpy[1]
5%	5%	5%	5%	5%	5%	5%	Safety Factor[2]
23.4	5.8E-04	0.117	0.068	0.0136	0.23	0.42	

[1] Assumes emissions for MRU equipment is 50% of the fugitive emissions associated with the equipment monitored under NSPS KKK (FUG-1)

2 10% safety factor added to account for additional fugitive components anticipated within the MRU/closed drain systen

Unit(s): TK-1, TK-2, TK-3
Description: 300-bbl condensate storage tank

General Tank Information

No of Condensate Tank:	3			
Volume:	300	bbl		
Height (shell):	15	ft		
Diameter:	12	ft	60000 bbl/yr	Updated Throughput
Tank Throughput:	20,000	bbl/yr	2520000 gal/yr	
Tank Throughput:	840,000	gal/yr		
Turnovers:	66.67	maximum turnovers/yr		

Working and Breathing Losses[1]

Component	Emissions (lb/yr)	Emissions (tpy)
VOC	9986.15	4.99
Hexanes	25.10	0.013
Benzene	23.60	0.012
Toluene	11.73	0.0059
Ethylbenzene	1.63	0.00082
Xylenes	4.79	0.0024
Total HAPs	66.85	0.033

[1] Working and breathing losses calculated in TANKS 4.0.9d

Emission Total for unit TK-1 through TK-3

	lb/hr	tpy
VOC	-	14.98
Total HAPs	-	0.10
Benzene	-	0.035
n-Hexane	-	0.038

Emission unit: Load
Source Description: Oil Loadout

LL = 12.46 (SPM) / T

Eq. 1, AP-42 Section 5.2, Transportation and Marketing of Petroleum Liquids

Parameter	Value	Unit	Notes
S =	0.6	Dimensionless	Submerged Loading, Table 5.2-1
T =	93.23	F	Tanks 4.0.9d Max Liquid Temperature
P =	8.5259	psia	Tanks 4.0.9.d Max Vapor Pressure
M =	67	lb/lbmole	Tanks 4.0.9.d Vapor Mol. Weight
LL =	7.7	lb VOC/1000 gal	

Uncontrolled VOC Emissions

Parameter	Value	Unit
Truck Capacity	180	bbl
Max Loadout Rate [1]	7,560	gallon/hr
	2,520,000	gallons/yr
	164	bbl/day
Annual Loadout	2,520	Mgal/yr
	60,000	bbl/yr
	19,453	lb/yr
VOC Emissions [2]	***9.73***	***tpy***

[1] Maximum hourly loadout rate based on the truck capacity, assuming 1 hour loadout time per truck.

[2] Requested emission rate for tpy =Requested Loadout * Loading Loss/1000/2000

HAP Emissions

Parameter	Value	Unit
Tank VOCs [1]	15.0	tpy
Loadout VOC	9.7	tpy
Truck Tank Volume	7,560	gallons
Annual Loadout	2,520,000	gallons/yr
Loadout Time	1	hour/ loadout
Turnovers [2]	333	per year

[1] Working and Breathing emissions for Tank-1 through Tank-3

[2] Turnovers = loading volume / truck tank volume

HAPs	Tanks Working & Breathing	Uncontrolled Loadout Emissions
	lb/yr	tpy
Benzene	70.80	0.023
Toluene	35.19	0.011
Ethylbenzene	4.89	0.0016
Xylene (m)	14.37	0.0047
n-Hexane	75.30	0.024
TOTAL HAPs	***200.55***	***0.065***

Mean Vehicle Weight and Trip Calculator for Unpaved Road Emissions

Plant Road

Vehicle Type	Weight (tons) Empty Vehicle[1]	Load Size[2]	Loaded Vehicle[3]	Mean Vehicle[4]	Vehicles Per Day (VPD)[5]	Segments per trip	Trips per hour[6]
Condensate	16	21.2	37.2	26.6	24	1	6

Hours of Operation per Day		24	
Total Vehicles Per Day		24.0	
ted Mean Vehicle Weight (WMVW)[8]		26.6	tons
Total Trips per Hour		6.0	

[1] Empty vehicle weight includes driver and occupants and full fuel load.
[2] Cargo, transported materials, etc. (5.6 lb/gal RVP10 *7560 gal truck/ 2000lb/ton)
[3] Loaded vehicle weight = Empty + Load Size
[4] Mean Vehicle weight = (Loaded Weight + Empty Weight) / 2
[5] A conservative estimate of vehicles per day.
[6] Maximum expected trips per hour
[7] WMVW = (Mean Vehicle Weight*VPD) ÷ Total Vehicles per Day

Unpaved Road Emission Factors

	Factor Calculation (AP-42 Sec. 13.2.2.3 November, 2006, Equation 2)												Hourly Emission Factor			Annual, Wet Day, Emission Factor			
Route	Operating Hours per Year	Surface material silt content[1] s %	Mean Vehicle Weight, tons W tons	PM-30 k lb/VMT	PM-10 k lb/VMT	PM-2.5 k lb/VMT	PM-30 a lb/VMT	PM-10 a lb/VMT	PM-2.5 a lb/VMT	PM-30 b lb/VMT	PM-10 b lb/VMT	PM-2.5 b lb/VMT	E PM-30 lb/VMT	E PM-10 lb/VMT	E PM-2.5 lb/VMT	E PM-30 lb/VMT	E PM-10 lb/VMT	E PM-2.5 lb/VMT	Wet Days
sate trucks	8760	2.7	26.58	4.9	1.5	0.15	0.7	0.9	0.9	0.45	0.45	0.45	4.60	1.05	0.10	3.85	0.87	0.087	60

Unpaved Production Road Emissions

Route	Segment Length	Trips per Segment	Trips per hour	Trips per day	Effective Segment Length	Average VMT/hr	Potential Emission Rate PM-30 lb/hr	PM-30 tpy	PM-10 lb/hr	PM-10 tpy	PM-2.5 lb/hr	PM-2.5 tpy	Potential to Emit PM-30 lb/hr	PM-30 tpy	PM-10 lb/hr	PM-10 tpy	PM-2.5 lb/hr	PM-2.5 tpy
	mi		T	T	mi	mi/hr												
sate trucks	0.20	1	6.0	24.0	0.20	1.20	5.5	3.4	1.3	0.77	0.13	0.077	5.5	3.4	1.3	0.77	0.13	0.077
						TOTAL	**5.52**	**3.37**	**1.25**	**0.77**	**0.13**	**0.077**	**5.52**	**3.37**	**1.25**	**0.77**	**0.13**	**0.077**

[1] Surface silt = % of 75 micron diameter and smaller particles
[2] E = k x (s/12)^a x (W/3)^b (AP-42 page 13.2.2-4 Equation 1a, November 2006)
E= Size Specific Emission Factor (lb/VMT)
s = surface material silt content (%), adjusted by 40% to account for gravel, rather than dirt roads
k, a, b = constants from AP-42 Table 13.2.2-2
W = Weighted Mean Vehicle Weight from Haul Road Inputs (tons)
[3] PM-30 emission factor in equation is assumed as a surrogate for TSP emissions
[4] VMT/hr = Vehicle Miles Travelled per hour= Trips per hour * Segment Length
[5] Wet Day Emission Factor = E * (365 - Wet Days)/365. Wet days value is the NM default allowed by NMED without additional justification.
[6] Controlled Emissions = Uncontrolled Emissions * (1 - Control Factor/100%)
Control Factor = 0%

Unit(s): FLARE
Description: SSM/M1 flaring

Blowdown Rates

75369	lb/hr	Design maximum
0.05267	lb/cf	Nominal density
1,431,089	scf/hr	Blowdown rate (lb/hr) / Density (lb/cf)
10,000,000	scf/yr	Expected annual volume
1166	Btu/scf	Flare gas sample (3/24/14)
1668.65	MMBtu/hr	
11660.00	MMBtu/yr	
Total 1668.65	MMBtu/hr	

Stack Parameters

1000	°C	Exhaust temperature	Per NMAQB modeling guidelines
20	m/sec	Exhaust velocity	Per NMAQB modeling guidelines
100	ft	Flare height	Design
37.20	g/mol	Flared gas molecular weight	Wtd. MW from pilot and steady-state
116,805,474	cal/sec	Heat release (q)	MMBtu/hr * 10^6 * 252 cal/Btu ÷ 3600 sec/hr
82,609,427		q_n	$q_n = q(1-0.048(MW)^{1/2})$
9.0890	m	Effective stack diameter (D)	$D = (10^{-6} q_n)^{1/2}$

Emission Rates

SSM/M1

	NO_x	CO	VOC	H_2S	SO_2	HAPs	Units	
	0.1380	0.2755					lb/MMBtu	TNRCC RG-109, high Btu gas, other
			40.65%	0.0004%		0.4510%	mol%	Nominal for facility
			6.262	11.136		6.262	ft^3/lb	specific volume
			92895.19	0.5140		1030.62	lb/hr	vol. Gas * mole fraction / specific volume
			649122.4	3.59		7201.67	lb/yr	vol. Gas * mole fraction / specific volume
	230.3	**459.7**					lb/hr	lb/MMBtu * MMBtu/hr
			1857.9	**1.0E-02**	**0.95**	**20.6**	lb/hr	98% combustion; 100% conversion to SO_2
	0.80	**1.6**	**6.49**	**3.6E-05**	**3.31E-03**	**0.072**	tpy	
TOTAL	**230.3**	**459.7**	**1857.9**	**0.010**	**0.9**	**20.6**	lb/hr	
	0.80	**1.6**	**6.49**	**3.6E-05**	**3.3E-03**	**0.072**	tpy	
	10.0	**10.0**	**10.0**	**0.045**	**4.2**	**10.0**	tpy (assume for all annual emissions)	

Flare Gas Composition: Combined waste streams associated the VRU and other sources

Component	MW	Wet vol/mol%	Dry vol/mol%	MW * dry vol %	Mass Fraction (dry)	Spec. Volume ft^3/lb	Spec. Volume VOC ft^3/lb
Water	18.02	1.93%					
Nitrogen	28.01	0.42%	0.4307%	0.12064	0.33%	13.547	
CO_2	44.01	0.45%	0.4579%	0.20150	0.54%	8.623	
H_2S	34.08	0.00040%	0.00041%	0.00014	0.00038%	11.136	
Methane	16.04	40.80%	41.608%	6.67397	18.01%	23.65	
Ethane	30.07	15.74%	16.0516%	4.82671	13.03%	12.62	
Propane	44.10	14.89%	15.1835%	6.69593	18.07%	8.606	2.28420521
Iso-butane	58.12	2.97%	3.0262%	1.75883	4.75%	6.529	0.45519154
N-butane	58.12	8.20%	8.3631%	4.86063	13.12%	6.529	1.25794593
Iso-pentane	72.15	3.50%	3.5686%	2.57474	6.95%	5.26	0.53683588
N-pentane	72.15	3.73%	3.7987%	2.74073	7.40%	5.26	0.57144561
Iso-Hexanes	86.08	2.78%	2.8312%	2.43710	6.58%	4.404	0.42544465
*N-Hexane**	86.18	1.20%	1.2287%	1.05891	2.86%	4.404	0.1848535
*Benzene**	78.11	0.86%	0.8767%	0.68477	1.85%	4.858	0.13186351
Cyclohexane	84.16	0.99%	1.0112%	0.85106	2.30%	4.509	0.15211118
Iso-heptanes	100.20	1.10%	1.1176%	1.11986	3.02%	4.404	0.19549447
n-heptane	100.21	0.0000%	0.0000%	0.00000	0.00%	4.404	0.0000
*Toluene**	92.14	0.28%	0.2896%	0.26684	0.72%	4.119	0.04356835
iso-octanes	114.23	0.12%	0.1233%	0.14082	0.38%	3.322	0.01854367
n-octane	114.23	0.00%	0.0000%	0.00000	0.00%	3.322	0.000000
*Ethylbenzene**	106.07	0.00%	0.0000%	0.00000	0.00%	3.574	0
*m,o & p xylene**	106.16	0.021%	0.0215%	0.02279	0.06%	3.574	0.00322874
i-nonanes	128.26	0.010%	0.0106%	0.01364	0.04%	2.959	0.00160027
n-nonanes	128.20	0.00%	0.0000%	0.00000	0.00%	2.959	0
i-decanes	142.29	0.00067%	0.0007%	0.00097	0.00%	2.667	0.00010291
n-decanes	142.29	0.00%	0.0000%	0.00000	0.00%	2.667	0
i-undecanes +	142.29	0.00%	0.0000%	0.00005	0.00%	2.667	4.9004E-06
Total		100.00%	100.00%	37.05	100%		6.262
Dry total		98.07%		*(mixture mol. wt)*			
	NMEHC (VOC)	*40.65%*			68.09%		

Greenhouse Gas Calculations

CO_2	N_2O	CH_4	CO_2e		
1	298	25		GWP	40 CFR 98 Subpart A, Table A-1
1126.3	0.0014	1.7	1169.9	tpy	40 CFR 98 Equations W-19, W-20, W-21, and W-40

Section 7

Information Used To Determine Emissions

Information Used to Determine Emissions shall include the following:

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

Engines 1000, 2000, 5000, 6000, 7000
- Caterpillar G3516 LE manufacturer data
- AP-42 Table 3.2-2
- GRI-HAPCalc 3.01 output

Engines 3000, 4000
- Waukesha L7042 GL manufacturer data
- AP-42 Table 3.2-2
- GRI-HAPCalc 3.01 output

DEHY-1 and DEHY-2
- AP-42 Tables 1.4-1 and 1.4-2
- ProMax Output

AMINE-2
- ProMax output

MOLE-1
- AP-42 Tables 1.4-1 and 1.4-2
- GRI-HAPCalc 3.01 output

LOAD-1
- AP-42 Section 5.2

Tanks TK-1, TK-2, TK-3
- TANKS 4.0.9d output for working and breathing losses

FLARE
- TNRCC RG-109, October 2010
- ProMax output

FUG-1
- Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates (1995)

HAUL
- AP-42 Section 13.2.2 (11/06)

Engine VRU-1
- CAT G3508LE manufacturer data
- AP-42 Table 3.2-2 (7/00)
- GRI-HAPCalc 3.01 output

FUG-2
- Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates (1995)

Engines 1000, 2000, 5000, 6000 and 7000

- Caterpillar G3516 LE manufacturer data
- AP-42 Table 3.2-2
- GRI-HAPCalc 3.01 output

G3516 LE Gas Industrial Engine Performance

CATERPILLAR

Engine Speed (rpm)	1200	Fuel	NAT GAS
Compression Ratio	8:1	LHV of Fuel (Btu/SCF)	920
Aftercooler Inlet Temperature (°F)	130	Fuel System	HPG IMPCO
Jacket Water Outlet Temperature (°F)	210		
Ignition System	EIS	Minimum Fuel Pressure (psig)	35
Exhaust Manifold	WATER COOLED	Methane Number at Conditions Shown	80
Combustion System Type	LOW EMISSION	Rated Altitude (ft) at 77°F Design Temperature	5000

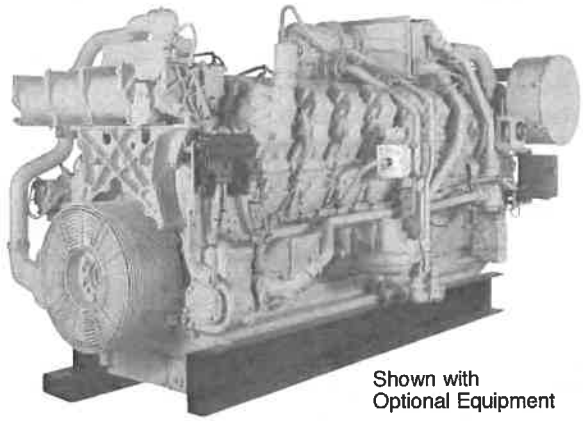
Engine Rating Data	**% Load**	**100%**	**75%**	**50%**
Engine Power (w/o fan)	bhp	1151	863	575
Engine Data				
Specific Fuel Consumption (BSFC) (1)	Btu/bhp-hr	7415	7594	8085
Air Flow (Wet, @ 77°F, 28.8 in Hg)	SCFM	2435	1866	1285
Air Mass Flow (Wet)	lb/hr	10796	8274	5697
Compressor Out Pressure	in. HG (abs)	74.2	69.4	52.3
Compressor Out Temperature	°F	306	283	209
Inlet Manifold Pressure	in. HG (abs)	66.7	52.6	37.1
Inlet Manifold Temperature (10)	°F	136	136	136
Timing (11)	°BTDC	33	33	33
Exhaust Stack Temperature	°F	840	817	808
Exhaust Gas Flow (Wet, @ stack temperature, 29.7 in Hg)	CFM	6415	4830	3306
Exhaust Gas Mass Flow (Wet)	lb/hr	11217	8600	5928
Engine Emissions Data				
Nitrous Oxides (NOx as NO2) (9)	g/bhp-hr	1.5	1.5	1.5
(Corr. 15% 02)	ppm	110	106	104
Carbon Monoxide (CO) (9)	g/bhp-hr	1.8	1.8	2.0
(Corr. 15% 02)	ppm	212	213	217
Total Hydrocarbons (THC) (9)	g/bhp-hr	3.3	3.5	4.0
(Corr. 15% 02)	ppm	694	720	770
Non-Methane Hydrocarbons (NMHC) (9)	g/bhp-hr	0.49	0.53	0.60
(Corr. 15% 02)	ppm	49	50	52
Exhaust Oxygen (9)	%	8.2	8.0	7.7
Lambda		1.58	1.57	1.52
Engine Heat Balance Data				
Input Energy LHV (1)	Btu/min	142195	109220	77514
Work Output	Btu/min	48817	36613	24408
Heat Rejection to Jacket (2) (6)	Btu/min	41210	33828	27726
Heat Rejection to Atmosphere (Radiated) (4)	Btu/min	4554	3795	3037
Heat Rejection to Lube Oil (5)	Btu/min	0	0	0
Total Heat Rejection to Exhaust (to 77°F) (2)	Btu/min	40027	29869	20489
Heat Rejection to Exhaust (LHV to 350°F) (2)	Btu/min	24609	17954	12153
Heat Rejection to Aftercooler (3) (7) (8)	Btu/min	7587	5115	1853

CATERPILLAR®

G3516 LE Gas Petroleum Engine

858-999 bkW
1150-1340 bhp
1200-1400 rpm

2.0 g/bhp-hr NOx (NTE)



Shown with Optional Equipment

CAT® ENGINE SPECIFICATIONS

V-16, 4-Stroke-Cycle

Bore	170 mm (6.7 in.)
Stroke	190 mm (7.5 in.)
Displacement	69 L (4210 cu. in.)
Aspiration	Turbocharged-Aftercooled
Digital Engine Management Governor and Protection	Electronic (ADEM™ A3)
Combustion	Low Emission (Lean Burn)
Engine Weight, net dry (approx)	8015 kg (17,670 lb)
Power Density	8 kg/kW (13.2 lb/bhp)
Power per Displacement	19.3 bhp/L
Total Cooling System Capacity	217.7 L (57.5 gal)
Jacket Water	200.6 L (53 gal)
Aftercooler Circuit	17 L (4.5 gal)
Lube Oil System (refill)	424 L (112 gal)
Oil Change Interval	1000 hours
Rotation (from flywheel end)	Counterclockwise
Flywheel and Flywheel Housing	SAE No. 00
Flywheel Teeth	183

FEATURES

Engine Design
- Proven reliability and durability
- Ability to burn a wide spectrum of gaseous fuels
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Broad operating speed range

Emissions
Meets U.S. EPA Spark Ignited Stationary NSPS Emissions for 2007/8

Lean Burn Engine Technology
Lean-burn engines operate with large amounts of excess air. The excess air absorbs heat during combustion reducing the combustion temperature and pressure, greatly reducing levels of NOx. Lean-burn design also provides longer component life and excellent fuel consumption.

Advanced Digital Engine Management
ADEM A3 control system providing integrated ignition, speed governing, protection, and controls, including detonation-sensitive variable ignition timing. ADEM A3 has improved: user interface, display system, shutdown controls, and system diagnostics.

Ease of Operation
Side covers on block allow for inspection of internal components

Full Range of Attachments
Large variety of factory-installed engine attachments reduces packaging time

Testing
Every engine is full-load tested to ensure proper engine performance.

Gas Engine Rating Pro
GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

Product Support Offered Through Global Cat Dealer Network
More than 2,200 dealer outlets

Cat factory-trained dealer technicians service every aspect of your petroleum engine

Cat parts and labor warranty

Preventive maintenance agreements available for repair-before-failure options

S•O•S℠ program matches your oil and coolant samples against Caterpillar set standards to determine:
- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

Over 80 Years of Engine Manufacturing Experience
Over 60 years of natural gas engine production

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products.
- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

Web Site
For all your petroleum power requirements, visit www.catoilandgas.cat.com.

STANDARD EQUIPMENT

Air Inlet System
Air cleaner — intermediate-duty with service indicator

Control System
A3 ECU
Air-fuel ratio control

Cooling System
Thermostats and housing
Jacket water pump
Aftercooler water pump
Aftercooler core for sea-air atmosphere
Aftercooler thermostats and housing

Exhaust System
Watercooled exhaust manifolds

Flywheels & Flywheel Housings
SAE No. 00 flywheel
SAE No. 00 flywheel housing
SAE standard rotation

Fuel System
Gas pressure regulator
Natural gas carburetor

Ignition System
A3 ECU

Instrumentation
PL1000 Advisor panel

Lubrication System
Crankcase breather — top mounted
Oil cooler
Oil filter — RH
Oil bypass filter
Oil pan — shallow
Oil sampling valve
Turbo oil accumulator

Mounting System
Rails, engine mounting — 254 mm (10 in)

Protection System
Electronic shutoff system
Gas shutoff valve

General
Paint — Cat yellow
Vibration damper and guard — dual 484 mm (23 in)

OPTIONAL EQUIPMENT

Air Inlet System
Remote air inlet adapters
Precleaner

Charging System
Battery chargers
Charging alternators

Cooling System
Aftercooler core
Thermostatic valve
Temperature switch
Connections
Expansion and overflow tank
Water level switch gauge

Exhaust System
Flexible fittings
Elbows
Flange
Flange and exhaust expanders
Rain cap
Mufflers

Fuel System
Low pressure gas conversions
Propane gas valve and jet kits
Fuel filter

Instrumentation
PL1000 communications modules

Lubrication System
Oil bypass filter removal and oil pan accessories
Sump pump
Air prelube pump
Manual prelube pump
Lubricating oil

Mounting System
Rails
Vibration isolators

Power Take-Offs
Front accessory drives
Auxiliary drive shafts and pulleys
Front stub shaft
Pulleys

Protection System
Explosion relief valves, status control box interconnect wiring harness

Starting System
Air starting motor
Air pressure regulator
Air silencer
Electric air start controls
Electric starting motors — dual 24-volt
Starting aids
Battery sets (24-volt dry), cables, and rack

General
Flywheel intertia weight
Guard removal
Engine barring group
Premium 8:1 pistons
Premium cylinder heads

TECHNICAL DATA

G3516 LE Gas Petroleum Engine

Fuel System		2 g NOx NTE Rating DM8618-01	2 g NOx NTE Rating DM8620-01
Engine Power			
@ 100% Load	bkW (bhp)	999 (1340)	858 (1150)
@ 75% Load	bkW (bhp)	749 (1004)	643 (862)
Engine Speed	rpm	**1400**	**1200**
Max Altitude @ Rated Torque and 38°C (100°F)	m (ft)	304.8 (1000)	1219.2 (4000)
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	25	9.2
SCAC Temperature	°C (°F)	54 (130)	54 (130)
Emissions*			
NOx	g/bkW-hr (g/bhp-hr)	2.68 (2)	2.68 (2)
CO	g/bkW-hr (g/bhp-hr)	2.49 (1.86)	2.35 (1.75)
CO_2	g/bkW-hr (g/bhp-hr)	632 (471)	624 (466)
VOC**	g/bkW-hr (g/bhp-hr)	0.35 (0.26)	0.4 (0.3)
Fuel Consumption***			
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr)	10.48 (7405)	10.36 (7324)
@ 75% Load	MJ/bkW-hr (Btu/bhp-hr)	10.79 (7628)	10.76 (7605)
Heat Balance			
Heat Rejection to Jacket Water			
@ 100% Load	bkW (Btu/mn)	741 (42,123)	639 (36,343)
@ 75% Load	bkW (Btu/mn)	616.7 (35,075)	554 (31,480)
Heat Rejection to Aftercooler			
@ 100% Load	bkW (Btu/mn)	167.8 (9546)	131.9 (7509)
@ 75% Load	bkW (Btu/mn)	108.6 (6179)	72.2 (4108)
Heat Rejection to Exhaust			
@ 100% Load LHV to 25° C (77° F)	bkW (Btu/mn)	837.8 (47,643)	694.6 (39,536)
@ 75% Load LHV to 25° C (77° F)	bkW (Btu/mn)	630.4 (35,848)	524.1 (29,806)
Exhaust System			
Exhaust Gas Flow Rate			
@ 100% Load	m^3/min (cfm)	217.0 (7663)	182.9 (6460)
@ 75% Load	m^3/min (cfm)	163.8 (5785)	138.9 (4905)
Exhaust Stack Temperature			
@ 100% Load	°C (°F)	467.22 (873)	452.2 (846)
@ 75% Load	°C (°F)	467.22 (873)	450.5 (843)
Intake System			
Air Inlet Flow Rate			
@ 100% Load	m^3/min (scfm)	80.6 (2847)	69.5 (2453)
@ 75% Load	m^3/min (scfm)	60.8 (2147)	52.8 (1864)
Gas Pressure	kPag (psig)	241.5-275.8 (35-40)	241.5-275.8 (35-40)

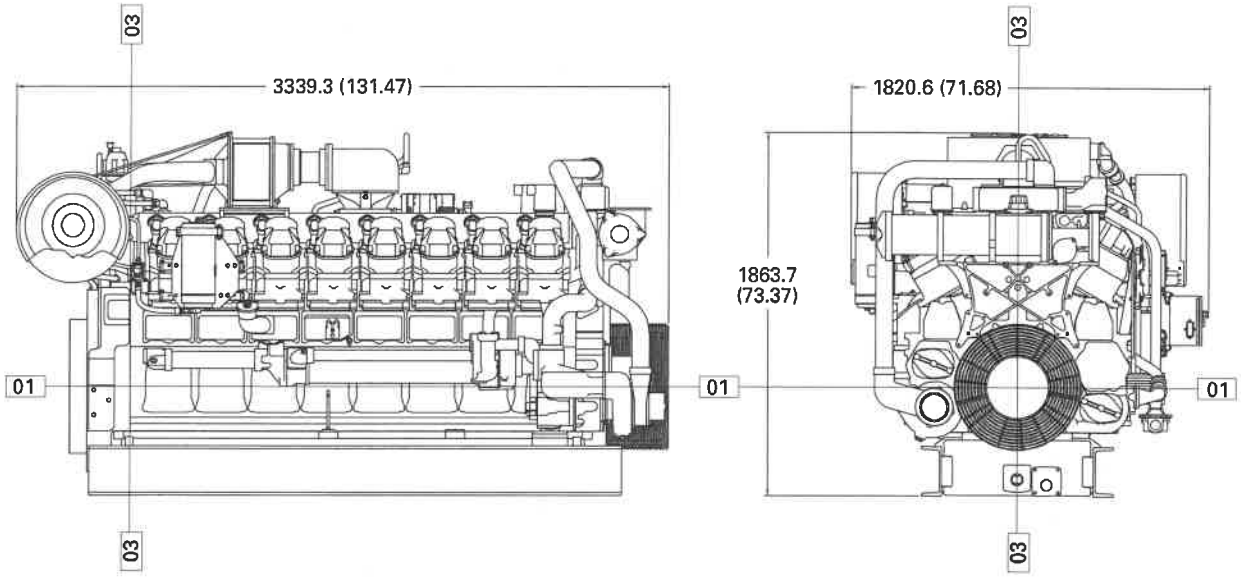
*at 100% load and speed, all values are listed as not to exceed
**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJJ
***ISO 3046/1

CATERPILLAR®

G3516 LE GAS PETROLEUM ENGINE

858-999 bkW (1150-1340 bhp)

GAS PETROLEUM ENGINE



DIMENSIONS		
Length	mm (in.)	3339.3 (131.47)
Width	mm (in.)	1820.6 (71.68)
Height	mm (in.)	1863.7 (73.37)
Shipping Weight	kg (lb)	8015 (17,670)

Note: General configuration not to be used for installation. See general dimension drawings for detail (drawing #289-2971).

Dimensions are in mm (inches).

RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

Transient response data is acquired from an engine/ generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

Conditions: Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in. Hg) and 15° C (59° F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in. Hg) and 15.6° C (60.1° F). Air flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and 25° C (77° F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and stack temperature.

Performance Numbers: DM8618-01, DM8620-01
LEHW0036-00 (11-09)
Supersedes LEHW6046-02

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES[a]
(SCC 2-02-002-54)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	4.08 E+00	B
NO_x[c] <90% Load	8.47 E-01	B
CO[c] 90 - 105% Load	3.17 E-01	C
CO[c] <90% Load	5.57 E-01	B
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	1.47 E+00	A
Methane[g]	1.25 E+00	C
VOC[h]	1.18 E-01	C
PM10 (filterable)[i]	7.71 E-05	D
PM2.5 (filterable)[i]	7.71 E-05	D
PM Condensable[j]	9.91 E-03	D
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[k]	<4.00 E-05	E
1,1,2-Trichloroethane[k]	<3.18 E-05	E
1,1-Dichloroethane	<2.36 E-05	E
1,2,3-Trimethylbenzene	2.30 E-05	D
1,2,4-Trimethylbenzene	1.43 E-05	C
1,2-Dichloroethane	<2.36 E-05	E
1,2-Dichloropropane	<2.69 E-05	E
1,3,5-Trimethylbenzene	3.38 E-05	D
1,3-Butadiene[k]	2.67E-04	D
1,3-Dichloropropene[k]	<2.64 E-05	E
2-Methylnaphthalene[k]	3.32 E-05	C
2,2,4-Trimethylpentane[k]	2.50 E-04	C
Acenaphthene[k]	1.25 E-06	C

GRI-HAPCalc ® 3.01
Engines Report

Facility ID:	**CHAPARRAL**	**Notes:**	**Caterpillar G3516 LE**
Operation Type:	**GAS PLANT**		
Facility Name:	**CHAPARRAL**		
User Name:			
Units of Measure:	**U.S. STANDARD**		

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

Engine Unit

Unit Name: G3516 LE Units 1000, 2000 and 5000

Hours of Operation:	8,760	Yearly
Rate Power:	1,151	hp
Fuel Type:	NATURAL GAS	
Engine Type:	4-Stroke, Lean Burn	
Emission Factor Set:	EPA > FIELD > LITERATURE	
Additional EF Set:	-NONE-	

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
Tetrachloroethane	0.0001	0.00000820 g/bhp-hr	EPA
Formaldehyde	1.9350	0.17425810 g/bhp-hr	EPA
Methanol	0.0916	0.00825090 g/bhp-hr	EPA
Acetaldehyde	0.3064	0.02759090 g/bhp-hr	EPA
1,3-Butadiene	0.0098	0.00088120 g/bhp-hr	EPA
Acrolein	0.1884	0.01696380 g/bhp-hr	EPA
Benzene	0.0161	0.00145220 g/bhp-hr	EPA
Toluene	0.0150	0.00134650 g/bhp-hr	EPA
Ethylbenzene	0.0015	0.00013100 g/bhp-hr	EPA
Xylenes(m,p,o)	0.0067	0.00060730 g/bhp-hr	EPA
2,2,4-Trimethylpentane	0.0092	0.00082510 g/bhp-hr	EPA
n-Hexane	0.0407	0.00366340 g/bhp-hr	EPA
Phenol	0.0009	0.00007920 g/bhp-hr	EPA
Styrene	0.0009	0.00007790 g/bhp-hr	EPA
Naphthalene	0.0027	0.00024550 g/bhp-hr	EPA
2-Methylnaphthalene	0.0012	0.00010960 g/bhp-hr	EPA
Acenaphthylene	0.0002	0.00001830 g/bhp-hr	EPA
Biphenyl	0.0078	0.00069970 g/bhp-hr	EPA
Acenaphthene	0.0000	0.00000410 g/bhp-hr	EPA
Fluorene	0.0002	0.00001870 g/bhp-hr	EPA
Phenanthrene	0.0004	0.00003430 g/bhp-hr	EPA
Ethylene Dibromide	0.0016	0.00014620 g/bhp-hr	EPA
Fluoranthene	0.0000	0.00000370 g/bhp-hr	EPA
Pyrene	0.0000	0.00000450 g/bhp-hr	EPA
Chrysene	0.0000	0.00000230 g/bhp-hr	EPA

Benzo(b)fluoranthene	0.0000	0.00000050 g/bhp-hr	EPA
Benzo(e)pyrene	0.0000	0.00000140 g/bhp-hr	EPA
Benzo(g,h,i)perylene	0.0000	0.00000140 g/bhp-hr	EPA
Vinyl Chloride	0.0005	0.00004920 g/bhp-hr	EPA
Methylene Chloride	0.0007	0.00006600 g/bhp-hr	EPA
1,1-Dichloroethane	0.0009	0.00007790 g/bhp-hr	EPA
1,3-Dichloropropene	0.0010	0.00008710 g/bhp-hr	EPA
Chlorobenzene	0.0011	0.00010030 g/bhp-hr	EPA
Chloroform	0.0010	0.00009410 g/bhp-hr	EPA
1,1,2-Trichloroethane	0.0012	0.00010500 g/bhp-hr	EPA
1,1,2,2-Tetrachloroethane	0.0015	0.00013200 g/bhp-hr	EPA
Carbon Tetrachloride	0.0013	0.00012110 g/bhp-hr	EPA
Total	2.6456		

Criteria Pollutants

PM	0.3660	0.03296090 g/bhp-hr	EPA
CO	11.6175	1.04620860 g/bhp-hr	EPA
NMEHC	4.3245	0.38944040 g/bhp-hr	EPA
NOx	149.5246	13.46539810 g/bhp-hr	EPA
SO2	0.0215	0.00194060 g/bhp-hr	EPA

Other Pollutants

Butryaldehyde	0.0037	0.00033330 g/bhp-hr	EPA
Chloroethane	0.0001	0.00000620 g/bhp-hr	EPA
Methane	45.8102	4.12542830 g/bhp-hr	EPA
Ethane	3.8481	0.34653600 g/bhp-hr	EPA
Propane	1.5356	0.13828440 g/bhp-hr	EPA
Butane	0.0198	0.00178550 g/bhp-hr	EPA
Cyclopentane	0.0083	0.00074920 g/bhp-hr	EPA
n-Pentane	0.0953	0.00858090 g/bhp-hr	EPA
Methylcyclohexane	0.0451	0.00405940 g/bhp-hr	EPA
1,2-Dichloroethane	0.0009	0.00007790 g/bhp-hr	EPA
1,2-Dichloropropane	0.0010	0.00008880 g/bhp-hr	EPA
n-Octane	0.0129	0.00115840 g/bhp-hr	EPA
1,2,3-Trimethylbenzene	0.0008	0.00007590 g/bhp-hr	EPA
1,2,4-Trimethylbenzene	0.0005	0.00004720 g/bhp-hr	EPA
1,3,5-Trimethylbenzene	0.0012	0.00011160 g/bhp-hr	EPA
n-Nonane	0.0040	0.00036300 g/bhp-hr	EPA
CO2	4,031.3017	363.03769350 g/bhp-hr	EPA

GRI-HAPCalc ® 3.01
Engines Report

Facility ID:	**G3516 LE**	**Notes:**
Operation Type:	**PRODUCTION**	
Facility Name:	**CHAPARRAL**	
User Name:		
Units of Measure:	**U.S. STANDARD**	

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

Engine Unit

Unit Name: Unit 6000 & Unit 7000

Hours of Operation:	8,760 Yearly
Rate Power:	1,340 hp
Fuel Type:	NATURAL GAS
Engine Type:	4-Stroke, Lean Burn
Emission Factor Set:	EPA > FIELD > LITERATURE
Additional EF Set:	-NONE-

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
Tetrachloroethane	0.0001	0.00000820 g/bhp-hr	EPA
Formaldehyde	2.2528	0.17425810 g/bhp-hr	EPA
Methanol	0.1067	0.00825090 g/bhp-hr	EPA
Acetaldehyde	0.3567	0.02759090 g/bhp-hr	EPA
1,3-Butadiene	0.0114	0.00088120 g/bhp-hr	EPA
Acrolein	0.2193	0.01696380 g/bhp-hr	EPA
Benzene	0.0188	0.00145220 g/bhp-hr	EPA
Toluene	0.0174	0.00134650 g/bhp-hr	EPA
Ethylbenzene	0.0017	0.00013100 g/bhp-hr	EPA
Xylenes(m,p,o)	0.0079	0.00060730 g/bhp-hr	EPA
2,2,4-Trimethylpentane	0.0107	0.00082510 g/bhp-hr	EPA
n-Hexane	0.0474	0.00366340 g/bhp-hr	EPA
Phenol	0.0010	0.00007920 g/bhp-hr	EPA
Styrene	0.0010	0.00007790 g/bhp-hr	EPA
Naphthalene	0.0032	0.00024550 g/bhp-hr	EPA
2-Methylnaphthalene	0.0014	0.00010960 g/bhp-hr	EPA
Acenaphthylene	0.0002	0.00001830 g/bhp-hr	EPA
Biphenyl	0.0090	0.00069970 g/bhp-hr	EPA
Acenaphthene	0.0001	0.00000410 g/bhp-hr	EPA
Fluorene	0.0002	0.00001870 g/bhp-hr	EPA
Phenanthrene	0.0004	0.00003430 g/bhp-hr	EPA
Ethylene Dibromide	0.0019	0.00014620 g/bhp-hr	EPA
Fluoranthene	0.0000	0.00000370 g/bhp-hr	EPA
Pyrene	0.0001	0.00000450 g/bhp-hr	EPA
Chrysene	0.0000	0.00000230 g/bhp-hr	EPA

Benzo(b)fluoranthene	0.0000	0.00000050 g/bhp-hr	EPA
Benzo(e)pyrene	0.0000	0.00000140 g/bhp-hr	EPA
Benzo(g,h,i)perylene	0.0000	0.00000140 g/bhp-hr	EPA
Vinyl Chloride	0.0006	0.00004920 g/bhp-hr	EPA
Methylene Chloride	0.0009	0.00006600 g/bhp-hr	EPA
1,1-Dichloroethane	0.0010	0.00007790 g/bhp-hr	EPA
1,3-Dichloropropene	0.0011	0.00008710 g/bhp-hr	EPA
Chlorobenzene	0.0013	0.00010030 g/bhp-hr	EPA
Chloroform	0.0012	0.00009410 g/bhp-hr	EPA
1,1,2-Trichloroethane	0.0014	0.00010500 g/bhp-hr	EPA
1,1,2,2-Tetrachloroethane	0.0017	0.00013200 g/bhp-hr	EPA
Carbon Tetrachloride	0.0016	0.00012110 g/bhp-hr	EPA
Total	3.0802		

Criteria Pollutants

PM	0.4261	0.03296090 g/bhp-hr	EPA
CO	13.5251	1.04620860 g/bhp-hr	EPA
NMEHC	5.0346	0.38944040 g/bhp-hr	EPA
NOx	174.0773	13.46539810 g/bhp-hr	EPA
SO2	0.0251	0.00194060 g/bhp-hr	EPA

Other Pollutants

Butryaldehyde	0.0043	0.00033330 g/bhp-hr	EPA
Chloroethane	0.0001	0.00000620 g/bhp-hr	EPA
Methane	53.3325	4.12542830 g/bhp-hr	EPA
Ethane	4.4799	0.34653600 g/bhp-hr	EPA
Propane	1.7877	0.13828440 g/bhp-hr	EPA
Butane	0.0231	0.00178550 g/bhp-hr	EPA
Cyclopentane	0.0097	0.00074920 g/bhp-hr	EPA
n-Pentane	0.1109	0.00858090 g/bhp-hr	EPA
Methylcyclohexane	0.0525	0.00405940 g/bhp-hr	EPA
1,2-Dichloroethane	0.0010	0.00007790 g/bhp-hr	EPA
1,2-Dichloropropane	0.0011	0.00008880 g/bhp-hr	EPA
n-Octane	0.0150	0.00115840 g/bhp-hr	EPA
1,2,3-Trimethylbenzene	0.0010	0.00007590 g/bhp-hr	EPA
1,2,4-Trimethylbenzene	0.0006	0.00004720 g/bhp-hr	EPA
1,3,5-Trimethylbenzene	0.0014	0.00011160 g/bhp-hr	EPA
n-Nonane	0.0047	0.00036300 g/bhp-hr	EPA
CO2	4,693.2617	363.03769350 g/bhp-hr	EPA

Engines 3000, 4000

- Waukesha L7042 GL manufacturer data
- AP-42 Table 3.2-2
- GRI-HAPCalc 3.01 output

ENVIRONMENTAL 9

AT-GL EMISSION LEVELS‡

MODEL	CARBURETOR SETTING	GRAMS/BHP-HR				% OBSERVED DRY		MASS AFR (2)	VOLUME AFR (2)	EXCESS AIR RATIO
		NOx (1)	CO	NMHC (4)	THC	CO	O_2			
AT25GL	Standard	1.0	2.25	1.0	8.0	0.06	9.8	28.0:1	16.8:1	1.74
AT27GL	Standard	1.5	1.7	0.5	5.0	0.06	9.8	28.0:1	16.8:1	1.74
	Ultra Lean	1.25	1.5	0.4	3.5	0.05	11.2	32.0:1	19.2:1	2.00

‡ The AT-GL emission levels are based on 900 – 1000 rpm operation. For information at all other speeds contact Waukesha's Sales Engineering Department.

VHP EMISSION LEVELS

MODEL	CARBURETOR SETTING	GRAMS/BHP-HR				% OBSERVED DRY		MASS AFR (2)	VOLUME AFR (2)	EXCESS AIR RATIO
		NOx (1)	CO	NMHC (4)	THC	CO	O_2			
G, GSI	Lowest Manifold (Best Power)	8.5	32.0	0.35	2.3	1.15	0.30	15.5:1	9.3:1	0.97
	Equal NOx & CO	12.0	12.0	0.35	2.3	0.45	0.30	15.9:1	9.6:1	0.99
	Catalytic Conv. Input (3-way(3))	13.0	9.0	0.30	2.0	0.38	0.30	15.95:1	9.6:1	0.99
	Standard (Best Economy)	22.0	1.5	0.25	1.5	0.02	1.35	17.0:1	10.2:1	1.06
F3524GSI, L7044GSI	Equal NOx & CO	14.0	14.0	0.25	1.1	0.45	0.30	15.85:1	9.5:1	0.99
	Catalytic Conv. Input (3-way(3))	15.0	13.0	0.20	1.0	0.38	0.30	15.95:1	9.6:1	0.99
	Standard (Best Economy)	23.0	2.0	0.20	0.8	0.02	1.35	17.0:1	10.2:1	1.06
L5794GSI	Equal NOx & CO	13.5	13.5	0.45	3.0	0.45	0.30	15.85:1	9.5:1	0.99
	Catalytic Conv. Input (3-way(3))	14.5	11.0	0.45	2.9	0.38	0.30	15.95:1	9.6:1	0.99
	Standard (Best Economy)	22.0	3.0	0.35	2.4	0.02	1.35	17.0:1	10.2:1	1.06
GL	Standard	1.5	2.65	1.0	5.5	0.06	9.8	28.0:1	16.8:1	1.74
L5774LT#	Standard	2.6	2.0	0.60	4.0	0.04	8.0	24.7:1	14.8:1	1.54
L5794LT#	Standard	2.6	2.0	0.60	4.0	0.04	7.8	24.5:1	14.7:1	1.52

L5774LT and L5794LT emission levels are based on 1000 – 1200 rpm operation. For information at all other speeds contact Waukesha's Sales Engineering Department.

NOTE: The above tables indicate emission levels that are valid for new engines for the duration of the standard warranty period and are attainable by an engine in good operating condition running on commercial quality natural gas of 900 BTU/ft^3 (35.38 MJ/m^3 [25, V(0; 101.325)]) SLHV, Waukesha Knock Index™ of 91 or higher, 93% methane content by volume, and at ISO standard conditions. Emissions are based on standard engine timing at 91 WKI™ with an absolute humidity of 42 grains/lb. Refer to engine specific WKI™ Power & Timing curves for standard timing. Unless otherwise noted these emission levels can be achieved across the continuous duty speed range and from 75% to 110% of the ISO Standard Power (continuous duty) rating. ***Contact your local Waukesha representative or Waukesha's Sales Engineering Department for emission values which can be obtained on a case-by-case basis for specific ratings, fuels, and site conditions.***

DRESSER Waukesha

L7042GL

VHP® Series Gas Engine Extender Series®
987 - 1480 BHP (736 - 1104 kWb)

Specifications

Cylinders: V12
Piston Displacement: 7040 cu. in. (115 L)
Bore & Stroke: 9.375" x 8.5" (238 x 216 mm)
Compression Ratio: 10.5:1
Jacket Water System Capacity: 100 gal. (379 L)
Lube Oil Capacity: 190 gal. (719 L)
Starting System: 125 - 150 psi air/gas 24/32V electric
Dry Weight: 21,000 lb. (9525 kg)

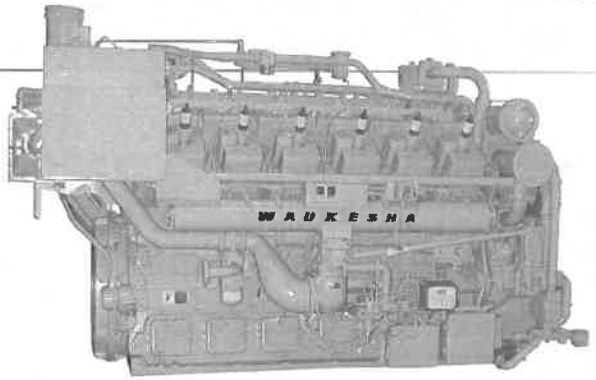


Image may not be an accurate representation of this model

Standard Equipment

AIR CLEANER – Two, 3" dry type filter with hinged rain shield and service indicator.

BARRING DEVICE – Manual.

BATTERY BOX – Ship loose battery box designed to accommodate two series 31 12 VDC batteries. Includes power disconnect switch and 20 foot (6.1 m) cable for connection to ESM Power Distribution Box.

BEARINGS – Heavy duty, replaceable, precision type.

BREATHER – Self regulating, closed system.

CONNECTING RODS – Drop forged steel, rifle drilled.

CONTROL SYSTEM – Waukesha Engine System Manager (ESM) integrates spark timing control, speed governing, detonation detection, start-stop control, diagnostic tools, fault logging and engine safeties. Engine Control Unit (ECU) is central brain of the control system and main customer interface. Interface with ESM is through 25 foot (7.6 m) harness to local panel, through MODBUS RTU slave connection RS-485 multidrop hardware, and through the Electronic Service Program (ESP). Customer connections are only required to the local panel, fuel valve, and 24V DC power supply. Compatible with Woodward load sharing module. ESM meets Canadian Standards Association Class I, Division 2, Group A, B, C & D (Canada & US) hazardous location requirements. ESM controlled prechamber logic.

CRANKCASE – Integral crankcase and cylinder frame. Main bearing caps drilled and tapped for temperature sensors. Does not include sensors.

CRANKSHAFT – Counterweighted, forged steel, seven main bearings, and dynamically balanced.

CYLINDERS – Removable bainitic cast iron wet type cylinder liners, chrome plated on outer diameter.

CYLINDER HEADS – Twelve interchangeable. Two hard faced intake and two hard faced exhaust valves per cylinder. Hard faced intake and exhaust valve seat inserts. Roller valve lifters and hydraulic push rods. Includes prechamber and related fuel control valves.

ELECTRONIC SERVICE PROGRAM (ESP) – Microsoft® Windows-based program provided on CD-ROM for programming and interface to ESM. Includes E-Help for troubleshooting any ESM faults. Serial harness is provided for connection of a customer supplied laptop to the ECU RS-232 port.

ENGINE ROTATION – Counterclockwise when facing flywheel.

ENGINE MONITORING DEVICES – Factory mounted and wired sensors for lube oil pressure and temperature; intake manifold temperature and pressure; overspeed; and jacket water temperature; all accessible through ESM®. ESM continually monitors combustion performance through accelerometers to provide detonation protection. Dual magnetic pick-ups are used for accurate engine speed monitoring. ESM provides predictive spark plug diagnostics as well as advanced diagnostics of engine and all ESM sensors and logs any faults into non-volatile flash memory. Sensors meet Canadian Standards Association Class 1, Division 2, Group A, B, C, & D (Canada & US) hazardous location requirements.

EXHAUST THERMOCOUPLES – 14 K-type thermocouples. One for each individual cylinder and one pre-turbine for each bank and 25 foot (7.6 m) harness.

EXHAUST OUTLET – Single vertical at rear. Flexible stainless steel connection with 8" (203 mm) pipe flange.

FLYWHEEL – Approx. WR^2 = 155000 lb-in²; with ring gear (208 teeth), machined to accept two drive adapters: 31.88" (810 mm) pilot bore, 30.25" (768 mm) bolt circle, (12) 0.75"–10 tapped holes; or 28.88" (734 mm) pilot bore, 27.25" (692 mm) bolt circle, (12) 0.625"–11 tapped holes and (12) 0.75"–10 tapped holes.

FLYWHEEL HOUSING – No. 00 SAE.

FUEL SYSTEM – Single 3" ANSI flange fuel inlet connection. Dual natural gas, 4" (102 mm) duplex updraft carburetors. Two mounted Fisher 99, 2" (51 mm) gas regulators, 43 – 60 psi (296 – 414 kPa) gas inlet pressure required. Prechamber fuel system and control logic. 10 foot (3 m) harness provided for ESM control of customer supplied fuel shutoff valve.

GOVERNOR – Electric throttle actuator controlled by ESM with throttle position feedback. Governor tuning is performed using ESP. ESM includes option of a load-coming feature to improve engine response to step loads.

IGNITION SYSTEM – Ignition Power Module (IPM) controlled by ESM, with spark timing optimized for any speed-load condition. Dual voltage energy levels automatically controlled by ESM to maximize spark plug life.

INTERCOOLER – Air–to–water.

LEVELING BOLTS

LIFTING EYES – Requires 9.5 ton Working Load Limit (W.L.L.) anchor shackles.

LUBRICATION – Full pressure, gear type pump. Engine mounted full flow lube oil micro-fiberglass filters with mounted differential pressure gauge. MICROSPIN® bypass filter, engine mounted. Air/gas motor driven prelube pump, requires final piping.

MANIFOLDS – Exhaust, (2) water cooled.

OIL COOLER – Shell and tube type, with thermostatic temperature controller and pressure regulating valve. Factory mounted.

OIL PAN – Deep sump type. 190 gallon (719 L) capacity including filter and cooler.

PAINT – Oilfield orange primer.

PISTONS – Aluminum with floating pin. Oil cooled.

SHIPPING SKID –For domestic truck or rail.

TURBOCHARGERS – Two, dry type. Wastegate controlled.

VIBRATION DAMPER – Two, viscous type. Guard included with remote mounted radiator or no radiator.

WATER CIRCULATING SYSTEM, AUXILIARY CIRCUIT – Belt driven water circulating high capacity pump for intercooler and lube oil cooler. See S6543-38 performance curve for use with standard 10" diameter crankshaft pulley. Includes thermostatic valve.

WATER CIRCULATING SYSTEM, ENGINE JACKET – Belt driven water circulating pump, cluster type thermostatic temperature regulating valve, full flow bypass type. Flange connections and mating flanges for (2) 4" (102 mm) inlets and (1) 5" (127 mm) outlet.

POWER RATINGS: L7042GL VHP Series Gas Engines

Model	C.R.	Bore & Stroke in. (mm)	Displ. cu. in. (litres)	Brake Horsepower (kWb Output) 130°F (54°C) I.C. Water Temperature							
				1200 RPM		1000 RPM		900 RPM		800 RPM	
				C	I	C	I	C	I	C	I
L7042GL	10.5:1	9.375" x 8.5" (238 x 216)	7040 (115)	1480 (1104)	1626 (1213)	1233 (920)	1355 (1010)	1110 (830)	1219 (909)	987 (736)	1084 (808)

		1200 rpm		1000 rpm	
		C	I	C	I
	Power bhp (kWb)	1480 (1104)	1626 (1213)	1233 (919)	1355 (1010)
	BSFC (LHV) Btu/bhp-hr (kJ/kWh)	7157 (10128)	7031 (9948)	7036 (9958)	6759 (9567)
	Fuel Consumption Btu/hr x 1000 (kW)	10592 (3106)	11433 (3352)	8675 (2542)	9159 (2684)
Emissions	NOx g/bhp-hr (mg/nm³ @ 5% O_2)	1.50 (607)	1.50 (607)	1.50 (607)	1.50 (607)
Emissions	CO g/bhp-hr (mg/nm³ @ 5% O_2)	2.70 (1073)	2.70 (1073)	2.70 (1073)	2.70 (1073)
Emissions	THC g/bhp-hr (mg/nm³ @ 5% O_2)	5.50 (2227)	5.50 (2227)	5.50 (2227)	5.50 (2227)
Emissions	NMHC g/bhp-hr (mg/nm³ @ 5% O_2)	1.00 (405)	1.00 (405)	1.00 (405)	1.00 (405)
Heat Balance	Heat to Jacket Water Btu/hr x 1000 (kW)	2834 (830)	3010 (882)	2351 (689)	2400 (703)
Heat Balance	Heat to Lube Oil Btu/hr x 1000 (kW)	432 (127)	449 (132)	355 (104)	358 (105)
Heat Balance	Heat to Intercooler Btu/hr x 1000 (kW)	547 (160)	616 (181)	451 (132)	452 (132)
Heat Balance	Heat to Radiation Btu/hr x 1000 (kW)	336 (99)	332 (97)	310 (91)	308 (90)
Heat Balance	Total Exhaust Heat Btu/hr x 1000 (kW)	3073 (901)	3370 (988)	2394 (702)	2580 (756)
Intake/ Exhaust System	Induction Air Flow scfm (Nm³/hr)	3699 (5685)	3800 (6110)	3029 (4656)	3045 (4896)
Intake/ Exhaust System	Exhaust Flow lb/hr (kg/hr)	16050 (7281)	17200 (7802)	13145 (5963)	13825 (6271)
Intake/ Exhaust System	Exhaust Temperature °F (°C)	710 (376)	719 (382)	669 (354)	683 (362)

Typical heat data is shown, however no guarantee is expressed or implied. Consult your Dresser Waukesha Application Engineering Department for system application assistance.

All natural gas engine ratings are based on a fuel of 900 Btu/ft³ (35.3 MJ/nm³) SLHV, with a 91 WKI®. For conditions or fuels other than standard, consult the Dresser Waukesha Application Engineering Department.

Data based on standard conditions of 77°F (25°C) ambient temperature, 29.53 inches Hg (100kPa) barometric pressure, 30% relative humidity (0.3 inches HG / 1 kPa water vapor pressure).

Fuel consumption based on ISO3046/1-1995 with a tolerance of +5% for commercial quality natural gas having a 900 BTU/ft³ (35.3 MJ/nm³) SLHV.

Heat data based on fuel consumption +2%.

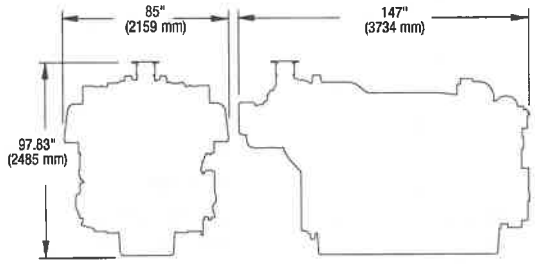
Heat rejection based on cooling exhaust temperature to 77°F (25°C).

Rating Standard: All models - Ratings are based on ISO 3046/1-1986 with mechanical efficiency of 90% and Tcra (clause 10.1) as specified above limited to ± 10° F (5° C). Ratings are also valid for SAE J1349, BS5514, DIN6271 and AP17B-11C standard atmospheric conditions.

C = ISO Standard Power/Continuous Power Rating: The highest load and speed which can be applied 24 hours per day, seven days per week, 365 days per year except for normal maintenance. It is permissible to operate the engine at up to 10% overload, or a maximum load indicated by the intermittent rating, whichever is lower, for two hours in every 24 hour period.

I = Intermittent Service Rating: The highest load and speed that can be applied in variable speed mechanical system application only. Operation at this rating is limited to a maximum of 3500 hours per year.

Consult your local Waukesha representative for system application assistance. The manufacturer reserves the right to change or modify without notice, the design or equipment specifications as herein set forth without incurring any obligation either with respect to equipment previously sold or in the process of construction except where otherwise specifically guaranteed by the manufacturer.



Dresser, Inc.
Dresser Waukesha
1101 West St. Paul Avenue
Waukesha, WI 53188-4999
T. 262 547 3311
F. 262 549 2795

DRESSER Waukesha

Bulletin 7005 0710

www.dresser.com/waukesha

GE Power & Water
Distributed Power

Waukesha* gas engines

power ratings summary

natural gas fueled continuous duty engine ratings for oilfield power generation, gas compression, and mechanical drives

Gas compression & mechanical drives								Oilfield power generation				
Lean- burn engines				Rich-burn engines				Lean- burn engines				
Model	RPM	BHP	kWb	Model	RPM	BHP	kWb	Model	Hz/RPM	kWe	Hz/RPM	kWe
16V275GL+	1000	4835	3605	P9394GSI	1200	2250	1678	16V275GL+	60/900	3110	50/1000	3480
12V275GL+	1000	3625	2703	P9390GSI	1200	1980	1476	12V275GL+	60/900	2330	50/1000	2600
P9390GL	1200	1980	1476	L7044GSI	1200	1680	1253	VHP9500GL	60/1200	1400	50/1000	1175
L7042GL	1200	1480	1104	L7042GSI S4	1200	1480	1104	VHP7100GL	60/1200	1050	50/1000	875
L5794LT	1200	1450	1081	L7044G	1200	920	686	VHP5904LT	60/1200	1025	50/1000	900
L5774LT	1200	1280	954	L5794GSI	1200	1380	1029	VGF48GL	60/1800	830	50/1500	685
P48GL	1800	1065	800	F3524GSI	1200	840	626	VGF36GL	60/1800	620	50/1500	515
L36GL	1800	800	600	F3514GSI	1200	740	552	VGF24GL	60/1800	415	50/1500	340
H24GL	1800	530	400	F3524G	1200	460	343	VGF18GL	60/1800	310	50/1500	250
F18GL	1800	400	300	P48GSI	1800	1065	800	Rich- burn engines				
				L36GSI	1800	800	600	VHP9504GSI	60/1200	1600	50/1000	1460
				H24GSI	1800	530	400	VHP9500GSI	60/1200	1400	50/1000	1175
				F18GSI	1800	400	300	VHP7104GSI	60/1200	1200	50/1000	1100
								VHP7104GSI-EPA	60/1200	1200	—	—
								VH7104GSI-MOB	—	—	50/1000	1100
								VHP7100GSI S4	60/1200	1050	50/1000	875
								VHP5904GSI	60/1200	980	50/1000	900
								VHP5904GSI-EPA	60/1200	980	—	—
								VHP5904GSI-MOB	—	—	50/1000	900
								VHP3604GSI	60/1200	600	50/1000	540
								VGF48GSI	60/1800	750	50/1500	625
								VGF36GSI	60/1800	560	50/1500	475
								VGF24GSI	60/1800	375	50/1500	310
								VGF18GSI	60/1800	280	50/1500	230

GE Power & Water manufactures Waukesha spark ignited gaseous fueled engines and Enginator* systems for gas compression, electric power generation, cogeneration and mechanical drive applications — ranging in output from 400 to 4835 bhp (300 - 3605 kWb).

Notes:

- Additional Ratings at speeds not shown are available.
- Rating Standard: All models: Ratings conform to ISO 3046/1 (latest version) with a mechanical efficiency of 90% and auxiliary water temperature, Tcra, as specified in the Power Ratings 18900 (latest version) limited to ±10° F (±5.5° C). Ratings are also valid for SAE J1349, BS 5514, DIN 6271 and API 7B-11C standard atmospheric reference conditions.
- For intermittent, reduced speed, alternate fuel, and other site condition power ratings, see Power Ratings 18900 or consult GE Power & Water's Waukesha team.

* Trademark of General Electric Company

BASIC FORMULAS

$°F = (°C \times 1.8) + 32$

$°C = \frac{(°F - 32)}{1.8}$

$BMEP_{(psi)} = \frac{792{,}000 \times BHP}{\text{Displacement (cu.in.)} \times \text{rpm}}$

$BMEP_{(bar)} = \frac{kWb \times 1200}{\text{Displacement (litres)} \times \text{rpm}}$

PREFIX DESIGNATIONS

Number of cylinders except 275GL* (which states actual number of cylinders).

P = 16 H = 8
L = 12 F = 6

SUFFIX DESIGNATIONS

G = Naturally aspirated
GSI = Turbocharged intercooled
GSID = Turbocharged intercooled draw-thru
GL = Turbocharged intercooled lean burn
LT = Lean combustion turbulence
GLD = Turbocharged intercooled lean burn draw-thru
LTD = Lean combustion turbulence draw-thru
EPA = United States Environmental Protection Agency (EPA) certified
MOB = Mobile, non-certified, Non-North America

DISPLACEMENT

Model	Displacement cu. in.	litres
275GL*		
16V275GL+	17398	285
12V275GL+	13048	214
VHP*		
P9390/P9394	9388	154
L7042/L7044	7040	116
L5794	5788	95
F3514/F3524	3520	58
VGF*		
P48	2924	48
L36	2193	36
H24	1462	24
F18	1096	18

Waukesha gas engines

Built to perform reliably in mission-critical and demanding oil and gas applications

With more than a century of innovation and engine-building expertise, Waukesha gas engines are designed and built to perform reliably in isolated, mission-critical, demanding applications in oil and gas fields the world over.

Waukesha natural gas-fired engines drive compressors and electrical generators featuring extended maintenance intervals, fuel flexibility, and rich-burn, lean-burn alternatives for optimal fuel efficiency at varying emissions compliance levels.

Reliable

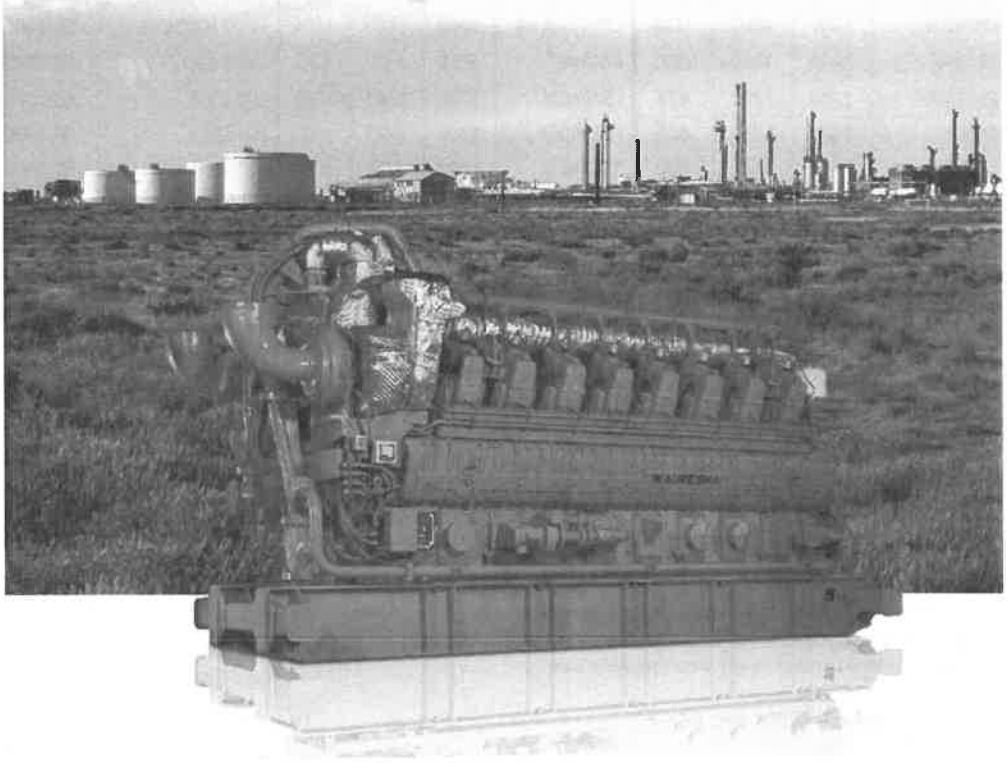
- Able to keep running on varying fuel quality
- More power at high altitudes/ambients

Low Emissions

- Both rich-burn and lean-burn models available to better match project requirements

Increased Uptime

- Extended oil change intervals
- Longer periods between servicing
- Simple controls and communications



GE Power & Water
Find your local support online:
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GEA-19144 1114

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES[a]
(SCC 2-02-002-54)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	4.08 E+00	B
NO_x[c] <90% Load	8.47 E-01	B
CO[c] 90 - 105% Load	3.17 E-01	C
CO[c] <90% Load	5.57 E-01	B
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	1.47 E+00	A
Methane[g]	1.25 E+00	C
VOC[h]	1.18 E-01	C
PM10 (filterable)[i]	7.71 E-05	D
PM2.5 (filterable)[i]	7.71 E-05	D
PM Condensable[j]	9.91 E-03	D
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[k]	<4.00 E-05	E
1,1,2-Trichloroethane[k]	<3.18 E-05	E
1,1-Dichloroethane	<2.36 E-05	E
1,2,3-Trimethylbenzene	2.30 E-05	D
1,2,4-Trimethylbenzene	1.43 E-05	C
1,2-Dichloroethane	<2.36 E-05	E
1,2-Dichloropropane	<2.69 E-05	E
1,3,5-Trimethylbenzene	3.38 E-05	D
1,3-Butadiene[k]	2.67E-04	D
1,3-Dichloropropene[k]	<2.64 E-05	E
2-Methylnaphthalene[k]	3.32 E-05	C
2,2,4-Trimethylpentane[k]	2.50 E-04	C
Acenaphthene[k]	1.25 E-06	C

GRI-HAPCalc ® 3.01
Engines Report

Facility ID:	**CHAPARRAL**	**Notes:**	**Waukesha**
Operation Type:	**GAS PLANT**		
Facility Name:	**CHAPARRAL**		
User Name:			
Units of Measure:	**U.S. STANDARD**		

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

Engine Unit

Unit Name: L7042 GL Units 3000 and 4000

Hours of Operation:	8,760	Yearly
Rate Power:	1,547	hp
Fuel Type:	NATURAL GAS	
Engine Type:	4-Stroke, Lean Burn	
Emission Factor Set:	EPA > FIELD > LITERATURE	
Additional EF Set:	-NONE-	

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
Tetrachloroethane	0.0001	0.00000820 g/bhp-hr	EPA
Formaldehyde	2.6008	0.17425810 g/bhp-hr	EPA
Methanol	0.1231	0.00825090 g/bhp-hr	EPA
Acetaldehyde	0.4118	0.02759090 g/bhp-hr	EPA
1,3-Butadiene	0.0132	0.00088120 g/bhp-hr	EPA
Acrolein	0.2532	0.01696380 g/bhp-hr	EPA
Benzene	0.0217	0.00145220 g/bhp-hr	EPA
Toluene	0.0201	0.00134650 g/bhp-hr	EPA
Ethylbenzene	0.0020	0.00013100 g/bhp-hr	EPA
Xylenes(m,p,o)	0.0091	0.00060730 g/bhp-hr	EPA
2,2,4-Trimethylpentane	0.0123	0.00082510 g/bhp-hr	EPA
n-Hexane	0.0547	0.00366340 g/bhp-hr	EPA
Phenol	0.0012	0.00007920 g/bhp-hr	EPA
Styrene	0.0012	0.00007790 g/bhp-hr	EPA
Naphthalene	0.0037	0.00024550 g/bhp-hr	EPA
2-Methylnaphthalene	0.0016	0.00010960 g/bhp-hr	EPA
Acenaphthylene	0.0003	0.00001830 g/bhp-hr	EPA
Biphenyl	0.0104	0.00069970 g/bhp-hr	EPA
Acenaphthene	0.0001	0.00000410 g/bhp-hr	EPA
Fluorene	0.0003	0.00001870 g/bhp-hr	EPA
Phenanthrene	0.0005	0.00003430 g/bhp-hr	EPA
Ethylene Dibromide	0.0022	0.00014620 g/bhp-hr	EPA
Fluoranthene	0.0001	0.00000370 g/bhp-hr	EPA
Pyrene	0.0001	0.00000450 g/bhp-hr	EPA
Chrysene	0.0000	0.00000230 g/bhp-hr	EPA

Benzo(b)fluoranthene	0.0000	0.00000050 g/bhp-hr	EPA
Benzo(e)pyrene	0.0000	0.00000140 g/bhp-hr	EPA
Benzo(g,h,i)perylene	0.0000	0.00000140 g/bhp-hr	EPA
Vinyl Chloride	0.0007	0.00004920 g/bhp-hr	EPA
Methylene Chloride	0.0010	0.00006600 g/bhp-hr	EPA
1,1-Dichloroethane	0.0012	0.00007790 g/bhp-hr	EPA
1,3-Dichloropropene	0.0013	0.00008710 g/bhp-hr	EPA
Chlorobenzene	0.0015	0.00010030 g/bhp-hr	EPA
Chloroform	0.0014	0.00009410 g/bhp-hr	EPA
1,1,2-Trichloroethane	0.0016	0.00010500 g/bhp-hr	EPA
1,1,2,2-Tetrachloroethane	0.0020	0.00013200 g/bhp-hr	EPA
Carbon Tetrachloride	0.0018	0.00012110 g/bhp-hr	EPA
Total	3.5563		

Criteria Pollutants

PM	0.4919	0.03296090 g/bhp-hr	EPA
CO	15.6145	1.04620860 g/bhp-hr	EPA
NMEHC	5.8123	0.38944040 g/bhp-hr	EPA
NOx	200.9684	13.46539810 g/bhp-hr	EPA
SO2	0.0290	0.00194060 g/bhp-hr	EPA

Other Pollutants

Butryaldehyde	0.0050	0.00033330 g/bhp-hr	EPA
Chloroethane	0.0001	0.00000620 g/bhp-hr	EPA
Methane	61.5712	4.12542830 g/bhp-hr	EPA
Ethane	5.1720	0.34653600 g/bhp-hr	EPA
Propane	2.0639	0.13828440 g/bhp-hr	EPA
Butane	0.0266	0.00178550 g/bhp-hr	EPA
Cyclopentane	0.0112	0.00074920 g/bhp-hr	EPA
n-Pentane	0.1281	0.00858090 g/bhp-hr	EPA
Methylcyclohexane	0.0606	0.00405940 g/bhp-hr	EPA
1,2-Dichloroethane	0.0012	0.00007790 g/bhp-hr	EPA
1,2-Dichloropropane	0.0013	0.00008880 g/bhp-hr	EPA
n-Octane	0.0173	0.00115840 g/bhp-hr	EPA
1,2,3-Trimethylbenzene	0.0011	0.00007590 g/bhp-hr	EPA
1,2,4-Trimethylbenzene	0.0007	0.00004720 g/bhp-hr	EPA
1,3,5-Trimethylbenzene	0.0017	0.00011160 g/bhp-hr	EPA
n-Nonane	0.0054	0.00036300 g/bhp-hr	EPA
CO2	5,418.2656	363.03769350 g/bhp-hr	EPA

DEHY-1 and DEHY-2

- AP-42 Tables 1.4-1 and 1.4-2
- Promax output

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 $lb/10^6$ 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 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. 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.

Bryan Research & Engineering, Inc.

ProMax® 4.0

Simulation Report

Project: Amine & TEG System - Permitting - with H2S 7.18.17.pmx

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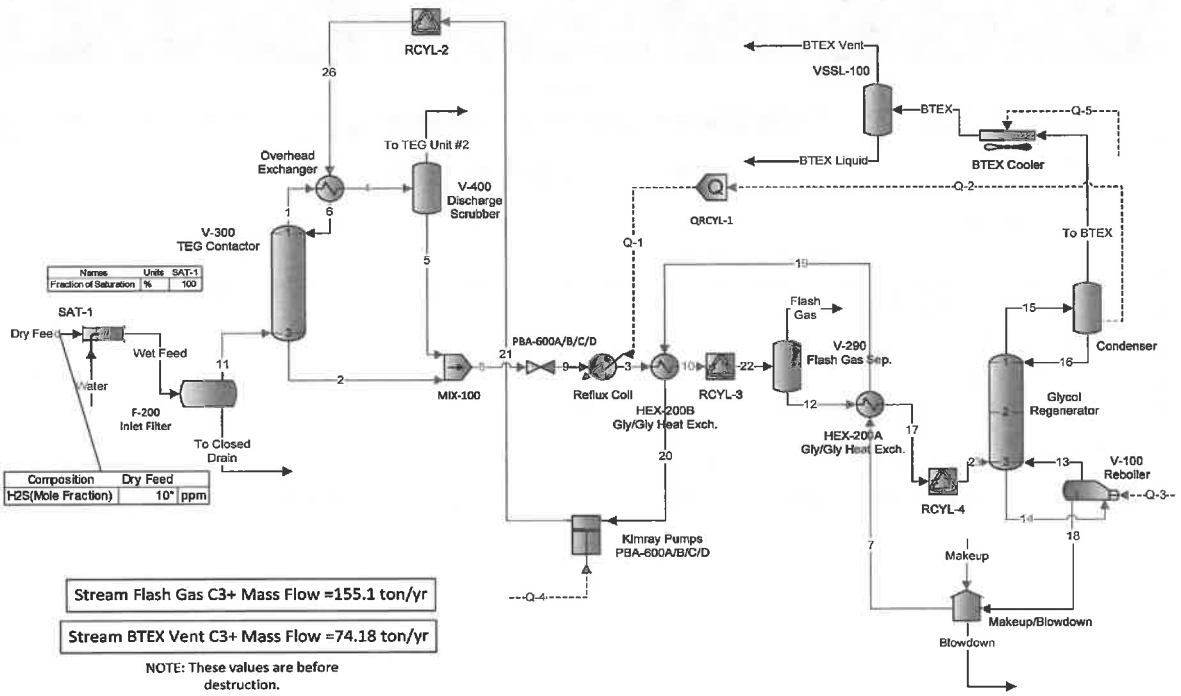
Client Name: Enterprise Products
Location: Chaparral
Job: Amine & TEG Environmental Models Updated 7.18.17

ProMax Filename: O:\EPCO\Process Technology\Jenessa Duncan\Chaparral Environmental\Models\Permitting\Rev. 3\Amine & TEG System - Permitting - with H2S 7.18.17.pmx
ProMax Version: 4.0.16071.0
Simulation Initiated: 7/16/2017 12:36:15 PM

Bryan Research & Engineering, Inc.
Chemical Engineering Consultants
P.O. Box 4747 Bryan, Texas 77805
Office: (979) 776-5220
FAX: (979) 776-4818
mailto:sales@bre.com
http://www.bre.com/

Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.

Chaparral TEG Unit 1



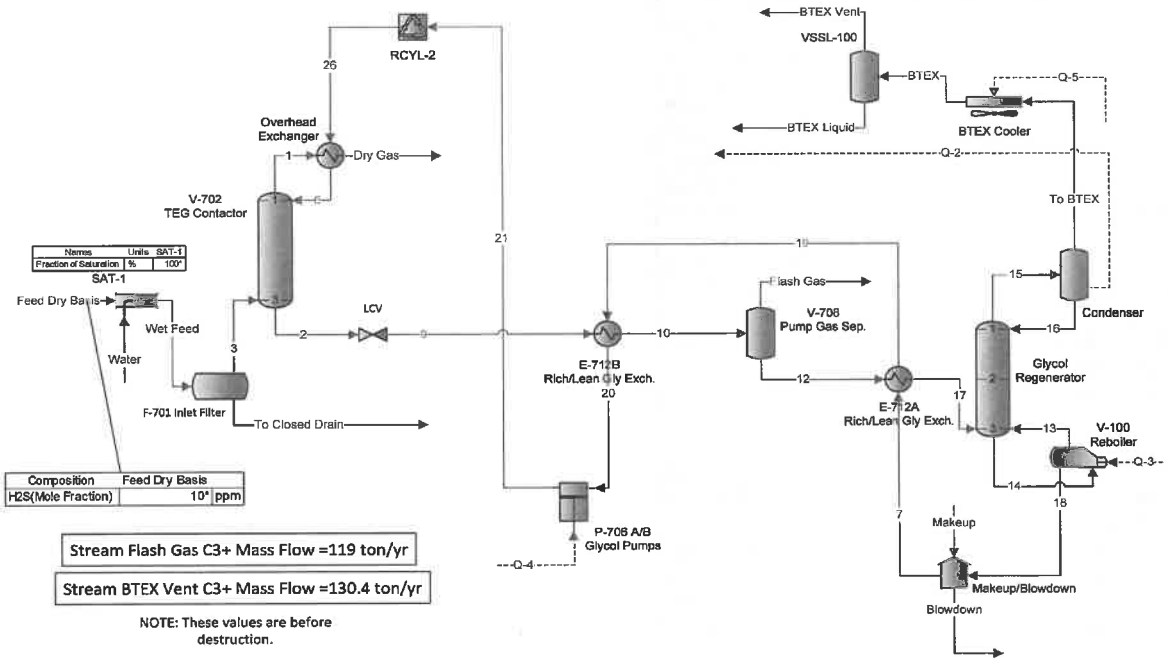
Stream Flash Gas C3+ Mass Flow =155.1 ton/yr

Stream BTEX Vent C3+ Mass Flow =74.18 ton/yr

NOTE: These values are before destruction.

Process Streams		BTEX Vent
Composition	Status:	Solved
Phase: Total	From Block:	VSSL-100
	To Block:	--
Mass Flow		lb/h
H2S		0.0158832
N2		0.00270781
CO2		0.931430
C1		0.834886
C2		1.75485
C3		3.09919
iC4		0.500457
nC4		1.97263
2,2-Dimethylpropane		0.00612728
iC5		0.842995
nC5		1.01250
2,2-Dimethylbutane		0.0157939
Cyclopentane		0
2,3-Dimethylbutane		0.143811
2-Methylpentane		0.297938
3-Methylpentane		0.203849
nC6		0.366447
Methylcyclopentane		0.938352
Benzene		4.37398
Cyclohexane		0.807924
2-Methylhexane		0.0475313
3-Methylhexane		0.0606760
2,2,4-Trimethylpentane		0
nC7		0.223874
Methylcyclohexane		0.384600
Toluene		1.43367
nC8		0.0744679
Ethylbenzene		0
m-Xylene		0.0419108
p-Xylene		0.0396539
o-Xylene		0.0381730
n-C9		0.0105773
n-Decane		0
H2O		0.880706
TEG		3.80709E-08

Chaparral TEG Unit 2



Process Streams		BTEX Vent
Composition	Status:	Solved
Phase: Total	From Block:	VSSL-100
	To Block:	--
Mass Flow		lb/h
H2S		0.0258602
N2		0.00352548
CO2		1.84064
C1		1.33067
C2		3.14414
C3		5.83906
iC4		0.993505
nC4		3.98885
2,2-Dimethylpropane		0.0126449
iC5		1.67900
nC5		1.96386
2,2-Dimethylbutane		0.0268380
Cyclopentane		0
2,3-Dimethylbutane		0.262883
2-Methylpentane		0.534667
3-Methylpentane		0.347326
nC6		0.652842
Methylcyclopentane		1.47358
Benzene		6.97916
Cyclohexane		1.21388
2-Methylhexane		0.0762048
3-Methylhexane		0.102331
2,2,4-Trimethylpentane		0
nC7		0.370390
Methylcyclohexane		0.568406
Toluene		1.94454
nC8		0.0959663
Ethylbenzene		0.0569326
m-Xylene		0.301506
p-Xylene		0.287396
o-Xylene		0
n-C9		0.00854626
n-Decane		0
H2O		1.56091
TEG		1.81690E-07

GRI-HAPCalc ® 3.01
External Combustion Devices Report

Facility ID:	**CHAPARRAL GP**	**Notes:**
Operation Type:	**GAS PLANT**	
Facility Name:	**CHAPARRAL GAS PLANT**	
User Name:		
Units of Measure:	**U.S. STANDARD**	

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

External Combustion Devices

Unit Name: DEHY-1

Hours of Operation:	8,760 Yearly
Heat Input:	2.0 MMBtu/hr
Fuel Type:	NATURAL GAS
Device Type:	HEATER
Emission Factor Set:	FIELD > EPA > LITERATURE
Additional EF Set:	-NONE-

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
3-Methylcholanthrene	0.0000	0.0000000018 lb/MMBtu	EPA
7,12-Dimethylbenz(a)anthracene	0.0000	0.0000000157 lb/MMBtu	EPA
Formaldehyde	0.0074	0.0008440090 lb/MMBtu	GRI Field
Methanol	0.0084	0.0009636360 lb/MMBtu	GRI Field
Acetaldehyde	0.0065	0.0007375920 lb/MMBtu	GRI Field
1,3-Butadiene	0.0030	0.0003423350 lb/MMBtu	GRI Field
Benzene	0.0066	0.0007480470 lb/MMBtu	GRI Field
Toluene	0.0089	0.0010163310 lb/MMBtu	GRI Field
Ethylbenzene	0.0185	0.0021128220 lb/MMBtu	GRI Field
Xylenes(m,p,o)	0.0116	0.0013205140 lb/MMBtu	GRI Field
2,2,4-Trimethylpentane	0.0249	0.0028417580 lb/MMBtu	GRI Field
n-Hexane	0.0123	0.0014070660 lb/MMBtu	GRI Field
Phenol	0.0000	0.0000001070 lb/MMBtu	GRI Field
Styrene	0.0182	0.0020788960 lb/MMBtu	GRI Field
Naphthalene	0.0000	0.0000005100 lb/MMBtu	GRI Field
2-Methylnaphthalene	0.0000	0.0000001470 lb/MMBtu	GRI Field
Acenaphthylene	0.0000	0.0000000670 lb/MMBtu	GRI Field
Biphenyl	0.0000	0.0000004730 lb/MMBtu	GRI Field
Acenaphthene	0.0000	0.0000000900 lb/MMBtu	GRI Field
Fluorene	0.0000	0.0000000800 lb/MMBtu	GRI Field
Anthracene	0.0000	0.0000000870 lb/MMBtu	GRI Field
Phenanthrene	0.0000	0.0000000600 lb/MMBtu	GRI Field
Fluoranthene	0.0000	0.0000000900 lb/MMBtu	GRI Field
Pyrene	0.0000	0.0000000830 lb/MMBtu	GRI Field
Benz(a)anthracene	0.0000	0.0000000870 lb/MMBtu	GRI Field

Chrysene	0.0000	0.0000001170	lb/MMBtu	GRI Field
Benzo(a)pyrene	0.0000	0.0000000700	lb/MMBtu	GRI Field
Benzo(b)fluoranthene	0.0000	0.0000001500	lb/MMBtu	GRI Field
Benzo(k)fluoranthene	0.0000	0.0000007600	lb/MMBtu	GRI Field
Benzo(g,h,i)perylene	0.0000	0.0000002600	lb/MMBtu	GRI Field
Indeno(1,2,3-c,d)pyrene	0.0000	0.0000001200	lb/MMBtu	GRI Field
Dibenz(a,h)anthracene	0.0000	0.0000001030	lb/MMBtu	GRI Field
Lead	0.0000	0.0000004902	lb/MMBtu	EPA
Total	0.1263			

Criteria Pollutants

VOC	0.0472	0.0053921569	lb/MMBtu	EPA
PM	0.0653	0.0074509804	lb/MMBtu	EPA
PM, Condensible	0.0490	0.0055882353	lb/MMBtu	EPA
PM, Filterable	0.0163	0.0018627451	lb/MMBtu	EPA
CO	0.2835	0.0323636360	lb/MMBtu	GRI Field
NMHC	0.0747	0.0085294118	lb/MMBtu	EPA
NOx	0.8499	0.0970167730	lb/MMBtu	GRI Field
SO2	0.0052	0.0005880000	lb/MMBtu	EPA

Other Pollutants

Dichlorobenzene	0.0000	0.0000011765	lb/MMBtu	EPA
Methane	0.0922	0.0105212610	lb/MMBtu	GRI Field
Acetylene	0.1226	0.0140000000	lb/MMBtu	GRI Field
Ethylene	0.0083	0.0009476310	lb/MMBtu	GRI Field
Ethane	0.0230	0.0026312210	lb/MMBtu	GRI Field
Propylene	0.0205	0.0023454550	lb/MMBtu	GRI Field
Propane	0.0094	0.0010686280	lb/MMBtu	GRI Field
Isobutane	0.0128	0.0014640770	lb/MMBtu	GRI Field
Butane	0.0121	0.0013766990	lb/MMBtu	GRI Field
Cyclopentane	0.0099	0.0011304940	lb/MMBtu	GRI Field
Pentane	0.0304	0.0034671850	lb/MMBtu	GRI Field
n-Pentane	0.0125	0.0014221310	lb/MMBtu	GRI Field
Cyclohexane	0.0080	0.0009183830	lb/MMBtu	GRI Field
Methylcyclohexane	0.0193	0.0022011420	lb/MMBtu	GRI Field
n-Octane	0.0250	0.0028538830	lb/MMBtu	GRI Field
1,2,3-Trimethylbenzene	0.0300	0.0034224540	lb/MMBtu	GRI Field
1,2,4-Trimethylbenzene	0.0300	0.0034224540	lb/MMBtu	GRI Field
1,3,5-Trimethylbenzene	0.0300	0.0034224540	lb/MMBtu	GRI Field
n-Nonane	0.0321	0.0036604170	lb/MMBtu	GRI Field
CO2	1,030.5882	117.6470588235	lb/MMBtu	EPA

Unit Name: DEHY-2

Hours of Operation: 8,760 Yearly

Heat Input: 1.0 MMBtu/hr

Fuel Type: NATURAL GAS

Device Type: HEATER

Emission Factor Set: FIELD > EPA > LITERATURE

Additional EF Set: -NONE-

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
3-Methylcholanthrene	0.0000	0.0000000018 lb/MMBtu	EPA
7,12-Dimethylbenz(a)anthracene	0.0000	0.0000000157 lb/MMBtu	EPA
Formaldehyde	0.0037	0.0008440090 lb/MMBtu	GRI Field
Methanol	0.0042	0.0009636360 lb/MMBtu	GRI Field
Acetaldehyde	0.0032	0.0007375920 lb/MMBtu	GRI Field
1,3-Butadiene	0.0015	0.0003423350 lb/MMBtu	GRI Field
Benzene	0.0033	0.0007480470 lb/MMBtu	GRI Field
Toluene	0.0045	0.0010163310 lb/MMBtu	GRI Field
Ethylbenzene	0.0093	0.0021128220 lb/MMBtu	GRI Field
Xylenes(m,p,o)	0.0058	0.0013205140 lb/MMBtu	GRI Field
2,2,4-Trimethylpentane	0.0124	0.0028417580 lb/MMBtu	GRI Field
n-Hexane	0.0062	0.0014070660 lb/MMBtu	GRI Field
Phenol	0.0000	0.0000001070 lb/MMBtu	GRI Field
Styrene	0.0091	0.0020788960 lb/MMBtu	GRI Field
Naphthalene	0.0000	0.0000005100 lb/MMBtu	GRI Field
2-Methylnaphthalene	0.0000	0.0000001470 lb/MMBtu	GRI Field
Acenaphthylene	0.0000	0.0000000670 lb/MMBtu	GRI Field
Biphenyl	0.0000	0.0000004730 lb/MMBtu	GRI Field
Acenaphthene	0.0000	0.0000000900 lb/MMBtu	GRI Field
Fluorene	0.0000	0.0000000800 lb/MMBtu	GRI Field
Anthracene	0.0000	0.0000000870 lb/MMBtu	GRI Field
Phenanthrene	0.0000	0.0000000600 lb/MMBtu	GRI Field
Fluoranthene	0.0000	0.0000000900 lb/MMBtu	GRI Field
Pyrene	0.0000	0.0000000830 lb/MMBtu	GRI Field
Benz(a)anthracene	0.0000	0.0000000870 lb/MMBtu	GRI Field
Chrysene	0.0000	0.0000001170 lb/MMBtu	GRI Field
Benzo(a)pyrene	0.0000	0.0000000700 lb/MMBtu	GRI Field
Benzo(b)fluoranthene	0.0000	0.0000001500 lb/MMBtu	GRI Field
Benzo(k)fluoranthene	0.0000	0.0000007600 lb/MMBtu	GRI Field
Benzo(g,h,i)perylene	0.0000	0.0000002600 lb/MMBtu	GRI Field
Indeno(1,2,3-c,d)pyrene	0.0000	0.0000001200 lb/MMBtu	GRI Field
Dibenz(a,h)anthracene	0.0000	0.0000001030 lb/MMBtu	GRI Field
Lead	0.0000	0.0000004902 lb/MMBtu	EPA
Total	0.0632		
Criteria Pollutants			
VOC	0.0236	0.0053921569 lb/MMBtu	EPA
PM	0.0326	0.0074509804 lb/MMBtu	EPA
PM, Condensible	0.0245	0.0055882353 lb/MMBtu	EPA
PM, Filterable	0.0082	0.0018627451 lb/MMBtu	EPA
CO	0.1418	0.0323636360 lb/MMBtu	GRI Field

NMHC	0.0374	0.0085294118 lb/MMBtu	EPA
NOx	0.4249	0.0970167730 lb/MMBtu	GRI Field
SO2	0.0026	0.0005880000 lb/MMBtu	EPA

Other Pollutants

Dichlorobenzene	0.0000	0.0000011765 lb/MMBtu	EPA
Methane	0.0461	0.0105212610 lb/MMBtu	GRI Field
Acetylene	0.0613	0.0140000000 lb/MMBtu	GRI Field
Ethylene	0.0042	0.0009476310 lb/MMBtu	GRI Field
Ethane	0.0115	0.0026312210 lb/MMBtu	GRI Field
Propylene	0.0103	0.0023454550 lb/MMBtu	GRI Field
Propane	0.0047	0.0010686280 lb/MMBtu	GRI Field
Isobutane	0.0064	0.0014640770 lb/MMBtu	GRI Field
Butane	0.0060	0.0013766990 lb/MMBtu	GRI Field
Cyclopentane	0.0050	0.0011304940 lb/MMBtu	GRI Field
Pentane	0.0152	0.0034671850 lb/MMBtu	GRI Field
n-Pentane	0.0062	0.0014221310 lb/MMBtu	GRI Field
Cyclohexane	0.0040	0.0009183830 lb/MMBtu	GRI Field
Methylcyclohexane	0.0096	0.0022011420 lb/MMBtu	GRI Field
n-Octane	0.0125	0.0028538830 lb/MMBtu	GRI Field
1,2,3-Trimethylbenzene	0.0150	0.0034224540 lb/MMBtu	GRI Field
1,2,4-Trimethylbenzene	0.0150	0.0034224540 lb/MMBtu	GRI Field
1,3,5-Trimethylbenzene	0.0150	0.0034224540 lb/MMBtu	GRI Field
n-Nonane	0.0160	0.0036604170 lb/MMBtu	GRI Field
CO2	515.2941	117.6470588235 lb/MMBtu	EPA

AMINE-1 & 2

- ProMax output

Bryan Research & Engineering, Inc.

ProMax® 4.0

Simulation Report

Project: Amine & TEG System - Permitting - with H2S 7.18.17.pmx

Licensed to EPCO Holdings, Inc. and Affiliates

Client Name: Enterprise Products
Location: Chaparral
Job: Amine & TEG Environmental Models Updated 7.18.17

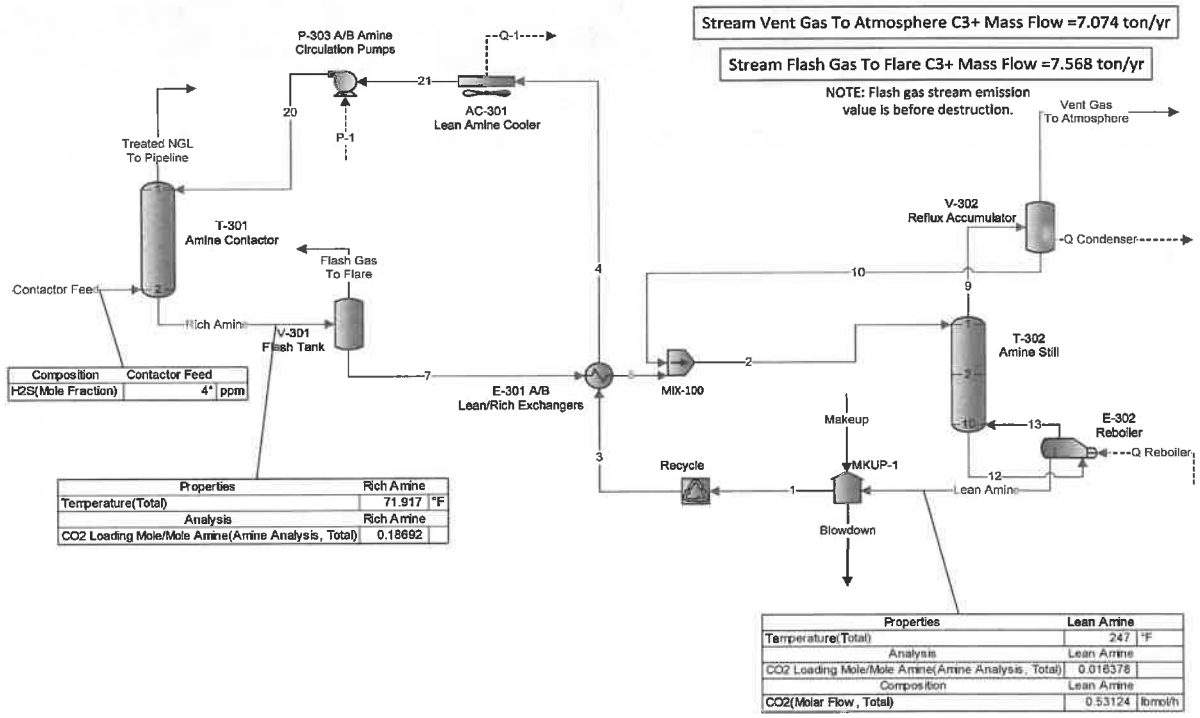
ProMax Filename: O:\EPCO\Process Technology\Jenessa Duncan\Chaparral Environmental\Models\Permitting\Rev. 3\Amine & TEG System - Permitting - with H2S 7.18.17.pmx
ProMax Version: 4.0.16071.0
Simulation Initiated: 7/18/2017 12:36:15 PM

Bryan Research & Engineering, Inc.
Chemical Engineering Consultants
P.O. Box 4747 Bryan, Texas 77805
Office: (979) 776-5220
FAX: (979) 776-4818
mailto:sales@bre.com
http://www.bre.com/

Report Navigator can be activated via the ProMax Navigator Toolbar
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.

Chaparral Amine System

30 wt% DEA



Composition	Contactor Feed	
H2S(Mole Fraction)	4*	ppm

Properties	Rich Amine	
Temperature(Total)	71.917	°F
Analysis	Rich Amine	
CO2 Loading Mole/Mole Amine(Amine Analysis, Total)	0.18692	

Properties	Lean Amine	
Temperature(Total)	247	°F
Analysis	Lean Amine	
CO2 Loading Mole/Mole Amine(Amine Analysis, Total)	0.016378	
Composition	Lean Amine	
CO2(Molar Flow, Total)	0.53124	lbmol/h

Process Streams		Vent Gas To Atmosphere
Composition Phase: Total	Status: From Block: To Block:	Solved V-302 Reflux Accumulator --
Mass Flow		lb/h
CO2		243.452
N2		2.36933E-07
C1		0.107871
C2		4.37793
C3		1.09022
iC4		0.0460583
nC4		0.131689
iC5		0.0104068
nC5		0.0111702
2,2-Dimethylpropane		0.000334195
2,2-Dimethylbutane		6.68176E-05
2,3-Dimethylbutane		0.000285653
3-Methylpentane		0.000388905
2-Methylpentane		0.000777727
nC6		0.000735999
Methylcyclopentane		0.00324799
Benzene		0.251702
Cyclohexane		0.00740842
2-Methylhexane		4.03327E-05
3-Methylhexane		3.00314E-05
nC7		4.45437E-05
Methylcyclohexane		0.00120185
Toluene		0.0571222
nC8		6.85961E-06
Ethylbenzene		0.000229667
m-Xylene		0.000776113
p-Xylene		0.000828850
o-Xylene		0.000353451
n-C9		1.01912E-07
n-Decane		0
nC11		0
nC12		0
nC13		0
nC14		0
nC15		0
H2O		4.42959
DEA		1.23780E-11
H2S		0.0753853

MOLE-1

- AP-42 Tables 1.4-1 and 1.4-2
- GRI-HAPCalc 3.01 output

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 $lb/10^6$ 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 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. 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.

Unit Name: MOLE-1

Hours of Operation:	8,760	Yearly
Heat Input:	2.80	MMBtu/hr
Fuel Type:	NATURAL GAS	
Device Type:	HEATER	
Emission Factor Set:	FIELD > EPA > LITERATURE	
Additional EF Set:	-NONE-	

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
3-Methylcholanthrene	0.0000	0.0000000018 lb/MMBtu	EPA
7,12-Dimethylbenz(a)anthracene	0.0000	0.0000000157 lb/MMBtu	EPA
Formaldehyde	0.0104	0.0008440090 lb/MMBtu	GRI Field
Methanol	0.0118	0.0009636360 lb/MMBtu	GRI Field
Acetaldehyde	0.0090	0.0007375920 lb/MMBtu	GRI Field
1,3-Butadiene	0.0042	0.0003423350 lb/MMBtu	GRI Field
Benzene	0.0092	0.0007480470 lb/MMBtu	GRI Field
Toluene	0.0125	0.0010163310 lb/MMBtu	GRI Field
Ethylbenzene	0.0259	0.0021128220 lb/MMBtu	GRI Field
Xylenes(m,p,o)	0.0162	0.0013205140 lb/MMBtu	GRI Field
2,2,4-Trimethylpentane	0.0349	0.0028417580 lb/MMBtu	GRI Field
n-Hexane	0.0173	0.0014070660 lb/MMBtu	GRI Field
Phenol	0.0000	0.0000001070 lb/MMBtu	GRI Field
Styrene	0.0255	0.0020788960 lb/MMBtu	GRI Field
Naphthalene	0.0000	0.0000005100 lb/MMBtu	GRI Field
2-Methylnaphthalene	0.0000	0.0000001470 lb/MMBtu	GRI Field
Acenaphthylene	0.0000	0.0000000670 lb/MMBtu	GRI Field
Biphenyl	0.0000	0.0000004730 lb/MMBtu	GRI Field
Acenaphthene	0.0000	0.0000000900 lb/MMBtu	GRI Field
Fluorene	0.0000	0.0000000800 lb/MMBtu	GRI Field
Anthracene	0.0000	0.0000000870 lb/MMBtu	GRI Field
Phenanthrene	0.0000	0.0000000600 lb/MMBtu	GRI Field
Fluoranthene	0.0000	0.0000000900 lb/MMBtu	GRI Field
Pyrene	0.0000	0.0000000830 lb/MMBtu	GRI Field
Benz(a)anthracene	0.0000	0.0000000870 lb/MMBtu	GRI Field
Chrysene	0.0000	0.0000001170 lb/MMBtu	GRI Field
Benzo(a)pyrene	0.0000	0.0000000700 lb/MMBtu	GRI Field
Benzo(b)fluoranthene	0.0000	0.0000001500 lb/MMBtu	GRI Field
Benzo(k)fluoranthene	0.0000	0.0000007600 lb/MMBtu	GRI Field
Benzo(g,h,i)perylene	0.0000	0.0000002600 lb/MMBtu	GRI Field
Indeno(1,2,3-c,d)pyrene	0.0000	0.0000001200 lb/MMBtu	GRI Field
Dibenz(a,h)anthracene	0.0000	0.0000001030 lb/MMBtu	GRI Field
Lead	0.0000	0.0000004902 lb/MMBtu	EPA
Total	0.1769		
Criteria Pollutants			
VOC	0.0661	0.0053921569 lb/MMBtu	EPA
PM	0.0914	0.0074509804 lb/MMBtu	EPA
PM, Condensible	0.0685	0.0055882353 lb/MMBtu	EPA

PM, Filterable	0.0228	0.0018627451	lb/MMBtu	EPA
CO	0.3969	0.0323636360	lb/MMBtu	GRI Field
NMHC	0.1046	0.0085294118	lb/MMBtu	EPA
NOx	1.1898	0.0970167730	lb/MMBtu	GRI Field
SO2	0.0072	0.0005880000	lb/MMBtu	EPA

Other Pollutants

Dichlorobenzene	0.0000	0.0000011765	lb/MMBtu	EPA
Methane	0.1290	0.0105212610	lb/MMBtu	GRI Field
Acetylene	0.1717	0.0140000000	lb/MMBtu	GRI Field
Ethylene	0.0116	0.0009476310	lb/MMBtu	GRI Field
Ethane	0.0323	0.0026312210	lb/MMBtu	GRI Field
Propylene	0.0288	0.0023454550	lb/MMBtu	GRI Field
Propane	0.0131	0.0010686280	lb/MMBtu	GRI Field
Isobutane	0.0180	0.0014640770	lb/MMBtu	GRI Field
Butane	0.0169	0.0013766990	lb/MMBtu	GRI Field
Cyclopentane	0.0139	0.0011304940	lb/MMBtu	GRI Field
Pentane	0.0425	0.0034671850	lb/MMBtu	GRI Field
n-Pentane	0.0174	0.0014221310	lb/MMBtu	GRI Field
Cyclohexane	0.0113	0.0009183830	lb/MMBtu	GRI Field
Methylcyclohexane	0.0270	0.0022011420	lb/MMBtu	GRI Field
n-Octane	0.0350	0.0028538830	lb/MMBtu	GRI Field
1,2,3-Trimethylbenzene	0.0420	0.0034224540	lb/MMBtu	GRI Field
1,2,4-Trimethylbenzene	0.0420	0.0034224540	lb/MMBtu	GRI Field
1,3,5-Trimethylbenzene	0.0420	0.0034224540	lb/MMBtu	GRI Field
n-Nonane	0.0449	0.0036604170	lb/MMBtu	GRI Field
CO2	1,442.8235	117.6470588235	lb/MMBtu	EPA

LOAD-1

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loading operation, resulting in high levels of vapor generation and loss. If the turbulence is great enough, liquid droplets will be entrained in the vented vapors.

A second method of loading is submerged loading. Two types are the submerged fill pipe method and the bottom loading method. In the submerged fill pipe method, the fill pipe extends almost to the bottom of the cargo tank. In the bottom loading method, a permanent fill pipe is attached to the cargo tank bottom. During most of submerged loading by both methods, the fill pipe opening is below the liquid surface level. Liquid turbulence is controlled significantly during submerged loading, resulting in much lower vapor generation than encountered during splash loading.

The recent loading history of a cargo carrier is just as important a factor in loading losses as the method of loading. If the carrier has carried a nonvolatile liquid such as fuel oil, or has just been cleaned, it will contain vapor-free air. If it has just carried gasoline and has not been vented, the air in the carrier tank will contain volatile organic vapors, which will be expelled during the loading operation along with newly generated vapors.

Cargo carriers are sometimes designated to transport only one product, and in such cases are practicing "dedicated service". Dedicated gasoline cargo tanks return to a loading terminal containing air fully or partially saturated with vapor from the previous load. Cargo tanks may also be "switch loaded" with various products, so that a nonvolatile product being loaded may expel the vapors remaining from a previous load of a volatile product such as gasoline. These circumstances vary with the type of cargo tank and with the ownership of the carrier, the petroleum liquids being transported, geographic location, and season of the year.

One control measure for vapors displaced during liquid loading is called "vapor balance service", in which the cargo tank retrieves the vapors displaced during product unloading at bulk plants or service stations and transports the vapors back to the loading terminal. Figure 5.2-5 shows a tank truck in vapor balance service filling a service station underground tank and taking on displaced gasoline vapors for return to the terminal. A cargo tank returning to a bulk terminal in vapor balance service normally is saturated with organic vapors, and the presence of these vapors at the start of submerged loading of the tanker truck results in greater loading losses than encountered during nonvapor balance, or "normal", service. Vapor balance service is usually not practiced with marine vessels, although some vessels practice emission control by means of vapor transfer within their own cargo tanks during ballasting operations, discussed below.

Emissions from loading petroleum liquid can be estimated (with a probable error of ±30 percent)[4] using the following expression:

$$L_L = 12.46 \frac{SPM}{T} \quad (1)$$

where:

L_L = loading loss, pounds per 1000 gallons (lb/10^3 gal) of liquid loaded

S = a saturation factor (see Table 5.2-1)
P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia) (see Section 7.1, "Organic Liquid Storage Tanks")
M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole) (see Section 7.1, "Organic Liquid Storage Tanks")
T = temperature of bulk liquid loaded, °R (°F + 460)

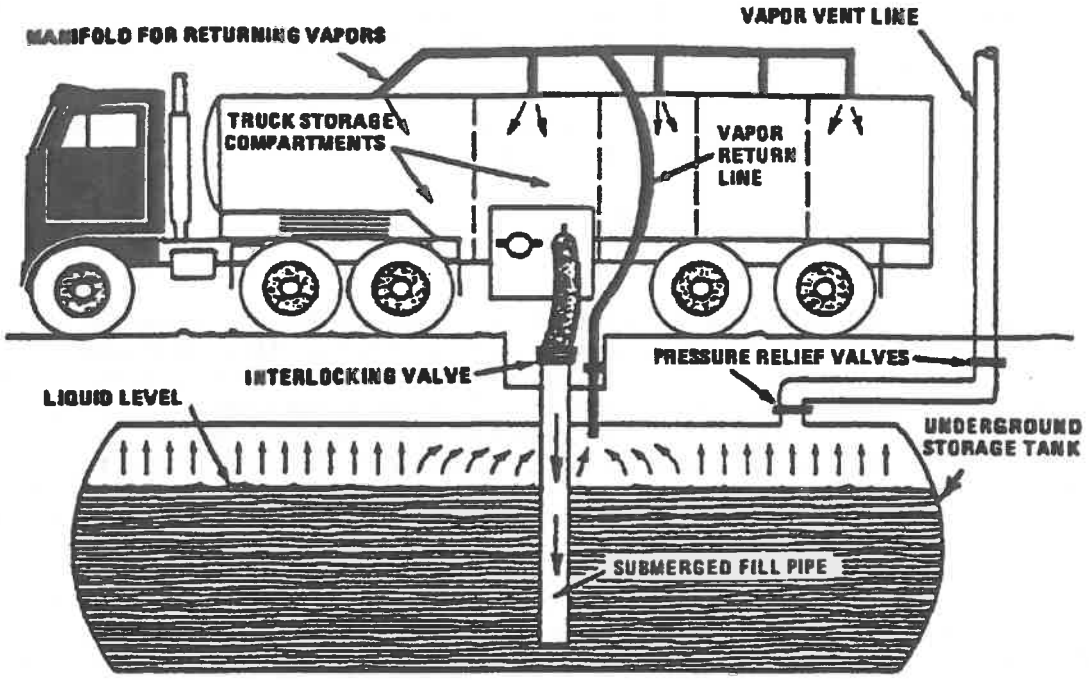

Figure 5.2-5. Tank truck unloading into a service station underground storage tank and practicing "vapor balance" form of emission control.

Table 5.2-1. SATURATION (S) FACTORS FOR CALCULATING PETROLEUM LIQUID LOADING LOSSES

Cargo Carrier	Mode Of Operation	S Factor
Tank trucks and rail tank cars	Submerged loading of a clean cargo tank	0.50
	Submerged loading: dedicated normal service	0.60
	Submerged loading: dedicated vapor balance service	1.00
	Splash loading of a clean cargo tank	1.45
	Splash loading: dedicated normal service	1.45
	Splash loading: dedicated vapor balance service	1.00
Marine vessels[a]	Submerged loading: ships	0.2
	Submerged loading: barges	0.5

[a] For products other than gasoline and crude oil. For marine loading of gasoline, use factors from Table 5.2-2. For marine loading of crude oil, use Equations 2 and 3 and Table 5.2-3.

The saturation factor, S, represents the expelled vapor's fractional approach to saturation, and it accounts for the variations observed in emission rates from the different unloading and loading methods. Table 5.2-1 lists suggested saturation factors.

Emissions from controlled loading operations can be calculated by multiplying the uncontrolled emission rate calculated in Equation 1 by an overall reduction efficiency term:

$$\left(1 - \frac{\text{eff}}{100}\right)$$

The overall reduction efficiency should account for the capture efficiency of the collection system as well as both the control efficiency and any downtime of the control device. Measures to reduce loading emissions include selection of alternate loading methods and application of vapor recovery equipment. The latter captures organic vapors displaced during loading operations and recovers the vapors by the use of refrigeration, absorption, adsorption, and/or compression. The recovered product is piped back to storage. Vapors can also be controlled through combustion in a thermal oxidation unit, with no product recovery. Figure 5.2-6 demonstrates the recovery of gasoline vapors from tank trucks during loading operations at bulk terminals. Control efficiencies for the recovery units range from 90 to over 99 percent, depending on both the nature of the vapors and the type of control equipment used.[5-6] However, not all of the displaced vapors reach the control device, because of leakage from both the tank truck and collection system. The collection efficiency should be assumed to be 99.2 percent for tanker trucks passing the MACT-level annual leak test (not more than 1 inch water column pressure change in 5 minutes after pressurizing to 18 inches water followed by pulling a vacuum of 6 inches water).[7] A collection efficiency of 98.7 percent (a 1.3 percent leakage rate) should be assumed for trucks passing the NSPS-level annual test (3 inches pressure change) A collection efficiency of 70 percent should be assumed for trucks not passing one of these annual leak tests[6].

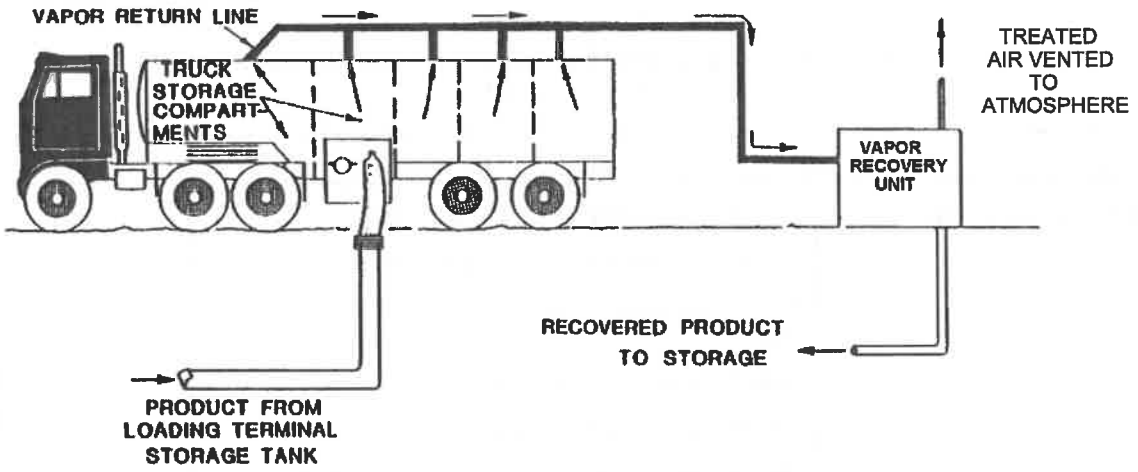

Figure 5.2-6. Tank truck loading with vapor recovery.

Sample Calculation -

Loading losses (L_L) from a gasoline tank truck in dedicated vapor balance service and practicing vapor recovery would be calculated as follows, using Equation 1:

Design basis -

Cargo tank volume is 8000 gal
Gasoline Reid vapor pressure (RVP) is 9 psia
Product temperature is 80°F
Vapor recovery efficiency is 95 percent
Vapor collection efficiency is 98.7 percent (NSPS-level annual leak test)

Loading loss equation -

$$L_L = 12.46 \frac{SPM}{T}\left(1 - \frac{eff}{100}\right)$$

where:

S = saturation factor (see Table 5.2-1) - 1.00
P = true vapor pressure of gasoline = 6.6 psia
M = molecular weight of gasoline vapors = 66
T = temperature of gasoline = 540°R
eff = overall reduction efficiency (95 percent control x 98.7 percent collection) = 94 percent

$$L_L = 12.46 \frac{(1.00)(6.6)(66)}{540}\left(1 - \frac{94}{100}\right)$$

$$= 0.60 \text{ lb}/10^3 \text{ gal}$$

Total loading losses are:

$$(0.60 \text{ lb}/10^3 \text{ gal})(8.0 \times 10^3 \text{ gal}) = 4.8 \text{ pounds (lb)}$$

Measurements of gasoline loading losses from ships and barges have led to the development of emission factors for these specific loading operations.[8] These factors are presented in Table 5.2-2 and should be used instead of Equation 1 for gasoline loading operations at marine terminals. Factors are expressed in units of milligrams per liter (mg/L) and pounds per 1000 gallons (lb/10^3 gal).

Table 5.2-2 (Metric And English Units). VOLATILE ORGANIC COMPOUND (VOC) EMISSION FACTORS FOR GASOLINE LOADING OPERATIONS AT MARINE TERMINALS[a]

Vessel Tank Condition	Previous Cargo	Ships/Ocean Barges[b]		Barges[b]	
		mg/L Transferred	lb/10^3 gal Transferred	mg/L Transferred	lb/10^3 gal Transferred
Uncleaned	Volatile[c]	315	2.6	465	3.9
Ballasted	Volatile	205	1.7	—[d]	—[d]
Cleaned	Volatile	180	1.5	ND	ND
Gas-freed	Volatile	85	0.7	ND	ND
Any condition	Nonvolatile	85	0.7	ND	ND
Gas-freed	Any cargo	ND	ND	245	2.0
Typical overall situation[e]	Any cargo	215	1.8	410	3.4

[a] References 2,9. Factors are for both VOC emissions (which excludes methane and ethane) and total organic emissions, because methane and ethane have been found to constitute a negligible weight fraction of the evaporative emissions from gasoline. ND = no data.
[b] Ocean barges (tank compartment depth about 12.2 m [40 ft]) exhibit emission levels similar to tank ships. Shallow draft barges (compartment depth 3.0 to 3.7 m [10 to 12 ft]) exhibit higher emission levels.
[c] Volatile cargoes are those with a true vapor pressure greater than 10 kilopascals (kPa) (1.5 psia).
[d] Barges are usually not ballasted.
[e] Based on observation that 41% of tested ship compartments were uncleaned, 11% ballasted, 24% cleaned, and 24% gas-freed. For barges, 76% were uncleaned.

In addition to Equation 1, which estimates emissions from the loading of petroleum liquids, Equation 2 has been developed specifically for estimating emissions from the loading of crude oil into ships and ocean barges:

$$C_L = C_A + C_G \quad (2)$$

where:

C_L = total loading loss, lb/10^3 gal of crude oil loaded
C_A = arrival emission factor, contributed by vapors in the empty tank compartment before loading, lb/10^3 gal loaded (see Note below)
C_G = generated emission factor, contributed by evaporation during loading, lb/10^3 gal loaded

Note: Values of C_A for various cargo tank conditions are listed in Table 5.2-3.

5.2-3 (English Units). AVERAGE ARRIVAL EMISSION FACTORS, C_A, FOR CRUDE OIL LOADING EMISSION EQUATION[a]

Ship/Ocean Barge Tank Condition	Previous Cargo	Arrival Emission Factor, lb/10^3 gal
Uncleaned	Volatile[b]	0.86
Ballasted	Volatile	0.46
Cleaned or gas-freed	Volatile	0.33
Any condition	Nonvolatile	0.33

[a] Arrival emission factors (C_A) to be added to generated emission factors (C_G) calculated in Equation 3 to produce total crude oil loading loss (C_L). Factors are for total organic compounds; VOC emission factors average about 15% lower, because VOC does not include methane or ethane.
[b] Volatile cargoes are those with a true vapor pressure greater than 10 kPa (1.5 psia).

This equation was developed empirically from test measurements of several vessel compartments.[8] The quantity C_G can be calculated using Equation 3:

$$C_G = 1.84\ (0.44\ P - 0.42)\ \frac{M\ G}{T} \qquad (3)$$

where:

P = true vapor pressure of loaded crude oil, psia
M = molecular weight of vapors, lb/lb-mole
G = vapor growth factor = 1.02 (dimensionless)
T = temperature of vapors, °R (°F + 460)

Emission factors derived from Equation 3 and Table 5.2-3 represent total organic compounds. Volatile organic compound (VOC) emission factors (which exclude methane and ethane because they are exempted from the regulatory definition of "VOC") for crude oil vapors have been found to range from approximately 55 to 100 weight percent of these total organic factors. When specific vapor composition information is not available, the VOC emission factor can be estimated by taking 85 percent of the total organic factor.[3]

5.2.2.1.2 Ballasting Losses -

Ballasting operations are a major source of evaporative emissions associated with the unloading of petroleum liquids at marine terminals. It is common practice to load several cargo tank compartments with sea water after the cargo has been unloaded. This water, termed "ballast", improves the stability of the empty tanker during the subsequent voyage. Although ballasting practices vary, individual cargo tanks are ballasted typically about 80 percent, and the total vessel 15 to 40 percent, of capacity. Ballasting emissions occur as vapor-laden air in the "empty" cargo tank is displaced to the atmosphere by ballast water being pumped into the tank. Upon arrival at a loading port, the ballast water is pumped from the cargo tanks before the new cargo is loaded. The ballasting of cargo tanks reduces the quantity of vapors returning in the empty tank, thereby reducing the quantity of vapors emitted during subsequent tanker loading. Regulations administered by the U. S. Coast Guard require that, at marine terminals located in ozone nonattainment areas, large tankers with crude oil washing systems contain the organic vapors from ballasting.[10] This is accomplished principally by displacing the vapors during ballasting into a cargo tank being simultaneously unloaded. In other areas, marine vessels emit organic vapors directly to the atmosphere.

Equation 4 has been developed from test data to calculate the ballasting emissions from crude oil ships and ocean barges[8]:

$$L_B = 0.31 + 0.20\ P + 0.01\ PU_A \qquad (4)$$

where:

L_B = ballasting emission factor, lb/10^3 gal of ballast water
P = true vapor pressure of discharged crude oil, psia
U_A = arrival cargo true ullage, before dockside discharge, measured from the deck, feet; (the term "ullage" here refers to the distance between the cargo surface level and the deck level)

Table 5.2-4 lists average total organic emission factors for ballasting into uncleaned crude oil cargo compartments. The first category applies to "full" compartments wherein the crude oil true ullage just before cargo discharge is less than 1.5 meters (m) (5 ft). The second category applies to lightered, or short-loaded, compartments (part of cargo previously discharged, or original load a partial fill), with an arrival true ullage greater than 1.5 m (5 ft). It should be remembered that these tabulated emission factors are examples only, based on average conditions, to be used when crude oil vapor pressure is unknown. Equation 4 should be used when information about crude oil vapor pressure and cargo compartment condition is available. The following sample calculation illustrates the use of Equation 4.

5.2-4 (Metric And English Units). TOTAL ORGANIC EMISSION FACTORS FOR CRUDE OIL BALLASTING[a]

Compartment Condition Before Cargo Discharge	Average Emission Factors			
	By Category		Typical Overall[b]	
	mg/L Ballast Water	lb/10^3 gal Ballast Water	mg/L Ballast Water	lb/10^3 gal Ballast Water
Fully loaded[c]	111	0.9	129	1.1
Lightered or previously short loaded[d]	171	1.4 ••		

[a] Assumes crude oil temperature of 16°C (60°F) and RVP of 34 kPa (5 psia). VOC emission factors average about 85% of these total organic factors, because VOCs do not include methane or ethane.
[b] Based on observation that 70% of tested compartments had been fully loaded before ballasting. May not represent average vessel practices.
[c] Assumed typical arrival ullage of 0.6 m (2 ft).
[d] Assumed typical arrival ullage of 6.1 m (20 ft).

Sample Calculation -

Ballasting emissions from a crude oil cargo ship would be calculated as follows, using Equation 4:

Design basis -

Vessel and cargo description: 80,000 dead-weight-ton tanker, crude oil capacity 500,000 barrels (bbl); 20 percent of the cargo capacity is filled with ballast water after cargo discharge. The crude oil has an RVP of 6 psia and is discharged at 75°F.

Compartment conditions: 70 percent of the ballast water is loaded into compartments that had been fully loaded to 2 ft ullage, and 30 percent is loaded into compartments that had been lightered to 15 ft ullage before arrival at dockside.

Ballasting emission equation -

$$L_B = 0.31 + 0.20\ P + 0.01\ PU_A$$

where:

P = true vapor pressure of crude oil
= 4.6 psia
U_A = true cargo ullage for the full compartments = 2 ft, and true cargo ullage for the lightered compartments = 15 ft

$$L_B = 0.70\ [0.31 + (0.20)\ (4.6) + (0.01)\ (4.6)\ (2)] + 0.30\ [0.31 + (0.20)\ (4.6) + (0.01)\ (4.6)\ (15)]$$

$$= 1.5\ lb/10^3\ gal$$

Total ballasting emissions are:

$$(1.5\ lb/10^3\ gal)\ (0.20)\ (500{,}000\ bbl)\ (42\ gal/bbl) = 6{,}300\ lb$$

Since VOC emissions average about 85 percent of these total organic emissions, emissions of VOCs are about: (0.85)(6,300 lb) = 5,360 lb

5.2.2.1.3 Transit Losses -

In addition to loading and ballasting losses, losses occur while the cargo is in transit. Transit losses are similar in many ways to breathing losses associated with petroleum storage (see Section 7.1, "Organic Liquid Storage Tanks"). Experimental tests on ships and barges[4] have indicated that transit losses can be calculated using Equation 5:

$$L_T = 0.1\ PW \qquad (5)$$

where:

L_T = transit loss from ships and barges, lb/week-10^3 gal transported
P = true vapor pressure of the transported liquid, psia
W = density of the condensed vapors, lb/gal

Emissions from gasoline truck cargo tanks during transit have been studied by a combination of theoretical and experimental techniques, and typical emission values are presented in Table 5.2-5.[11-12] Emissions depend on the extent of venting from the cargo tank during transit, which in turn depends on the vapor tightness of the tank, the pressure relief valve settings, the pressure in the tank at the start of the trip, the vapor pressure of the fuel being transported, and the degree of fuel vapor saturation of the space in the tank. The emissions are not directly proportional to the time spent in transit. If the vapor leakage rate of the tank increases, emissions increase up to a point, and then the rate changes as other determining factors take over. Truck tanks in dedicated vapor balance service usually contain saturated vapors, and this leads to lower emissions during transit because no additional fuel evaporates to raise the pressure in the tank to cause venting. Table 5.2-5 lists "typical" values for transit emissions and "extreme" values that could occur in the unlikely event that all determining factors combined to cause maximum emissions.

Table 5.2-5 (Metric And English Units). TOTAL UNCONTROLLED ORGANIC EMISSION FACTORS FOR PETROLEUM LIQUID RAIL TANK CARS AND TANK TRUCKS

Emission Source	Gasoline[a]	Crude Oil[b]	Jet Naphtha (JP-4)	Jet Kerosene	Distillate Oil No. 2	Residual Oil No. 6
Loading operations[c]						
Submerged loading - Dedicated normal service[d]						
mg/L transferred	590	240	180	1.9	1.7	0.01
lb/10^3 gal transferred	5	2	1.5	0.016	0.014	0.0001
Submerged loading - Vapor balance service[d]						
mg/L transferred	980	400	300	—[e]	—[e]	—[e]
lb/10^3 gal transferred	8	3	2.5	—[e]	—[e]	—[e]
Splash loading - Dedicated normal service						
mg/L transferred	1,430	580	430	5	4	0.03
lb/10^3 gal transferred	12	5	4	0.04	0.03	0.0003
Splash loading - Vapor balance service						
mg/L transferred	980	400	300	—[e]	—[e]	—[e]
lb/10^3 gal transferred	8	3	2.5	—[e]	—[e]	—[e]

Table 5.2-5 (cont.).

Emission Source	Gasoline[a]	Crude Oil[b]	Jet Naphtha (JP-4)	Jet Kerosene	Distillate Oil No. 2	Residual Oil No. 6
Transit losses						
Loaded with product						
mg/L transported						
Typical	0 - 1.0	ND	ND	ND	ND	ND
Extreme	0 - 9.0	ND	ND	ND	ND	ND
lb/10^3 gal transported						
Typical	0 - 0.01	ND	ND	ND	ND	ND
Extreme	0 - 0.08	ND	ND	ND	ND	ND
Return with vapor						
mg/L transported						
Typical	0 - 13.0	ND	ND	ND	ND	ND
Extreme	0 - 44.0	ND	ND	ND	ND	ND
lb/10^3 gal transported						
Typical	0 - 0.11	ND	ND	ND	ND	ND
Extreme	0 - 0.37	ND	ND	ND	ND	ND

[a] Reference 2. Gasoline factors represent emissions of VOC as well as total organics, because methane and ethane constitute a negligible weight fraction of the evaporative emissions from gasoline. VOC factors for crude oil can be assumed to be 15% lower than the total organic factors, to account for the methane and ethane content of crude oil evaporative emissions. All other products should be assumed to have VOC factors equal to total organics. The example gasoline has an RVP of 69 kPa (10 psia). ND = no data.
[b] The example crude oil has an RVP of 34 kPa (5 psia).
[c] Loading emission factors are calculated using Equation 1 for a dispensed product temperature of 16°C (60°F).
[d] Reference 2.
[e] Not normally used.

In the absence of specific inputs for Equations 1 through 5, the typical evaporative emission factors presented in Tables 5.2-5 and 5.2-6 should be used. It should be noted that, although the crude oil used to calculate the emission values presented in these tables has an RVP of 5, the RVP of crude oils can range from less than 1 up to 10. Similarly, the RVP of gasolines ranges from 7 to 13. In areas where loading and transportation sources are major factors affecting air quality, it is advisable to obtain the necessary parameters and to calculate emission estimates using Equations 1 through 5.

5.2.2.2 Service Stations -

Another major source of evaporative emissions is the filling of underground gasoline storage tanks at service stations. Gasoline is usually delivered to service stations in 30,000-liter (8,000-gal) tank trucks or smaller account trucks. Emissions are generated when gasoline vapors in the underground storage tank are displaced to the atmosphere by the gasoline being loaded into the tank. As with other loading losses, the quantity of loss in service station tank filling depends on several variables, including the method and rate of filling, the tank configuration, and the gasoline temperature, vapor pressure and composition. An average emission rate for submerged filling is 880 mg/L (7.3 lb/1000 gal) of transferred gasoline, and the rate for splash filling is 1380 mg/L (11.5 lb/1000 gal) transferred gasoline (see Table 5.2-7).[5]

Table 5.2-6 (Metric And English Units). TOTAL ORGANIC EMISSION FACTORS FOR PETROLEUM MARINE VESSEL SOURCES[a]

Emission Source	Gasoline[b]	Crude Oil[c]	Jet Naphtha (JP-4)	Jet Kerosene	Distillate Oil No. 2	Residual Oil No. 6
Loading operations						
Ships/ocean barges						
mg/L transferred	—[d]	73	60	0.63	0.55	0.004
lb/10^3 gal transferred	—[d]	0.61	0.50	0.005	0.005	0.00004
Barges						
mg/L transferred	—[d]	120	150	1.60	1.40	0.011
lb/10^3 gal transferred	—[d]	1.0	1.2	0.013	0.012	0.00009
Tanker ballasting						
mg/L ballast water	100	—[e]	ND	ND	ND	ND
lb/10^3 gal ballast water	0.8	—[e]	ND	ND	ND	ND
Transit						
mg/week-L transported	320	150	84	0.60	0.54	0.003
lb/week-10^3 gal transported	2.7	1.3	0.7	0.005	0.005	0.00003

[a] Factors are for a dispensed product of 16°C (60°F). ND = no data.
[b] Factors represent VOC as well as total organic emissions, because methane and ethane constitute a negligible fraction of gasoline evaporative emissions. All products other than crude oil can be assumed to have VOC factors equal to total organic factors. The example gasoline has an RVP of 69 kPa (10 psia).
[c] VOC emission factors for a typical crude oil are 15% lower than the total organic factors shown, in order to account for methane and ethane. The example crude oil has an RVP of 34 kPa (5 psia).
[d] See Table 5.2-2 for these factors.
[e] See Table 5.2-4 for these factors.

Emissions from underground tank filling operations at service stations can be reduced by the use of a vapor balance system such as in Figure 5.2-5 (termed Stage I vapor control). The vapor balance system employs a hose that returns gasoline vapors displaced from the underground tank to the tank truck cargo compartments being emptied. The control efficiency of the balance system ranges from 93 to 100 percent. Organic emissions from underground tank filling operations at a service station employing a vapor balance system and submerged filling are not expected to exceed 40 mg/L (0.3 lb/1000 gal) of transferred gasoline.

Table 5.2-7 (Metric And English Units). EVAPORATIVE EMISSIONS FROM GASOLINE SERVICE STATION OPERATIONS[a]

Emission Source	Emission Rate	
	mg/L Throughput	lb/10^3 gal Throughput
Filling underground tank (Stage I)		
Submerged filling	880	7.3
Splash filling	1,380	11.5
Balanced submerged filling	40	0.3
Underground tank breathing and emptying[b]	120	1.0
Vehicle refueling operations (Stage II)		
Displacement losses (uncontrolled)[c]	1,320	11.0
Displacement losses (controlled)	132	1.1
Spillage	80	0.7

[a] Factors are for VOC as well as total organic emissions, because of the methane and ethane content of gasoline evaporative emissions is negligible.
[b] Includes any vapor loss between underground tank and gas pump.
[c] Based on Equation 6, using average conditions.

A second source of vapor emissions from service stations is underground tank breathing. Breathing losses occur daily and are attributable to gasoline evaporation and barometric pressure changes. The frequency with which gasoline is withdrawn from the tank, allowing fresh air to enter to enhance evaporation, also has a major effect on the quantity of these emissions. An average breathing emission rate is 120 mg/L (1.0 lb/1000 gal) of throughput.

5.2.2.3 Motor Vehicle Refueling -

Service station vehicle refueling activity also produces evaporative emissions. Vehicle refueling emissions come from vapors displaced from the automobile tank by dispensed gasoline and from spillage. The quantity of displaced vapors depends on gasoline temperature, auto tank temperature, gasoline RVP, and dispensing rate. Equation 6 can be used to estimate uncontrolled displacement losses from vehicle refueling for a particular set of conditions.[14]

$$E_R = 264.2\,[(-5.909) - 0.0949\,(\Delta T) + 0.0884\,(T_D) + 0.485\,(RVP)] \quad (6)$$

where:

E_R = refueling emissions, mg/L
ΔT = difference between temperature of fuel in vehicle tank and temperature of dispensed fuel, °F
T_D = temperature of dispensed fuel, °F
RVP = Reid vapor pressure, psia

Note that this equation and the spillage loss factor are incorporated into the *MOBILE* model. The *MOBILE* model allows for disabling of this calculation if it is desired to include these emissions in the stationary area source portion of an inventory rather than in the mobile source portion. It is estimated that the uncontrolled emissions from vapors displaced during vehicle refueling average 1320 mg/L (11.0 lb/1000 gal) of dispensed gasoline.[5,13]

Spillage loss is made up of contributions from prefill and postfill nozzle drip and from spit-back and

overflow from the vehicles's fuel tank filler pipe during filling. The amount of spillage loss can depend on several variables, including service station business characteristics, tank configuration, and operator techniques. An average spillage loss is 80 mg/L (0.7 lb/1000 gal) of dispensed gasoline.[5,13]

Control methods for vehicle refueling emissions are based on conveying the vapors displaced from the vehicle fuel tank to the underground storage tank vapor space through the use of a special hose and nozzle, as depicted in Figure 5.2-7 (termed Stage II vapor control). In "balance" vapor control systems, the vapors are conveyed by natural pressure differentials established during refueling. In "vacuum assist" systems, the conveyance of vapors from the auto fuel tank to the underground storage tank is assisted by a vacuum pump. Tests on a few systems have indicated overall systems control efficiencies in the range of 88 to 92 percent.[5,13] When inventorying these emissions as an area source, rule penetration and rule effectiveness should also be taken into account. *Procedures For Emission Inventory Preparation, Volume IV: Mobile Sources*, EPA-450/4-81-026d, provides more detail on this.

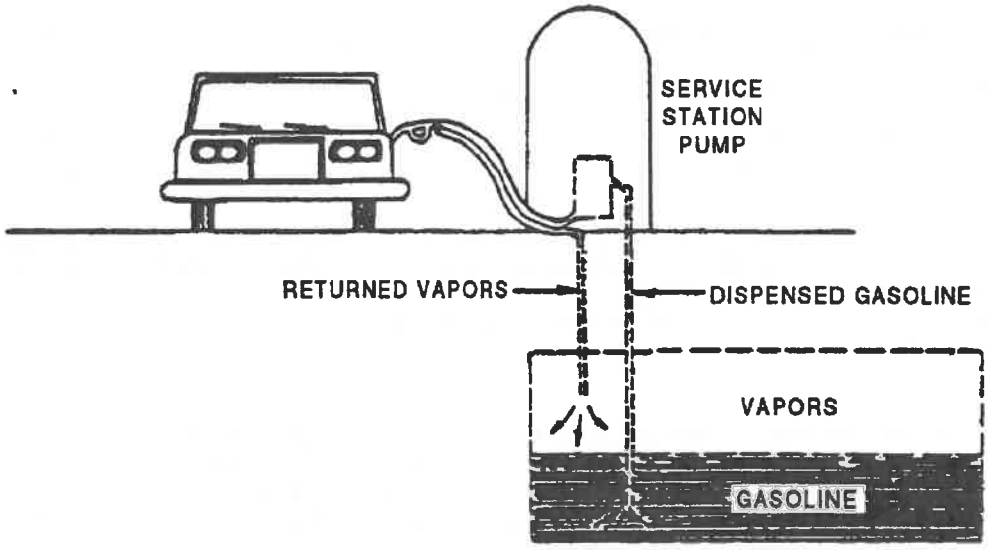

Figure 5.2-7. Automobile refueling vapor recovery system.

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Tanks TK-1, TK-2 & TK-3

- TANKS 4.0.9d output for working and breathing losses

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

Identification

User Identification:	Chaparral Gas Plant
City:	
State:	New Mexico
Company:	Enterprise
Type of Tank:	Vertical Fixed Roof Tank
Description:	30,000 barrels per year throughput for entire facility Three tanks, TK-1, TK-2 and TK-3

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	12.00
Liquid Height (ft) :	14.89
Avg. Liquid Height (ft):	7.45
Volume (gallons):	12,597.38
Turnovers:	33.34
Net Throughput(gal/yr):	420,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Red/Primer
Shell Condition	Poor
Roof Color/Shade:	Red/Primer
Roof Condition:	Poor

Roof Characteristics

Type:	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Roswell, New Mexico (Avg Atmospheric Pressure = 12.73 psia)

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

Chaparral Gas Plant - Vertical Fixed Roof Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 9)	All	76.33	59.43	93.23	65.28	6.2966	4.5594	8.5259	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0383	0.0200	0.0899	120.1900	0.0033	0.0000	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.8062	1.1494	2.7453	78.1100	0.0060	0.0024	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.8549	1.1927	2.7929	84.1600	0.0070	0.0028	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1875	0.1064	0.3165	106.1700	0.0040	0.0002	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.8812	1.8851	4.2700	86.1700	0.0040	0.0025	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane									114.2200	0.0010	0.0000	114.22	
Isopropyl benzene						0.0886	0.0471	0.1519	120.2000	0.0010	0.0000	120.20	Option 2: A=6.93666, B=1460.793, C=207.78
Toluene						0.5386	0.3243	0.8617	92.1300	0.0100	0.0012	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.5690	6.5332	6.5428	66.8616	0.9497	0.9904	91.84	
Xylene (-m)						0.1570	0.0886	0.2665	106.1700	0.0140	0.0005	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Chaparral Gas Plant - Vertical Fixed Roof Tank

Annual Emission Calcaulations	
Standing Losses (lb):	4,784.6697
Vapor Space Volume (cu ft):	868.0220
Vapor Density (lb/cu ft):	0.0733
Vapor Space Expansion Factor:	0.7333
Vented Vapor Saturation Factor:	0.2808
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	868.0220
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	7.6750
Tank Shell Height (ft):	15.0000
Average Liquid Height (ft):	7.4500
Roof Outage (ft):	0.1250
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.1250
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0625
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0733
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	6.2966
Daily Avg. Liquid Surface Temp. (deg. R):	535.9964
Daily Average Ambient Temp. (deg. F):	60.8167
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	524.9467
Tank Paint Solar Absorptance (Shell):	0.9100
Tank Paint Solar Absorptance (Roof):	0.9100
Daily Total Solar Insulation Factor (Btu/sqft day):	1,810.0000
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.7333
Daily Vapor Temperature Range (deg. R):	67.5988
Daily Vapor Pressure Range (psia):	3.9666
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	6.2966
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	4.5594
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	8.5259
Daily Avg. Liquid Surface Temp. (deg R):	535.9964
Daily Min. Liquid Surface Temp. (deg R):	519.0967
Daily Max. Liquid Surface Temp. (deg R):	552.8961
Daily Ambient Temp. Range (deg. R):	29.8333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.2808
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	6.2966
Vapor Space Outage (ft):	7.6750
Working Losses (lb):	4,218.7440
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	6.2966
Annual Net Throughput (gal/yr.):	420,000.0000
Annual Turnovers:	33.3403
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	12,597.3811
Maximum Liquid Height (ft):	14.8900
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	9,003.4137

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

Emissions Report for: Annual

Chaparral Gas Plant - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 9)	4,218.74	4,784.67	9,003.41
Hexane (-n)	10.60	12.02	22.63
Benzene	9.97	11.31	21.28
Isooctane	0.00	0.00	0.00
Toluene	4.96	5.62	10.58
Ethylbenzene	0.69	0.78	1.47
Xylene (-m)	2.02	2.29	4.32
Isopropyl benzene	0.08	0.09	0.17
1,2,4-Trimethylbenzene	0.12	0.13	0.25
Cyclohexane	11.95	13.55	25.49
Unidentified Components	4,178.36	4,738.87	8,917.23

FLARE

- TNRCC RG-109, October 2010
- ProMax Flare Run

Chaparral Flare Summary

Flare Collection System Summary						
	Total Dump to Flare Drum		Flow to Flare		Flow to Condensate Tanks	
	Mass Frac	Mass Flow, lb/hr	Mass Frac	Mass Flow, lb/hr	Mass Frac	Mass Flow, lb/hr
H2S	0.000	0.024	0.0000	0.034	0.0000	0.000
CO2	0.004	8.440	0.0063	11.885	0.0000	0.004
Nitrogen	0.002	4.641	0.0034	6.552	0.0000	0.000
Methane	0.128	258.370	0.1919	364.497	0.0003	0.036
Ethane	0.093	187.359	0.1385	263.091	0.0015	0.183
Propane	0.130	262.041	0.1905	361.834	0.0085	1.043
i-Butane	0.035	70.344	0.0491	93.210	0.0064	0.784
n-Butane	0.098	198.547	0.1343	255.111	0.0264	3.236
i-Pentane	0.057	115.202	0.0675	128.230	0.0360	4.419
n-Pentane	0.064	129.297	0.0700	132.948	0.0519	6.368
22-Mpropane	0.001	2.664	0.0018	3.329	0.0005	0.056
22-Mbutane	0.001	2.801	0.0012	2.296	0.0017	0.213
23-Mbutane	0.008	17.051	0.0069	13.086	0.0115	1.411
2-Mpentane	0.016	31.691	0.0121	23.073	0.0227	2.782
3-Mpentane	0.026	53.443	0.0191	36.180	0.0411	5.042
n-Hexane	0.037	73.980	0.0231	43.790	0.0635	7.788
Mcyclopentan	0.024	48.747	0.0143	27.092	0.0437	5.358
Benzene	0.029	57.875	0.0160	30.373	0.0537	6.591
Cyclohexane	0.035	71.660	0.0178	33.766	0.0705	8.654
2-Mhexane	0.011	22.529	0.0038	7.270	0.0257	3.150
3-Mhexane	0.009	18.897	0.0031	5.846	0.0218	2.675
n-Heptane	0.018	36.325	0.0047	8.911	0.0443	5.440
Mcyclohexane	0.035	70.059	0.0096	18.142	0.0845	10.370
Toluene	0.026	51.876	0.0052	9.782	0.0664	8.147
n-Octane	0.026	53.356	0.0023	4.422	0.0742	9.104
E-Benzene	0.001	1.700	0.0001	0.105	0.0024	0.295
m-Xylene	0.004	7.093	0.0002	0.359	0.0101	1.240
p-Xylene	0.003	6.832	0.0002	0.352	0.0097	1.193
o-Xylene	0.001	1.986	0.0000	0.093	0.0028	0.348
n-Nonane	0.007	15.116	0.0002	0.403	0.0219	2.688
n-Decane	0.001	3.018	0.0000	0.027	0.0044	0.544
n-C11	0.000	0.387	0.0000	0.001	0.0006	0.070
n-C12	0.000	0.029	0.0000	0.000	0.0000	0.005
n-C13	0.000	0.003	0.0000	0.000	0.0000	0.001
n-C14	0.000	0.000	0.0000	0.000	0.0000	0.000
n-C15	0.000	0.000	0.0000	0.000	0.0000	0.000
H2O	0.069	138.563	0.0068	12.909	0.1912	23.459
TEG	0.000	0.038	0.0000	0.005	0.0001	0.006
Total Flow, lb/hr		2022.0		1899.0		122.7
			Mole Wt	37.20		
			Flow	19,375 SCFH		
			LHV	1816 Btu/SCF		
			HHV	1964 Btu/SCF		

October 2000
RG-109 (Draft)

Air Permit Technical Guidance for Chemical Sources:

Flares and Vapor Oxidizers

printed on recycled paper

Air Permits Division

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Technical Disclaimer

This document is intended as guidance to explain the specific requirements for new source review permitting of flares and vapor oxidizers; it does not supersede or replace any state or federal law, regulation, or rule. References to abatement equipment technologies are not intended to represent minimum or maximum levels of Best Available Control Technology (BACT). Determinations of BACT are made on a case-by-case basis as part of the New Source Review of permit applications. BACT determinations are always subject to adjustment in consideration of specific process requirements, air quality concerns, and recent developments in abatement technology. Additionally, specific health effects concerns may indicate stricter abatement than required by the BACT determination.

The represented calculation methods are intended as an aid in the completion of acceptable submittals; alternate calculation methods may be equally acceptable if they are based upon, and adequately demonstrate, sound engineering assumptions or data.

These guidelines are applicable as of this document's publication date but are subject to revision during the permit application preparation and review period. It is the responsibility of the applicants to remain abreast of any guideline or regulation developments that may affect their industries.

The electronic version of this document may not contain attachments or forms (such as the PI-1, Standard Exemptions, or tables) that can be obtained electronically elsewhere on the TNRCC Web site.

The special conditions included with these guidelines are for purposes of example only. Special conditions included in an actual permit are written by the reviewing engineer to address specific permit requirements and operating conditions.

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Tables

Chapter 2—Types of Flare and Oxidizer Systems

This document provides guidance for two classes of vapor combustion control devices: flares and vapor oxidizers. While there may be some overlap between the two, flares have generally been treated separately by the EPA and the TNRCC, in large part because flares have an open flame and often cannot be sampled, so emissions are estimated based on the results of flare testing performed in the early 1980s. Each of the two classes will be dealt with separately in each of the chapters of this document.

Combustion Control Devices NOT Discussed. This document will not cover permitting of RCRA or BIF units because the requirements for these units often go beyond the requirements for state air permitting. Incinerators used to treat solid wastes are covered in another technical guidance document, *Incinerators*. Guidance for combustion control devices associated with spray paint booths, coatings operations, and semiconductor facilities should be obtained by calling the TNRCC New Source Review Permits Division at (512) 239-1250.

Flares

Flare systems generally are open-flame control devices used for disposing of waste gas streams during both routine process and emergency or upset conditions. In addition to simple, unassisted flares, typical smokeless flare systems include, but are not limited to, the following:

- ***Enclosed Flares/Vapor Combustors.*** Enclosed flares are used in disposing of waste gas streams in instances where a visible flame is unacceptable. Applications include chemical processing, petroleum refining and production, and municipal waste gas treatment. These may be referred to as vapor combustors and can have more than one burner in the stack.

- ***Steam-Assisted Flares***. Steam-assisted flares are used in disposing of low-pressure waste gas streams when steam is available and practical to minimize smoking from the flare. Applications are similar to those of enclosed flares. Flares might also be assisted with natural gas if readily available on site; these flares would undergo a case-by-case review.

- ***Air-Assisted Flares.*** Air-assisted flares are used in disposing of low-pressure waste gas streams when practical or when steam utilities are not available to minimize smoking from the flare. Applications include chemical processing, petroleum refining and production, and pipeline transportation.

- ***Sonic Flares.*** Sonic flares are used in disposing of high-pressure waste gas streams. Applications include gas production, pipeline transportation, and treatment plants.

- ***Multipoint Flare Systems.*** Multipoint flare systems are used in disposing of both high- and low-pressure waste gas streams. Multiple burner tips in conjunction with a staged control system provide for controlled combustion. Applications are similar to those of air-assisted flares.

Vapor Oxidizers

These devices generally do not have an open flame but have an exhaust stack which allows for sampling and monitoring of exhaust emissions. The most common type, thermal, relies on the combustion heat of the waste gas and assist fuel (if required) to oxidize the waste gas air contaminants. Other types include:

- ***Recuperative.*** In this case, the waste gas is directed to a heat exchanger to be preheated by the exhaust gas, to minimize the need for additional assist fuel. Recuperative oxidizers are considered a subset of thermal oxidizers in this document.

- ***Regenerative.*** Combustion takes place in a chamber with a heat sink, such as ceramic saddles, which retains the heat of combustion, allowing for combustion of more dilute vapor streams (which have a low heat of combustion) at a lower cost. These units generally have multiple chambers, which allow for the preheat of one chamber by exhaust gases while combustion takes place in another chamber.

- ***Catalytic.*** Combustion takes place over a catalyst that allows for combustion at a lower temperature (in the range of 600 to 800°F as opposed to greater than 1400°F for many thermal oxidizers). Catalytic oxidizers function best with a waste stream with constant flow and composition.

This chapter provides detailed instructions for the calculations necessary to verify BACT and estimate emissions from flares and vapor oxidizers. Flares must be checked to determine whether they will satisfy the flow and thermal requirements of 40 CFR § 60.18, and their emissions are determined by the use of emission factors. Example calculations are provided for these flare calculations.

Oxidizer emissions are determined by using previous sampling results or emission factors from the manufacturer or AP-42. These calculations are very similar to the flare calculations and are only discussed in general terms.

Flares: Introduction

Although emissions from emergency flares are not included in a permit when it is issued, emissions should be estimated for both routine process flares and emergency flares. Sometimes, emissions of routine pilot gas combustion may be included in an issued permit for emergency flares (although not required).

In this section, the *flare* emission factors and destruction efficiencies are presented first. This information is followed by sample *calculations* that demonstrate how to ensure that the requirements of 40 CFR § 60.18 are satisfied and how to estimate emissions from a flare. Flare data in Attachment B (typical refinery flare) will be used as a basis in most of the following calculations. Flare data in Attachment C (acid gas flare) will be used as a basis in the example calculations for SO_2 emissions.

Flare Emission Factors

The usual flare destruction efficiencies and emission factors are provided in Table 4. The high-Btu waste streams referred to in the table have a heating value greater than 1,000 Btu/scf.

Flare Destruction Efficiencies

Claims for destruction efficiencies greater than those listed in Table 4 will be considered on a case-by-case basis. The applicant may make one of the three following demonstrations to justify the higher destruction efficiency: (1) general method, (2) 99.5 percent justification, or (3) flare stack sampling.

Table 4. Flare Factors

Waste Stream	Destruction/Removal Efficiency (DRE)		
VOC	98 percent (generic) 99 percent for compounds containing no more than 3 carbons that contain no elements other than carbon and hydrogen in addition to the following compounds: methanol, ethanol, propanol, ethylene oxide and propylene oxide		
H_2S	98 percent		
NH_3	case by case		
CO	case by case		
Air Contaminants	**Emission Factors**		
thermal NO_x	steam-assist:	high Btu	0.0485 lb/MMBtu
		low Btu	0.068 lb/MMBtu
	other:	high Btu	0.138 lb/MMBtu
		low Btu	0.0641 lb/MMBtu
fuel NO_x	NO_x is 0.5 wt percent of inlet NH_3, other fuels case by case		
CO	steam-assist:	high Btu	0.3503 lb/MMBtu
		low Btu	0.3465 lb/MMBtu
	other:	high Btu	0.2755 lb/MMBtu
		low Btu	0.5496 lb/MMBtu
PM	none, required to be smokeless		
SO_2	100 percent S in fuel to SO_2		

*The only exeption ot this is if inorganics might be emitted from the flare. In the case of landfills, the AP-42 PM factor may be used. In other cases, the emissions should be based on the composition of the waste stream routed to the flare.

FUG-1

- Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates (1995)

United States
Environmental Protection
Agency

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

EPA-453/R-95-017
November 1995

Air

EPA

Protocol for Equipment Leak Emission Estimates

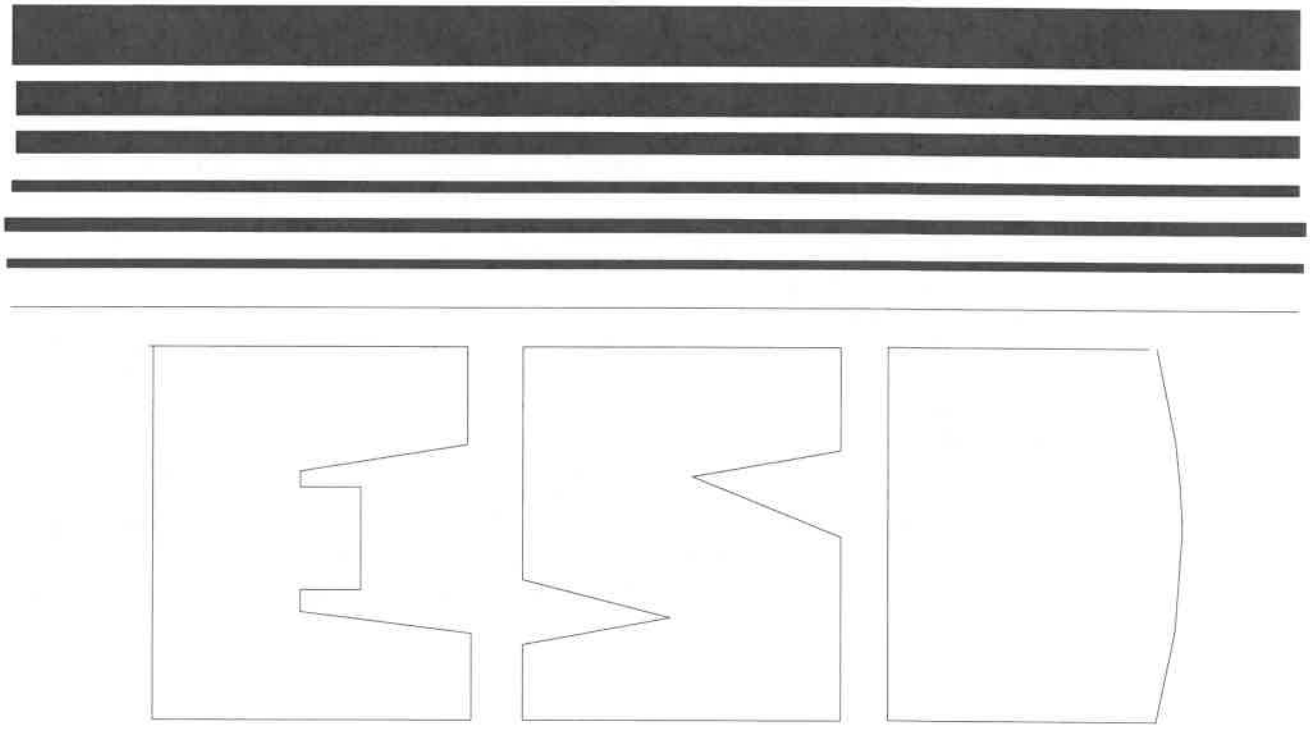


TABLE 2-4. OIL AND GAS PRODUCTION OPERATIONS AVERAGE EMISSION FACTORS (kg/hr/source)

Equipment Type	Service[a]	Emission Factor (kg/hr/source)[b]
Valves	Gas	4.5E-03
	Heavy Oil	8.4E-06
	Light Oil	2.5E-03
	Water/Oil	9.8E-05
Pump seals	Gas	2.4E-03
	Heavy Oil	NA
	Light Oil	1.3E-02
	Water/Oil	2.4E-05
Others[c]	Gas	8.8E-03
	Heavy Oil	3.2E-05
	Light Oil	7.5E-03
	Water/Oil	1.4E-02
Connectors	Gas	2.0E-04
	Heavy Oil	7.5E-06
	Light Oil	2.1E-04
	Water/Oil	1.1E-04
Flanges	Gas	3.9E-04
	Heavy Oil	3.9E-07
	Light Oil	1.1E-04
	Water/Oil	2.9E-06
Open-ended lines	Gas	2.0E-03
	Heavy Oil	1.4E-04
	Light Oil	1.4E-03
	Water/Oil	2.5E-04

[a]Water/Oil emission factors apply to water streams in oil service with a water content greater than 50%, from the point of origin to the point where the water content reaches 99%. For water streams with a water content greater than 99%, the emission rate is considered negligible.

[b]These factors are for total organic compound emission rates (including non-VOC's such as methane and ethane) and apply to light crude, heavy crude, gas plant, gas production, and off shore facilities. "NA" indicates that not enough data were available to develop the indicated emission factor.

[c]The "other" equipment type was derived from compressors, diaphrams, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents. This "other" equipment type should be applied for any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.

HAUL

- AP-42 Section 13.2.2 (11/06)

13.2.2 Unpaved Roads

13.2.2.1 General

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

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

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

13.2.2.2 Emissions Calculation And Correction Parameters[1-6]

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

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

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

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

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

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

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

[a]References 1,5-15.

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

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

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

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

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

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

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

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

1 lb/VMT = 281.9 g/VKT

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

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

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

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

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

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

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

[a] See discussion in text.

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

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

as shown in Table 13.2.2-4

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

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

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.
[b] Units shown are pounds per vehicle mile traveled (lb/VMT).
[c] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

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

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

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

The effect of routine watering to control emissions from unpaved roads is discussed below in Section 13.2.2.3, "Controls". However, all roads are subject to some natural mitigation because of rainfall and other precipitation. The Equation 1a and 1b emission factors can be extrapolated to annual

average uncontrolled conditions (but including natural mitigation) under the simplifying assumption that annual average emissions are inversely proportional to the number of days with measurable (more than 0.254 mm [0.01 inch]) precipitation:

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

where:

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

E = emission factor from Equation 1a or 1b

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

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

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

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

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

13.2.2.3 Controls[18-22]

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

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

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

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

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

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

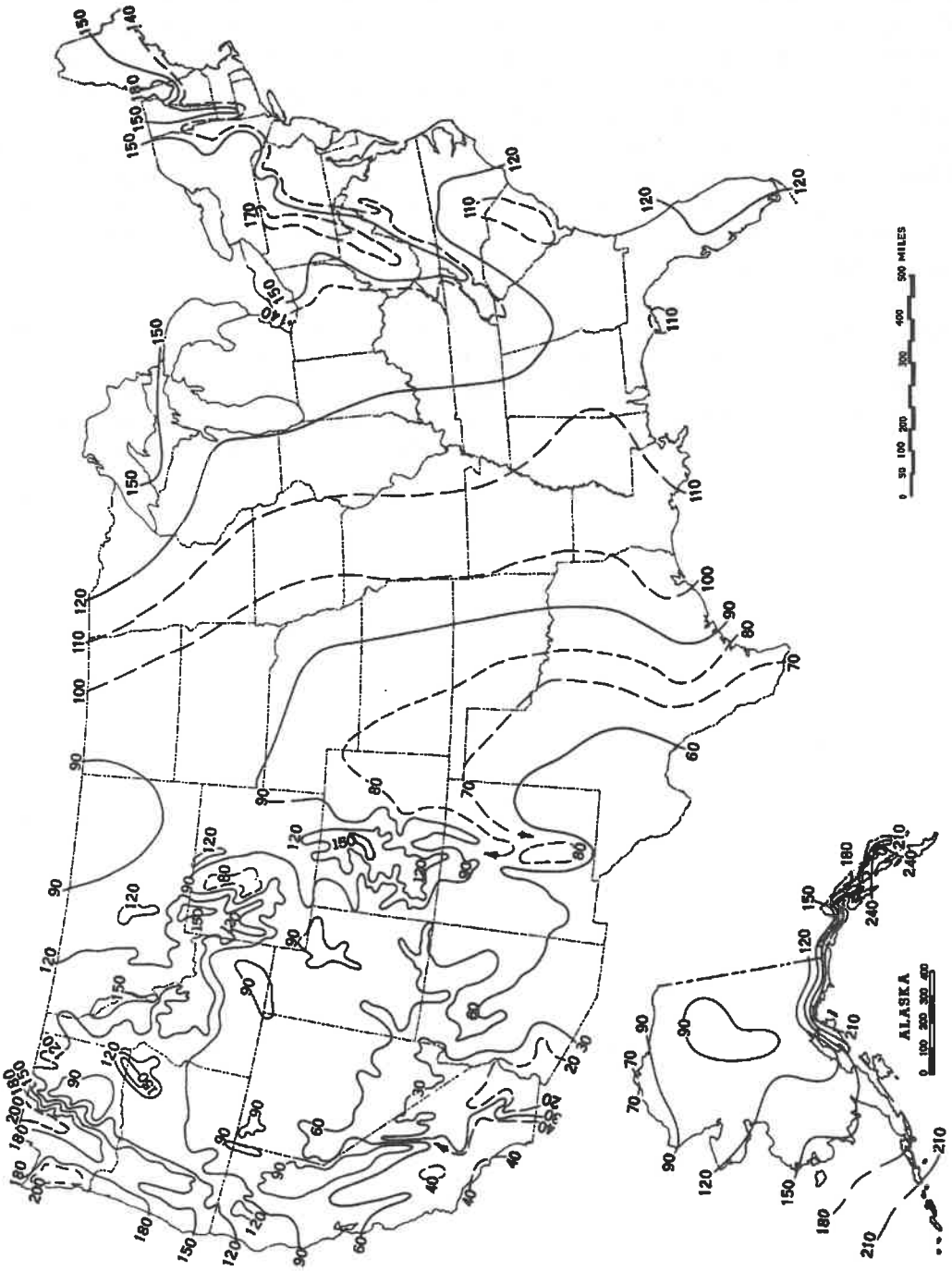


Figure 13.2.2-1. Mean number of days with 0.01 inch or more of precipitation in United States.

Engine VRU-1

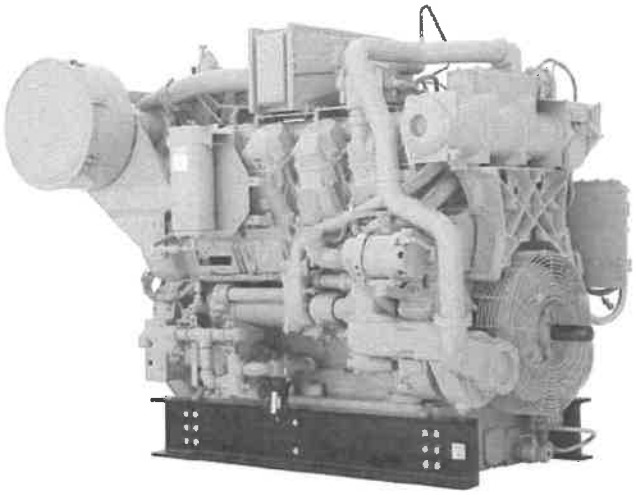
- CAT G3508LE manufacturer data
- AP-42 Table 3.2-2 (7/00)
- GRI-HAPCalc 3.01 output

CATERPILLAR®

G3508 LE Gas Petroleum Engine

500 bkW (670 bhp)
1400 rpm

2.0 g/bhp-hr NOx (NTE)



Shown with Optional Equipment

CAT® ENGINE SPECIFICATIONS

V-8, 4-Stroke-Cycle

Bore	170 mm (6.7 in.)
Stroke	190 mm (7.5 in.)
Displacement	34.5 L (2105 cu. in.)
Aspiration	Turbocharged-Aftercooled
Digital Engine Management Governor and Protection	Electronic (ADEM™ A3)
Combustion	Low Emission (Lean Burn)
Engine Weight, net dry (approx)	5420 kg (11,950 lb)
Power Density	10.9 kg/kW (17.8 lb/bhp)
Power per Displacement	19.4 bhp/L
Total Cooling System Capacity	124.9 L (33 gal)
Jacket Water	113.6 L (30 gal)
SCAC	11.4 L (3 gal)
Lube Oil System (refill)	230.9 L (61 gal)
Oil Change Interval	1000 hours
Rotation (from flywheel end)	Counterclockwise
Flywheel and Flywheel Housing	SAE No. 00
Flywheel Teeth	183

FEATURES

Engine Design
- Proven reliability and durability
- Ability to burn a wide spectrum of gaseous fuels
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Broad operating speed range

Emissions
Meets U.S. EPA Spark Ignited Stationary NSPS Emissions for 2007/8

Advanced Digital Engine Management
ADEM A3 control system providing integrated ignition, speed governing, protection, and controls, including detonation-sensitive variable ignition timing. ADEM A3 has improved: user interface, display system, shutdown controls, and system diagnostics.

Lean Burn Engine Technology
Lean-burn engines operate with large amounts of excess air. The excess air absorbs heat during combustion reducing the combustion temperature and pressure, greatly reducing levels of NOx. Lean-burn design also provides longer component life and excellent fuel consumption.

Ease of Operation
Side covers on block allow for inspection of internal components

Full Range of Attachments
Large variety of factory-installed engine attachments reduces packaging time

Testing
Every engine is full-load tested to ensure proper engine performance.

Gas Engine Rating Pro
GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

Product Support Offered Through Global Cat Dealer Network
More than 2,200 dealer outlets

Cat factory-trained dealer technicians service every aspect of your petroleum engine

Cat parts and labor warranty

Preventive maintenance agreements available for repair-before-failure options

S•O•S℠ program matches your oil and coolant samples against Caterpillar set standards to determine:
- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

Over 80 Years of Engine Manufacturing Experience
Over 60 years of natural gas engine production

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products.
- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

Web Site
For all your petroleum power requirements, visit www.catoilandgas.cat.com.

STANDARD EQUIPMENT

Air Inlet System
Remote air inlet adapters

Charging System
Battery chargers

Cooling System
Jacket water thermostats and housing — full open temperature 98°C (208°F)
Jacket water pump — gear driven, centrifugal, non-self-priming
Aftercooler water pump — gear driven, centrifugal, non-self-priming
Aftercooler core for sea-air atmosphere
Aftercooler thermostats and housing — full open temperature 35°C (95°F)
Aftercooler — raw water, cleanable

Exhaust System
Exhaust manifolds — watercooled

Flywheels & Flywheel Housings
SAE No. 00 flywheel
SAE No. 00 flywheel housing
SAE standard rotation

Fuel System
Gas pressure regulator
Natural gas carburetor
Fuel gas shut-off valve (24V DC)

Instrumentation
Advisor panel
Advisor interconnect harness

Lubrication System
Crankcase breathers — top mounted
Oil cooler
Oil filter — RH
Oil pan — shallow
Oil sampling valve
Turbo oil accumulator

Mounting System
Rails, engine mounting

Power Take-Offs
Front housing — two-sided
Front lower LH accessory drive

Protection System
Electronic shutoff system
Gas shutoff valve

General
Paint — Cat yellow
Vibration damper and guard

OPTIONAL EQUIPMENT

Air Inlet System
Remote air inlet adapters

Charging System
Battery chargers

Cooling System
Aftercooler core
Thermostatic valves
Connections
Expansion and overflow tank
Water level switch gauge

European Certifications
European Union certifications

Exhaust System
Flexible fittings
Elbows
Flanges
Flange and exhaust expanders
Mufflers

Fuel System
Fuel filter

Instrumentation
Customer communication modules

Lubrication System
Oil filters — duplex
Oil pan drain
Oil level regulator
Sump pumps
Lubricating oil

Mounting System
Rails
Vibration isolators

Power Take-Offs
Auxiliary drive shaft
Auxiliary drive pulleys
Front stub shaft
Pulleys

Protection System
Gas valve
Explosion relief valves

Starting System
Air pressure regulator
Air silencer
JW heaters
Battery sets (24-volt dry)
Battery accessories

General
Flywheel guard removal
Engine barring group
Premium 8:1 pistons

TECHNICAL DATA

G3508 LE Gas Petroleum Engine — 1400 rpm

		2 g NOx NTE Rating DM8621-2
Engine Power		
@ 100% Load	bkW (bhp)	500 (670)
@ 75% Load	bkW (bhp)	375 (502)
Engine Speed	rpm	1400
Max Altitude @ Rated Torque and 38°C (100°F)	m (ft)	609.6 (2000)
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	25
SCAC Temperature	°C (°F)	54 (130)
Emissions*		
NOx	g/bkW-hr (g/bhp-hr)	2.68 (2)
CO	g/bkW-hr (g/bhp-hr)	2.47 (1.84)
CO_2	g/bkW-hr (g/bhp-hr)	627 (468)
VOC**	g/bkW-hr (g/bhp-hr)	0.41 (0.3)
Fuel Consumption***		
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr)	10.63 (7510)
@ 75% Load	MJ/bkW-hr (Btu/bhp-hr)	11.22 (7936)
Heat Balance		
Heat Rejection to Jacket Water		
@ 100% Load	bkW (Btu/min)	319.8 (18,204)
@ 75% Load	bkW (Btu/min)	282 (16,013)
Heat Rejection to Aftercooler		
@ 100% Load	bkW (Btu/min)	80 (4555)
@ 75% Load	bkW (Btu/min)	56.1 (3191)
Heat Rejection to Exhaust		
@ 100% Load (LHV to 77° F / 25° C)	bkW (Btu/mn)	481.9 (27,406)
@ 75% Load (LHV to 77°) (LHV to 77° F / 25° C)	bkW (Btu/mn)	372.8 (21,203)
Exhaust System		
Exhaust Gas Flow Rate (@ stack temp.,14.5 psig)		
@ 100% Load	m³/min (cfm)	115.7 (4086)
@ 75% Load	m³/min (cfm)	89.57 (3163)
Exhaust Stack Temperature		
@ 100% Load	°C (°F)	529 (985)
@ 75% Load	°C (°F)	525 (977)
Intake System		
Air Inlet Flow Rate		
@ 100% Load	m³/min (scfm)	39.53 (1396)
@ 75% Load	m³/min (scfm)	30.72 (1085)
Gas Pressure	kPag (psig)	242-276 (35-40)

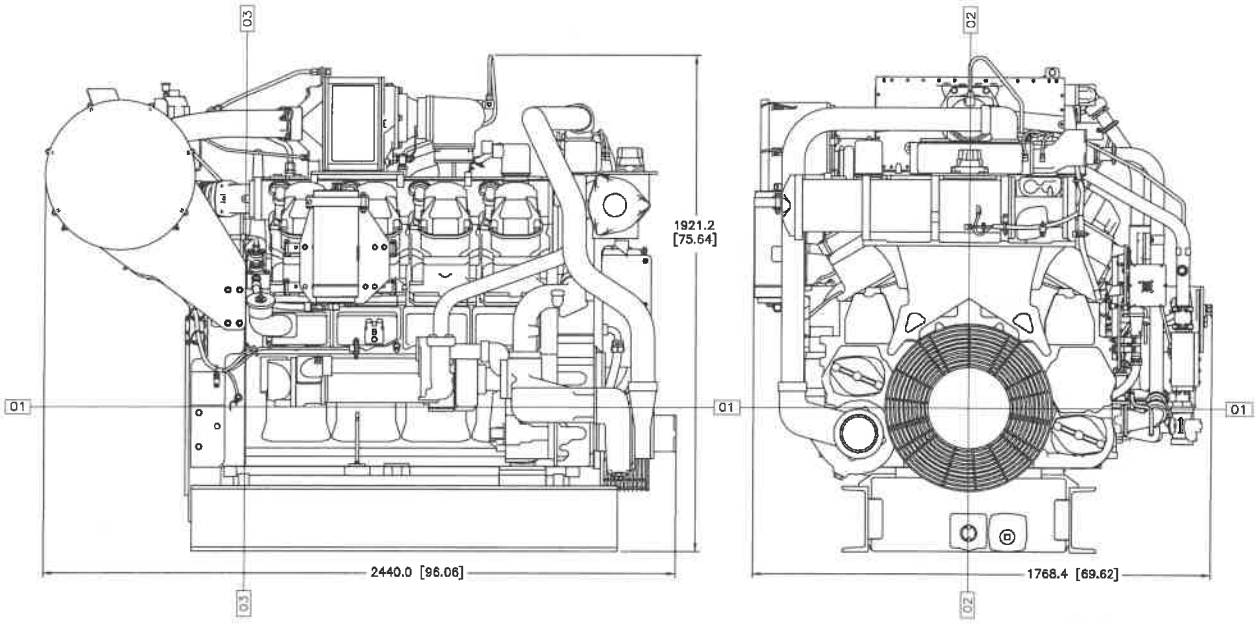
*at 100% load and speed, all values are listed as not to exceed
**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJJ
***ISO 3046/1

CATERPILLAR®

G3508 LE GAS PETROLEUM ENGINE

500 bkW (670 bhp)

GAS PETROLEUM ENGINE



DIMENSIONS		
Length	mm (in)	2440.0 (96.06)
Width	mm (in)	1768.4 (69.62)
Height	mm (in)	1921.2 (75.64)
Shipping Weight	kg (lb)	5420 (11,950)

Note: General configuration not to be used for installation. See general dimension drawings for detail (drawing #315-3136).

Dimensions are in mm (inches).

RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

Transient response data is acquired from an engine/ generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

Conditions: Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in. Hg) and 15° C (59° F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in. Hg) and 15.6° C (60.1° F). Air flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and 25° C (77° F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and stack temperature.

Performance Number: DM8621-02
LEHW0034-01 (2-10)

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES[a]
(SCC 2-02-002-54)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	4.08 E+00	B
NO_x[c] <90% Load	8.47 E-01	B
CO[c] 90 - 105% Load	3.17 E-01	C
CO[c] <90% Load	5.57 E-01	B
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	1.47 E+00	A
Methane[g]	1.25 E+00	C
VOC[h]	1.18 E-01	C
PM10 (filterable)[i]	7.71 E-05	D
PM2.5 (filterable)[i]	7.71 E-05	D
PM Condensable[j]	9.91 E-03	D
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[k]	<4.00 E-05	E
1,1,2-Trichloroethane[k]	<3.18 E-05	E
1,1-Dichloroethane	<2.36 E-05	E
1,2,3-Trimethylbenzene	2.30 E-05	D
1,2,4-Trimethylbenzene	1.43 E-05	C
1,2-Dichloroethane	<2.36 E-05	E
1,2-Dichloropropane	<2.69 E-05	E
1,3,5-Trimethylbenzene	3.38 E-05	D
1,3-Butadiene[k]	2.67E-04	D
1,3-Dichloropropene[k]	<2.64 E-05	E
2-Methylnaphthalene[k]	3.32 E-05	C
2,2,4-Trimethylpentane[k]	2.50 E-04	C
Acenaphthene[k]	1.25 E-06	C

GRI-HAPCalc ® 3.01
Engines Report

Facility ID:	**CHAPARRAL**	**Notes:**
Operation Type:	**GAS PLANT**	
Facility Name:	**CHAPARRAL**	
User Name:		
Units of Measure:	**U.S. STANDARD**	

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

Engine Unit

Unit Name: G3508LE

Hours of Operation:	8,760	Yearly
Rate Power:	670	hp
Fuel Type:	NATURAL GAS	
Engine Type:	4-Stroke, Lean Burn	
Emission Factor Set:	EPA > FIELD > LITERATURE	
Additional EF Set:	-NONE-	

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
Tetrachloroethane	0.0001	0.00000820 g/bhp-hr	EPA
Formaldehyde	1.1264	0.17425810 g/bhp-hr	EPA
Methanol	0.0533	0.00825090 g/bhp-hr	EPA
Acetaldehyde	0.1783	0.02759090 g/bhp-hr	EPA
1,3-Butadiene	0.0057	0.00088120 g/bhp-hr	EPA
Acrolein	0.1097	0.01696380 g/bhp-hr	EPA
Benzene	0.0094	0.00145220 g/bhp-hr	EPA
Toluene	0.0087	0.00134650 g/bhp-hr	EPA
Ethylbenzene	0.0008	0.00013100 g/bhp-hr	EPA
Xylenes(m,p,o)	0.0039	0.00060730 g/bhp-hr	EPA
2,2,4-Trimethylpentane	0.0053	0.00082510 g/bhp-hr	EPA
n-Hexane	0.0237	0.00366340 g/bhp-hr	EPA
Phenol	0.0005	0.00007920 g/bhp-hr	EPA
Styrene	0.0005	0.00007790 g/bhp-hr	EPA
Naphthalene	0.0016	0.00024550 g/bhp-hr	EPA
2-Methylnaphthalene	0.0007	0.00010960 g/bhp-hr	EPA
Acenaphthylene	0.0001	0.00001830 g/bhp-hr	EPA
Biphenyl	0.0045	0.00069970 g/bhp-hr	EPA
Acenaphthene	0.0000	0.00000410 g/bhp-hr	EPA
Fluorene	0.0001	0.00001870 g/bhp-hr	EPA
Phenanthrene	0.0002	0.00003430 g/bhp-hr	EPA
Ethylene Dibromide	0.0009	0.00014620 g/bhp-hr	EPA
Fluoranthene	0.0000	0.00000370 g/bhp-hr	EPA
Pyrene	0.0000	0.00000450 g/bhp-hr	EPA
Chrysene	0.0000	0.00000230 g/bhp-hr	EPA

Benzo(b)fluoranthene	0.0000	0.00000050 g/bhp-hr	EPA
Benzo(e)pyrene	0.0000	0.00000140 g/bhp-hr	EPA
Benzo(g,h,i)perylene	0.0000	0.00000140 g/bhp-hr	EPA
Vinyl Chloride	0.0003	0.00004920 g/bhp-hr	EPA
Methylene Chloride	0.0004	0.00006600 g/bhp-hr	EPA
1,1-Dichloroethane	0.0005	0.00007790 g/bhp-hr	EPA
1,3-Dichloropropene	0.0006	0.00008710 g/bhp-hr	EPA
Chlorobenzene	0.0006	0.00010030 g/bhp-hr	EPA
Chloroform	0.0006	0.00009410 g/bhp-hr	EPA
1,1,2-Trichloroethane	0.0007	0.00010500 g/bhp-hr	EPA
1,1,2,2-Tetrachloroethane	0.0009	0.00013200 g/bhp-hr	EPA
Carbon Tetrachloride	0.0008	0.00012110 g/bhp-hr	EPA
Total	1.5398		

Criteria Pollutants

PM	0.2131	0.03296090 g/bhp-hr	EPA
CO	6.7626	1.04620860 g/bhp-hr	EPA
NMEHC	2.5173	0.38944040 g/bhp-hr	EPA
NOx	87.0387	13.46539810 g/bhp-hr	EPA
SO2	0.0125	0.00194060 g/bhp-hr	EPA

Other Pollutants

Butryaldehyde	0.0022	0.00033330 g/bhp-hr	EPA
Chloroethane	0.0000	0.00000620 g/bhp-hr	EPA
Methane	26.6663	4.12542830 g/bhp-hr	EPA
Ethane	2.2400	0.34653600 g/bhp-hr	EPA
Propane	0.8939	0.13828440 g/bhp-hr	EPA
Butane	0.0115	0.00178550 g/bhp-hr	EPA
Cyclopentane	0.0048	0.00074920 g/bhp-hr	EPA
n-Pentane	0.0555	0.00858090 g/bhp-hr	EPA
Methylcyclohexane	0.0262	0.00405940 g/bhp-hr	EPA
1,2-Dichloroethane	0.0005	0.00007790 g/bhp-hr	EPA
1,2-Dichloropropane	0.0006	0.00008880 g/bhp-hr	EPA
n-Octane	0.0075	0.00115840 g/bhp-hr	EPA
1,2,3-Trimethylbenzene	0.0005	0.00007590 g/bhp-hr	EPA
1,2,4-Trimethylbenzene	0.0003	0.00004720 g/bhp-hr	EPA
1,3,5-Trimethylbenzene	0.0007	0.00011160 g/bhp-hr	EPA
n-Nonane	0.0023	0.00036300 g/bhp-hr	EPA
CO2	2,346.6309	363.03769350 g/bhp-hr	EPA

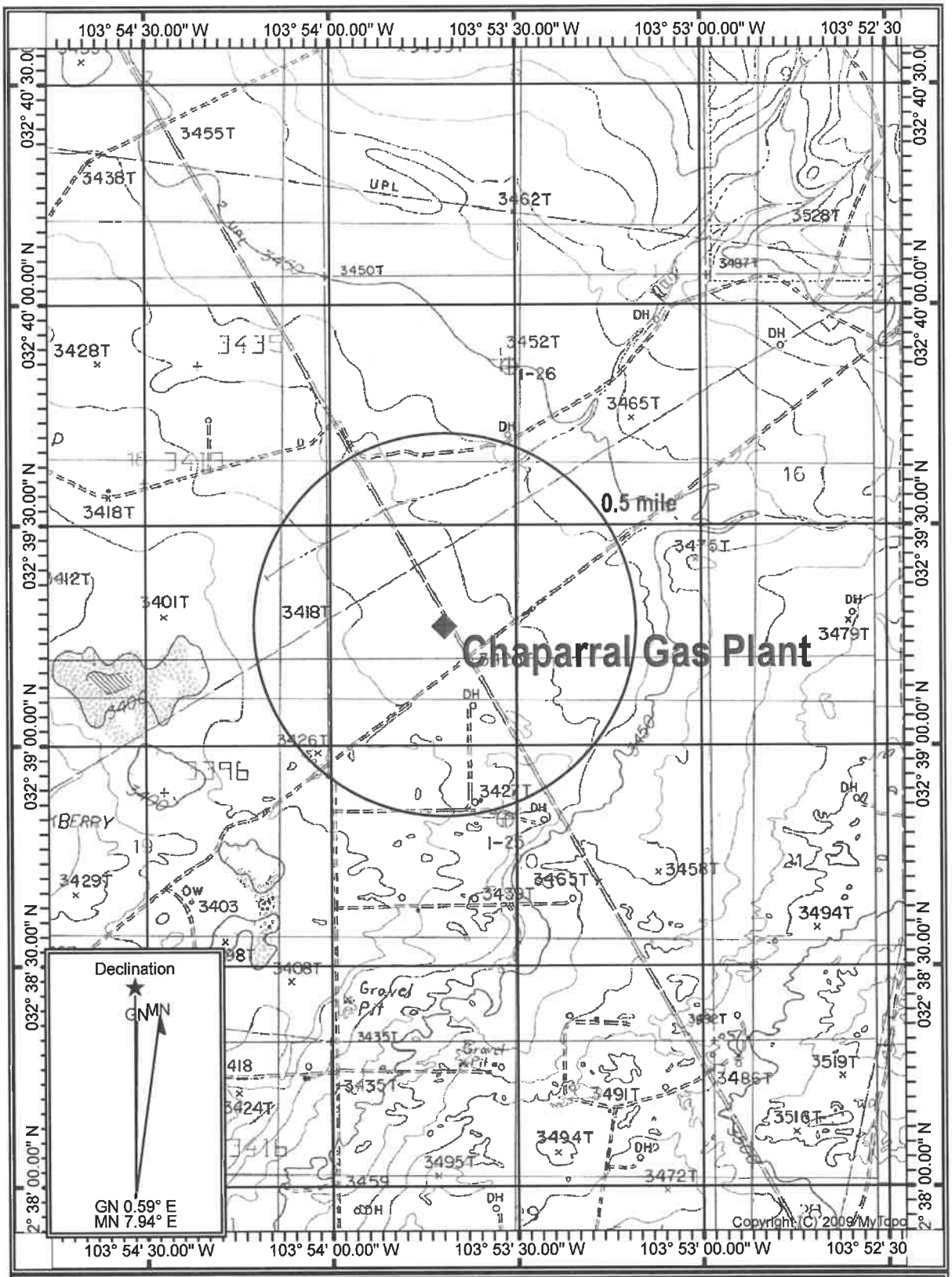
Section 8

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	

A map showing the location of the Plant is attached.



Map Name: HACKBERRY LAKE Scale: 1 inch = 2,000 ft. Horizontal Datum: WGS84
Print Date: 03/22/16 Map Center: 032° 39' 14.47" N 103° 53' 41.54" W

Section 9

Proof of Public Notice

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

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

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

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

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

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

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

Not Applicable.

Section 10

Written Description of the Routine Operations of the Facility

A written description of the routine operations of the facility. 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.

A mixture of natural gas, condensate, and water enter the Plant via pipeline and is sent through a three phase inlet separator. Condensate liquids are sent to 300 bbl condensate tanks (TK-1, TK-2 and TK-3). The natural gas is then compressed by the inlet compressor(s). Two (2) lean burn engines (unit 6000 and unit 7000) drive compression for a low-pressure field natural gas stream and are dedicated inlet compression units. The other 5 engines (units 1000 – 5000) drive compressors with the capability to operate as either inlet or residue gas compressors.

The natural gas is sent through a tri-ethylene glycol dehydrator (unit DEHY-1) where moisture is removed from the gas. The dehydrator is equipped with a BTEX Buster control device that routes all non-condensable vapors to either the reboiler firebox, the glow-plug, or the flare. The gas is further dried using a mole sieve dehydrator (unit MOLE-1). The gas is then thermally processed in a cryogenic unit (unit CRYO) to remove hydrocarbon liquids. The hydrocarbon liquids are treated in an amine unit for removal of CO_2. The resulting residue gas is compressed for transport via pipeline by the residue gas compressor(s). The Y-grade natural gas liquids are removed from the Plant by pipeline. Condensate from the 300-bbl condensate tanks is removed from the Plant by truck. The flare is used as a control device during normal operation; for SSM emissions from facility-wide blow down and compressor blowdowns; and during upset events.

Gas will be sent to the TEG dehydrator (unit DEHY-2) to remove water. After the water has been removed, the gas will be sent to the MRU (unit MRU) where Y-grade liquids will be removed from the gas. The Y-grade liquids will be sent the stabilizer. Gas off the stabilizer will be captured by VRU-1 and routed back to inlet. The gas off of the MRU will either tie in to the existing residue gas line or routed back to the inlet of the exiting cryogenic unit, where it will be further treated. The Y-grade liquids from the MRU will tie into the existing facility pipeline for removal from the facility.

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):

B. Apply the 3 criteria for determining a single source:

SIC Code: Surrounding or associated sources belong to the same 2-digit industrial grouping (2-digit SIC code) as this facility, OR surrounding or associated sources that belong to different 2-digit SIC codes are support facilities for this source.

☒ **Yes** ☐ **No**

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

☒ **Yes** ☐ **No**

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

☒ **Yes** ☐ **No**

C. Make a determination:

☒ The source, as described in this application, constitutes the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes. If in "A" above you evaluated only the source that is the subject of this application, all "**YES**" boxes should be checked. If in "A" above you evaluated other sources as well, you must check **AT LEAST ONE** of the boxes "**NO**" to conclude that the source, as described in the application, is the entire source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes.

☐ The source, as described in this application, **does not** constitute the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes (A permit may be issued for a portion of a source). The entire source consists of the following facilities or emissions sources (list and describe):

Section 12

Section 12.A
PSD Applicability Determination for All Sources

(Submitting under 20.2.72, 20.2.74 NMAC)

A PSD applicability determination for all sources. For sources applying for a significant permit revision, apply the applicable requirements of 20.2.74.AG and 20.2.74.200 NMAC and to determine whether this facility is a major or minor PSD source, and whether this modification is a major or a minor PSD modification. It may be helpful to refer to the procedures for Determining the Net Emissions Change at a Source as specified by Table A-5 (Page A.45) of the EPA New Source Review Workshop Manual to determine if the revision is subject to PSD review.

A. This facility is:

- ☐ **a minor PSD source before and after this modification (if so, delete C and D below).**
- ☐ **a major PSD source before this modification. This modification will make this a PSD minor source.**
- ☐ **an existing PSD Major Source that has never had a major modification requiring a BACT analysis.**
- ☐ **an existing PSD Major Source that has had a major modification requiring a BACT analysis**
- ☐ **a new PSD Major Source after this modification.**

B. **This facility [is or is not] one of the listed 20.2.74.501 Table I – PSD Source Categories. The "project" emissions** for this modification are **[significant or not significant]. [Discuss why.] The "project" emissions listed below [do or do not] only result from changes described in this permit application, thus no emissions from other [revisions or modifications, past or future] to this facility. Also, specifically discuss whether this project results in "de-bottlenecking", or other associated emissions resulting in higher emissions. The project emissions (before netting) for this project are as follows [see Table 2 in 20.2.74.502 NMAC for a complete list of significance levels]:**

a. **NOx: XX.X TPY**
b. **CO: XX.X TPY**
c. **VOC: XX.X TPY**
d. **SOx: XX.X TPY**
e. **TSP (PM): XX.X TPY**
f. **PM10: XX.X TPY**
g. **PM2.5: XX.X TPY**
h. **Fluorides: XX.X TPY**
i. **Lead: XX.X TPY**
j. **Sulfur compounds (listed in Table 2): XX.X TPY**
k. **GHG: XX.X TPY**

Not Applicable.

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	If subject, this would normally apply to the entire facility. 20.2.3 NMAC is a State Implementation Plan (SIP) approved regulation that limits the maximum allowable concentration of Total Suspended Particulates, Sulfur Compounds, Carbon Monoxide and Nitrogen Dioxide.
20.2.7 NMAC	Excess Emissions	Yes	Facility	If subject, this would normally apply to the entire facility. If your entire facility or individual pieces of equipment are subject to emissions limits in a permit or numerical emissions standards in a federal or state regulation, this applies. This would not apply to Notices of Intent since these are not permits.
20.2.33 NMAC	Gas Burning Equipment - Nitrogen Dioxide	No	N/A	**This regulation does not apply to internal combustion equipment such as engines. It only applies to external combustion equipment such as heaters or boilers.** This Plant does not have gas burning equipment (external combustion emission sources, such as gas fired boilers and heaters) having a heat input of greater than 1,000,000 million British Thermal Units per year per unit. The Plant is not subject to this regulation and does not have emission sources that meet the applicability requirements under 20.2.33.108 NMAC. Note: "New gas burning equipment" means gas burning equipment, the construction or modification of which is commenced after February 17, 1972.
20.2.34 NMAC	Oil Burning Equipment: NO_2	No	N/A	**This regulation does not apply to internal combustion equipment such as engines. It only applies to external combustion equipment such as heaters or boilers.** This Plant does not have oil burning equipment (external combustion emission sources, such as oil fired boilers and heaters) having a heat input of greater than 1,000,000 million British Thermal Units per year per unit. The Plant is not subject to this regulation and does not have emission sources that meet the applicability requirements under 20.2.34.108 NMAC.
20.2.35 NMAC	Natural Gas Processing Plant – Sulfur	No	N/A	This regulation could apply to existing (prior to July 1, 1974) or new (on or after July 1, 1974) natural gas processing plants that use a Sulfur Recovery Unit to reduce sulfur emissions. **See 'Guidance and Clarification Regarding Applicability of 20.2.35 NMAC' located with the Air Quality Bureau's Permit Section website guidance documents.**
20.2.37 and 20.2.36 NMAC	Petroleum Processing Facilities and Petroleum Refineries	N/A	N/A	These regulations were repealed by the Environmental Improvement Board. If equipment is subject to 20.2.37 NMAC before the repeal, the combustion emission sources are now subject to 20.2.61 NMAC.
20.2.38 NMAC	Hydrocarbon Storage Facility	No	TK-1, TK-2 and Tk-3	There are three 300 bbl tanks at this Plant, which do not meet the capacity or throughput thresholds to be subject to this regulation. [20.2.38.109 NMAC] [20.2.38.112 NMAC]
20.2.39 NMAC	Sulfur Recovery Plant - Sulfur	No	N/A	This regulation could apply to sulfur recovery plants that are not part of petroleum or natural gas processing facilities.
20.2.61.109 NMAC	Smoke & Visible Emissions	Yes	E-1000 through E-7000, DEHY-1a, DEHY-2a, MOLE-1, FLARE,	This regulation that limits opacity to 20% applies to Stationary Combustion Equipment, such as engines, boilers, heaters, and flares unless your equipment is subject to another state regulation that limits particulate matter such as 20.2.19 NMAC (see 20.2.61.109 NMAC). **If equipment at a facility was subject to the repealed regulation 20.2.37 NMAC it is now subject to 20.2.61 NMAC.**

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.)
			and E-VRU-1	
20.2.70 NMAC	Operating Permits	Yes	Facility	The Plant is subject to this regulation because the source is a Title V major source.
20.2.71 NMAC	Operating Permit Fees	Yes	Facility	This regulation establishes a schedule of operating permit emission fees. The Plant is subject to 20.2.70 NMAC and in turn subject to 20.2.71 NMAC.
20.2.72 NMAC	Construction Permits	Yes	Facility	This regulation establishes the requirements for obtaining a construction permit. The Plant is a stationary source that has potential emission rates greater than 10 pounds per hour or 25 tons per year of any regulated air contaminant for which there is a National or New Mexico Air Quality Standard. Therefore, this Plant is subject to 20.2.72 NMAC and complies with NSR Permit 3662-M7.
20.2.73 NMAC	NOI & Emissions Inventory Requirements	Yes	Facility	The Plant is a Title V major source and must meet the requirements of 20.2.73.300 NMAC for emissions inventory reporting.
20.2.74 NMAC	Permits – Prevention of Significant Deterioration (PSD)	No	Facility	This regulation establishes requirements for obtaining a prevention of significant deterioration permit. This Plant is a PSD minor source. Accordingly, this regulation does not apply.
20.2.75 NMAC	Construction Permit Fees	Yes	Facility	This regulation establishes a schedule of operating permit emission fees. This Plant 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	CRYO, MRU, C-VRU-1, FUG-1, FUG-2, FLARE, C-1000 to C-7000,E-1000, possibly E-7000	This regulation establishes state authority to implement new source performance standards (NSPS) for stationary sources as amended in the Federal Register through September 23, 2013. This is a stationary source which is subject to the requirements of 40 CFR Part 60, Subparts A, KKK, and OOOO, therefore, 20.2.77 NMAC applies.
20.2.78 NMAC	Emission Standards for HAPS	No	N/A	This regulation establishes state authority to implement emission standards for hazardous air pollutants subject to 40 CFR Part 61. In the event of asbestos demolition, NESHAP M may apply, making 20.2.78 NMAC applicable.
20.2.79 NMAC	Permits – Nonattainment Areas	No	N/A	This regulation establishes the requirements for obtaining a nonattainment area permit. The Plant is not located in a non-attainment area and therefore is not subject to this regulation.
20.2.80 NMAC	Stack Heights	No	N/A	This regulation establishes requirements for the evaluation of stack heights and other dispersion techniques. This regulation does not apply as all stacks at the Plant follow good engineering practice.
20.2.82 NMAC	MACT Standards for source categories of HAPS	Yes	E-1000 to E-7000, E-VRU-1, DEHY-1, DEHY-2	This regulation applies to all sources emitting hazardous air pollutants, which are subject to the requirements of 40 CFR Part 63, as amended through August 29, 2013. The Plant is an area source with two applicable MACT standards (MACT HH and MACT ZZZZ).

Table for Applicable FEDERAL REGULATIONS (Note: This is not an exhaustive list):

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
40 CFR 50	NAAQS	Yes	Facility	This regulation defines national ambient air quality standards. The Plant meets all applicable national ambient air quality standards for NOx, CO, SO_2, H_2S, PM_{10}, and $PM_{2.5}$ under this regulation.
NSPS 40 CFR 60, Subpart A	General Provisions	Yes	CRYO, MRU, FLARE, FUG-1, FUG-2, P24A, P24B, C-1000, To C-7000, E-1000, possibly E-7000	This regulation defines general provisions for relevant standards that have been set under this part. The units listed are subject to or potentially subject to this regulation as they are subject to another rule under this part.
NSPS 40 CFR60.40a Subpart Da	Subpart Da, Performance Standards for **Electric Utility Steam Generating Units**	No	N/A	This regulation establishes standards of performance for electric utility steam generating units. This regulation does not apply because the Plant does not operate any electric utility steam generating units.
NSPS 40 CFR60.40b Subpart Db	**Electric Utility Steam Generating Units**	No	N/A	This regulation establishes standards of performance for industrial-commercial-institutional steam generating units. This regulation does not apply because the Plant does not operate any industrial-commercial-institutional steam generating units.
40 CFR 60.40c, Subpart Dc	Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units	No	N/A	Potentially subject units are the reboiler heaters and the mole sieve regen heater. However, these units have a heat input less than 10 MMBtu/hr and, therefore, are not subject to this regulation.
NSPS 40 CFR 60, Subpart Ka	Standards of Performance for **Storage Vessels for Petroleum Liquids** for which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and **Prior** to July 23, 1984	No	N/A	This regulation establishes performance standards for storage vessels for petroleum liquids for which construction, reconstruction, or modification commenced after May 18, 1978, and prior to July 23, 1984. The tanks at the Plant are three (3) 300 bbl (37,800 gallons). The capacities of the tanks at the Plant are less than 40,000 gallons regulatory threshold, thus this regulation does not apply to these tanks. [40 CFR Part 60.110a(a)]

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
NSPS 40 CFR 60, Subpart Kb	Standards of Performance for **Volatile Organic Liquid Storage Vessels** (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced **After** July 23, 1984	No	N/A	This regulation establishes performance standards for volatile organic liquid storage vessels (including petroleum liquid storage vessels) for which construction, reconstruction, or modification commenced after July 23, 1984. The tanks at the Plant have a capacity of 300 bbl (12,600 gallons or 48 m^3) each. Because the capacity of each tank is less than 75 m^3, this regulation does not apply. [60.110b(a)]
NSPS 40 CFR 60.330 Subpart GG	**Stationary Gas Turbines**	No	N/A	This regulation establishes standards of performance for stationary gas turbines with a heat input at a peak load equal to or greater than 10 MMBtu/hr based on the lower heating value of the fuel fired and have commenced construction, modification, or reconstruction after October 3, 1977. This regulation is not applicable as this Plant does not have any stationary gas turbines.
NSPS 40 CFR 60, Subpart KKK	Leaks of VOC from **Onshore Gas Plants**	Yes	FUG-1, C-1000, C-2000, C-3000, C-4000, C-5000, C-6000,	This regulation defines standards of performance for equipment leaks of VOC emissions from onshore natural gas processing plants for which construction, reconstruction, or modification commenced after January 20, 1984, and on or before August 23, 2011. The group of all equipment (each pump, pressure relief device, open-ended valve or line, valve, compressor, and flange or other connector that is in VOC service or in wet gas service, and any device or system required by this subpart) except compressors (defined in § 60.631) within a process unit is an affected facility. CRYO unit is subject to NSPS KKK. Units C-1000 through C-6000 are compressors in wet gas service and are subject to the provisions of this subpart.
NSPS 40 CFR Part 60 Subpart LLL	Standards of Performance for **Onshore Natural Gas Processing**: SO_2 Emissions	No	N/A	This regulation establishes standards of performance for SO_2 emissions from onshore natural gas processing for which construction, reconstruction, or modification of the amine sweetening unit commenced after January 20, 1984 and on or before August 23, 2011. This regulation does not apply as the Plant does not process natural gas with a H_2S concentration greater than 4 ppmv.
NSPS 40 CFR Part 60 Subpart OOOO	Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution for which construction, modification or reconstruction commenced after August 23, 2011 and before September 18, 2015	Yes	P24A, P24B, MRU, FUG-2, C-VRU1	This regulation establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO_2) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. This Plant is not located in the oil and natural gas production segment, as defined by this regulation. In addition, Units TK-1, TK-2 and TK-3 are not subject to NSPS Subpart OOOO because they commenced construction prior to August 23, 2011. Therefore, they are not subject to this regulation. Units P24A and P24B are centrifugal pumps that are a source of fugitive emissions and are subject to the requirements of NSPS OOOO. The fugitive equipment associated with unit MRU is expected to be monitored under this subpart. Vapor recovery unit compressor C-VRU1 is a reciprocating compressor subject to this subpart.
NSPS 40 CFR Part 60 Subpart OOOOa	Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015	Yes	C-7000	Unit C-7000 could be subject to this regulation because the installation of this unit is a modification to the site that will take place after September 18, 2015. Therefore, some LDAR regulations will apply to this unit.
NSPS 40 CFR 60 Subpart IIII	Standards of performance for Stationary Compression Ignition Internal Combustion Engines	No	N/A	This Plant does not operate any stationary compression ignition internal combustion engine; therefore it is not subject to this regulation.
NSPS 40 CFR Part 60 Subpart	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines	Yes	E-1000, E-7000,	This regulation establishes standards of performance for stationary spark ignition combustion engines. E-1000 and E-7000 are subject to NSPS JJJJ.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
JJJJ				
NSPS 40 CFR 60 Subpart TTTT	Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units	No	N/A	This Plant does not operate electric generating units; therefore, it is not subject to this regulation.
NSPS 40 CFR 60 Subpart UUUU	Emissions Guidelines for Greenhouse Gas Emissions and Compliance Times for Electric Utility Generating Units	No	N/A	This Plant does not operate electric generating units; therefore, it is not subject to this regulation.
NSPS 40 CFR 60, Subparts WWW, XXX, Cc, and Cf	Standards of performance for Municipal Solid Waste (MSW) Landfills	No	N/A	This Plant is not a municipal solid waste landfill; therefore, it is not subject to this regulation.
NESHAP 40 CFR 61 Subpart A	General Provisions	No	N/A	There are no NESHAP-affected source types at this Plant.
NESHAP 40 CFR 61 Subpart E	National Emission Standards for **Mercury**	No	N/A	This regulation establishes a national emission standard for mercury. The Plant does not have stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge [40 CFR Part 61.50]. The Plant is not subject to this regulation.
NESHAP 40 CFR 61 Subpart V	National Emission Standards for **Equipment Leaks** (Fugitive Emission Sources)	No	N/A	This regulation establishes national emission standards for equipment leaks (fugitive emission sources). The Plant does not have equipment that operates in volatile hazardous air pollutant (VHAP) service [40 CFR Part 61.240]. The regulated activities subject to this regulation do not take place at this Plant. The Plant is not subject to this regulation.
MACT 40 CFR 63, Subpart A	General Provisions	Yes	E-1000 to E-7000, E-VRU-1, DEHY-1, DEHY-2	Applies if any other Subpart in 40 CFR 63 applies.
MACT 40 CFR 63.760 Subpart HH	**Oil and Natural Gas Production Facilities**	Yes	DEHY-1, DEHY-2	This regulation establishes national emission standards for hazardous air pollutants from oil and natural gas production facilities. The Plant is an area source of HAPs. DEHY-1 and DEHY-2 have actual average benzene emissions less than 0.90 Mg/yr. Pursuant to 63.764(e), the Plant is exempt from standards of 63.764(c)(l) and (d) but has to maintain records required in 63.774(d)(1).
MACT 40 CFR 63 Subpart HHH	National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities	No	N/A	This regulation establishes national emission standards for hazardous air pollutants from natural gas transmission and storage facilities. The Plant is not subject to the rule because it is not a natural gas transmission and storage facility.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
MACT 40 CFR 63 Subpart DDDDD	National Emission Standards for Hazardous Air Pollutants for Major Industrial, Commercial, and Institutional Boilers & Process Heaters	No	N/A	This Plant does not operate boilers or process heaters that comply with the regulation definitions. Boilers and process heaters that use natural gas are exempt from complying with this regulation.
MACT 40 CFR 63 Subpart UUUUU	National Emission Standards for Hazardous Air Pollutants Coal & Oil Fire Electric Utility Steam Generating Unit	No	N/A	This Plant does not operate a steam generating unit.
MACT 40 CFR 63 Subpart ZZZZ	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines **(RICE MACT)**	Yes	E-1000 to E-7000, E-VRU-1	This regulation defines national emissions standards for HAPs for stationary reciprocating Internal Combustion Engines. Facilities are subject to this subpart if they own or operate a stationary RICE. Enterprise will comply with any applicable requirements.
40 CFR 64	**Compliance Assurance Monitoring**	Yes	DEHY-1b, DEHY-2b	This regulation defines compliance assurance monitoring. Unit DEHY-1b and DEHY-2b have pre-controlled emissions greater than 100 tpy. The units will comply with the requirements.
40 CFR 68	**Chemical Accident Prevention**	Yes	Facility	This Plant has more than a threshold quantity of a regulated substance in a process, as determined under §68.115, and is therefore an affected source. To comply with this regulation, the Plant operator maintains a current RMP.
Title IV – Acid Rain 40 CFR 72	**Acid Rain**	No	N/A	This part establishes the acid rain program. This Plant is not an acid rain source. This regulation does not apply.
Title IV – Acid Rain 40 CFR 73	**Sulfur Dioxide** Allowance Emissions	No	N/A	This regulation establishes sulfur dioxide allowance emissions for certain types of facilities. This Plant is not an acid rain source. This regulation does not apply.
Title IV- Acid Rain 40 CFR 75	**Continuous Emissions Monitoring**	No	N/A	This Plant does not generate commercial electric power or electric power for sale, therefore it is not subject to this regulation.
Title IV – Acid Rain 40 CFR 76	**Acid Rain** Nitrogen Oxides **Emission Reduction Program**	No	N/A	This regulation establishes an acid rain nitrogen oxides emission reduction program. This regulation applies to each coal-fired utility unit that is subject to an acid rain emissions limitation or reduction requirement for SO_2. This part does not apply because the Plant does not operate any coal-fired units [40 CFR Part 76.1].
Title VI – 40 CFR 82	Protection of **Stratospheric Ozone**	No	N/A	Enterprise owns appliances containing CFCs and is therefore subject to this requirement. Enterprise uses only certified technicians for the maintenance, service, repair and disposal of appliances and maintains the appropriate records for this requirement.

Section 14

Operational Plan to Mitigate Emissions

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

☒ **Title V Sources** (20.2.70 NMAC)**:** By checking this box and certifying this application the permittee certifies that it has developed an **Operational Plan to Mitigate Emissions During Startups, Shutdowns, and Emergencies** defining the measures to be taken to mitigate source emissions during startups, shutdowns, and emergencies as required by 20.2.70.300.D.5(f) and (g) NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.

☐ **NSR** (20.2.72 NMAC)**, PSD** (20.2.74 NMAC) **& Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has developed an **Operational Plan to Mitigate Source Emissions During Malfunction, Startup, or Shutdown** defining the measures to be taken to mitigate source emissions during malfunction, startup, or shutdown as required by 20.2.72.203.A.5 NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.

☒ **Title V** (20.2.70 NMAC)**, NSR** (20.2.72 NMAC)**, PSD** (20.2.74 NMAC) **& Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has established and implemented a Plan to Minimize Emissions During Routine or Predictable Startup, Shutdown, and Scheduled Maintenance through work practice standards and good air pollution control practices as required by 20.2.7.14.A and B NMAC. This plan shall be kept on site or at the nearest field office to be made available to the Department upon request. This plan should not be submitted with this application.

Enterprise keeps the appropriate documentation at the Plant.

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.

This facility operates on a continuous basis with no alternative operating scenarios.

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.	
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.	X
Relocation (20.2.72.202.B.4 or 72.202.D.3.c NMAC)	
Minor Source Technical Permit Revision 20.2.72.219.B.1.d.vi NMAC for like-kind unit replacements.	
Other: i.e. SSM modeling. See #2 above.	
This application does not require modeling since this is a No Permit Required (NPR) application.	
This application does not require modeling since this is a Notice of Intent (NOI) application (20.2.73 NMAC).	
This application does not require modeling according to 20.2.70.7.E(11), 20.2.72.203.A(4), 20.2.74.303, 20.2.79.109.D NMAC and in accordance with the Air Quality Bureau's Modeling Guidelines.	

Check each box that applies:

☐ See attached, approved modeling **waiver for all** pollutants from the facility.
☐ See attached, approved modeling **waiver for some** pollutants from the facility.
☐ Attached in Universal Application Form 4 (UA4) is a **modeling report for all** pollutants from the facility.
☐ Attached in UA4 is a **modeling report for some** pollutants from the facility.
☒ No modeling is required.

Section 17

Compliance Test History

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

To show compliance with existing NSR permits conditions, you must submit a compliance test history. The table below provides an example.

Compliance Test History Table

Unit No.	Test Description	Test Date
1000	Tested in accordance with EPA test methods for NOx and CO.	8/29/2012
	Portable Analyzer for NOx and CO	7/20/2015
2000	Tested in accordance with EPA test methods for NOx and CO.	8/28/2012
	Portable Analyzer for NOx and CO	7/20/2015
3000	Tested in accordance with EPA test methods for NOx and CO.	8/27/2012
	Portable Analyzer for NOx and CO	7/22/2015
4000	Tested in accordance with EPA test methods for NOx and CO.	8/27/2012
	Portable Analyzer for NOx and CO	7/20/2015
5000	Tested in accordance with EPA test methods for NOx and CO.	8/27/2012
	Portable Analyzer for NOx and CO	7/20/2015
6000	Tested in accordance with EPA test methods for NOx and CO.	3/27/2014
	Portable Analyzer for NOx and CO	7/22/2015
7000	Tested in accordance with EPA test methods for NOx and CO.	TBD
	Portable Analyzer for NOx and CO	TBD

Section 19

Requirements for Title V Program

Who Must Use this Attachment:

* Any major source as defined in 20.2.70 NMAC.
* Any source, including an area source, subject to a standard or other requirement promulgated under Section 111 - Standards of Performance for New Stationary Sources, or Section 112 Hazardous Air Pollutants, of the 1990 federal Clean Air Act ("federal Act"). Non-major sources subject to Sections 111 or 112 of the federal Act are exempt from the obligation to obtain an 20.2.70 NMAC operating permit until such time that the EPA Administrator completes rulemakings that require such sources to obtain operating permits. In addition, sources that would be required to obtain an operating permit solely because they are subject to regulations or requirements under Section 112(r) of the federal Act are exempt from the requirement to obtain an Operating Permit.
* Any Acid Rain source as defined under title IV of the federal Act. The Acid Rain program has additional forms. See http://www.env.nm.gov/aqb/index.html. Sources that are subject to both the Title V and Acid Rain regulations are encouraged to submit both applications simultaneously.
* Any source in a source category designated by the EPA Administrator ("Administrator"), in whole or in part, by regulation, after notice and comment.

19.1 - 40 CFR 64, Compliance Assurance Monitoring (CAM) (20.2.70.300.D.10.e NMAC)

Any source subject to 40CFR, Part 64 (Compliance Assurance Monitoring) must submit all the information required by section 64.7 with the operating permit application. The applicant must prepare a separate section of the application package for this purpose; if the information is already listed elsewhere in the application package, make reference to that location. Facilities not subject to Part 64 are invited to submit periodic monitoring protocols with the application to help the AQB to comply with 20.2.70 NMAC. Sources subject to 40 CFR Part 64, must submit a statement indicating your source's compliance status with any enhanced monitoring and compliance certification requirements of the federal Act.

This regulation defines compliance assurance monitoring. Units DEHY-1b and DEHY-2b will continue to comply with CAM requirements. A copy of the CAM plan is included in this application.

19.2 - Compliance Status (20.2.70.300.D.10.a & 10.b NMAC)

Describe the facility's compliance status with each applicable requirement at the time this permit application is submitted. This statement should include descriptions of or references to all methods used for determining compliance. This statement should include descriptions of monitoring, recordkeeping and reporting requirements and test methods used to determine compliance with all applicable requirements. Refer to Section 2, Tables 2-N and 2-O of the Application Form as necessary. (20.2.70.300.D.11 NMAC) For facilities with existing Title V permits, refer to most recent Compliance Certification for existing requirements. Address new requirements such as CAM, here, including steps being taken to achieve compliance.

The Chaparral Gas Plant is in compliance with requirements applicable at the time of this permit application. Enterprise is committed to comply with other applicable requirements for the Plant as they come into effect during the permit term. After issuance of the Title V Permit, Enterprise shall certify to compliance with the terms and conditions of that permit. Enterprise will continue to be in compliance with applicable requirements as described in Section 13.

19.3 - Continued Compliance (20.2.70.300.D.10.c NMAC)

Provide a statement that your facility will continue to be in compliance with requirements for which it is in compliance at the time of permit application. This statement must also include a commitment to comply with other applicable requirements as they come into effect during the permit term. This compliance must occur in a timely manner or be consistent with such schedule expressly required by the applicable requirement.

The Chaparral Gas Plant is in compliance with requirements applicable at the time of this permit application. Enterprise is committed to comply with other applicable requirements for the Plant as they come into effect during the permit term.

19.4 - Schedule for Submission of Compliance (20.2.70.300.D.10.d NMAC)

You must provide a proposed schedule for submission to the department of compliance certifications during the permit term. This certification must be submitted annually unless the applicable requirement or the department specifies a more frequent period. A sample form for these certifications will be attached to the permit.

Enterprise will submit an annual compliance certification report within 30 days following the end of every 12-month reporting period, according to the schedule prescribed in the subsequent Title V permit.

19.5 - Stratospheric Ozone and Climate Protection

In addition to completing the four (4) questions below, you must submit a statement indicating your source's compliance status with requirements of Title VI, Section 608 (National Recycling and Emissions Reduction Program) and Section 609 (Servicing of Motor Vehicle Air Conditioners).

1. Does your facility have any air conditioners or refrigeration equipment that uses CFCs, HCFCs or other ozone-depleting substances? ☑ **Yes** ☐ **No**

2. Does any air conditioner(s) or any piece(s) of refrigeration equipment contain a refrigeration charge greater than 50 lbs? ☐ **Yes** ☑ **No**

   (If the answer is yes, describe the type of equipment and how many units are at the facility.)

3. Do your facility personnel maintain, service, repair, or dispose of any motor vehicle air conditioners (MVACs) or appliances ("appliance" and "MVAC" as defined at 82. 152)? ☐ **Yes** ☑ **No**

4. Cite and describe which Title VI requirements are applicable to your facility (i.e. 40 CFR Part 82, Subpart A through G.)

Title VI, Section 608 may apply to this facility. Though Enterprise may own CFC refrigeration equipment meeting the criteria described in 40 CFR 82, Subpart F, which applies to owners of CFC-containing appliances, Enterprise does not "service", "maintain", or "repair" Class I or Class II appliances, nor "dispose" of appliances at the Plant as defined in this Subpart.

Enterprise states that the facility is operated in compliance with and will continue to operate in compliance with the requirements of Title VI, Section 608. Title VI, Section 609 does not apply to the Plant as there is no servicing of motor vehicle air conditioners performed at the Plant.

19.6 - Compliance Plan and Schedule

Applications for sources, which are not in compliance with all applicable requirements at the time the permit application is submitted to the department, must include a proposed compliance plan as part of the permit application package. This plan shall include the information requested below:

A. **Description of Compliance Status:** (20.2.70.300.D.11.a NMAC)
A narrative description of your facility's compliance status with respect to all applicable requirements (as defined in 20.2.70 NMAC) at the time this permit application is submitted to the department.

B. **Compliance plan:** (20.2.70.300.D.11.B NMAC)
A narrative description of the means by which your facility will achieve compliance with applicable requirements with which it is not in compliance at the time you submit your permit application package.

C. **Compliance schedule:** (20.2.70.300D.11.c NMAC)
A schedule of remedial measures that you plan to take, including an enforceable sequence of actions with milestones, which will lead to compliance with all applicable requirements for your source. This schedule of compliance must be at least as stringent as that contained in any consent decree or administrative order to which your source is subject. The obligations of any consent decree or administrative order are not in any way diminished by the schedule of compliance.

D. **Schedule of Certified Progress Reports:** (20.2.70.300.D.11.d NMAC)
A proposed schedule for submission to the department of certified progress reports must also be included in the compliance schedule. The proposed schedule must call for these reports to be submitted at least every six (6) months.

E. **Acid Rain Sources:** (20.2.70.300.D.11.e NMAC)
If your source is an acid rain source as defined by EPA, the following applies to you. For the portion of your acid rain source subject to the acid rain provisions of title IV of the federal Act, the compliance plan must also include any additional requirements under the acid rain provisions of title IV of the federal Act. Some requirements of title IV regarding the schedule and methods the source will use to achieve compliance with the acid rain emissions limitations may supersede the requirements of title V and 20.2.70 NMAC. You will need to consult with the Air Quality Bureau permitting staff concerning how to properly meet this requirement.

NOTE: The Acid Rain program has additional forms. See http://www.env.nm.gov/aqb/index.html. Sources that are subject to both the Title V and Acid Rain regulations are **encouraged** to submit both applications **simultaneously**.

The Chaparral Gas Plant is in compliance with all applicable requirements. No compliance plan is required.

19.7 - 112(r) Risk Management Plan (RMP)

Any major sources subject to section 112(r) of the Clean Air Act must list all substances that cause the source to be subject to section 112(r) in the application. The permittee must state when the RMP was submitted to and approved by EPA.

This facility has more than a threshold quantity of a regulated substance in a process, as determined under §68.115, and is therefore an affected source. To comply with this regulation, the facility operator maintains a current RMP.

19.8 - Distance to Other States, Bernalillo, Indian Tribes and Pueblos

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 NMAC)?

(If the answer is yes, state which apply and provide the distances.)

The facility is located approximately 73 km from Texas.

19.9 - Responsible Official

Provide the Responsible Official as defined in 20.2.70.7.AD NMAC: Ivan W Zirbes

C103 Compliance Assurance Monitoring (CAM) Plan: Units DEHY-1 and DEHY-2

Compliance Assurance Monitoring (CAM) Plan for Glycol Dehydration Units
The TEG dehydrators still vent and flash tank emissions from Units DEHY-1 and DEHY-2 shall be equipped with a condenser.

CAM Requirement	Condenser
Condenser Performance Indicator [64.3(a)(l)]	Indicator is the temperature of the non-condensable exhaust stream leaving, or at the outlet of, the condenser.
Measurement Approach	Condenser exhaust temperature is measured continuously using an in-line thermocouple.
Indicator Range [64.3(a)(2)]	Acceptable temperature range is 20 °F to 120 °F. This range has been selected based on atmospheric temperature conditions for this site.
Data Representativeness [64.3(b)(l)]	Guarantee from the thermocouple manufacturer. If the condenser outlet temperature exceeds the acceptable indicator range, the required control efficiency is not achieved.
Verification of Operational Status [64.3(b)(2)]	Temperature is measured at the outlet of the condenser by a thermocouple. Accuracy shall be within ± 2 %.
QA/QC Practices and Criteria [64.3(b)(3)]	Thermocouple is calibrated at least once every 12-months and records kept of each calibration.
Monitoring Frequency [64.3(b)(4)(i) & (iii)]	Once per day an instantaneous temperature measurement will be taken.
Data Collection Procedures [64.3(b)(4)(i)&(iii)]	Once per day personnel will perform a reading.
Averaging Period [64.3(b)(4)(i)&(iii)]	Monthly rolling 12-month average calculated using the daily readings for each month.*

* Initially the rolling average will begin with the first month and accumulate each successive month until 12 months of averaged data are obtained. After the first 12-month average is attained, the monthly rolling 12-month average will be determined and recorded.

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.

There is no other relevant information

Section 22: Certification

Company Name: Enterprise Field Services, LLC

I, Ivan W. Zirbes, 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 28th day of November, 2018, upon my oath or affirmation, before a notary of the State of Texas.

*Signature

11/28/18
Date

Ivan W. Zirbes
Printed Name

Vice President
Title

Scribed and sworn before me on this 28th day of November, 2018.

My authorization as a notary of the State of Texas expires on the 23rd day of February, 2022.

BRENDA J. MENDEZ
Notary Public, State of Texas
Comm. Expires 02-23-2022
Notary ID 10264322

Brenda J. Mendez
Notary's Signature

11/28/18
Date

Brenda J. Mendez
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.