# NMED AIR QUALITY
# TITLE V PERMIT RENEWAL APPLICATION
## DCP Operating Company, LP
## Linam Ranch Gas Plant


Prepared By:

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April 2019

Project 193201.0085


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April 12, 2019

Mr. Ted Schooley
Permit Programs Manager
NMED Air Quality Bureau
525 Camino de los Marquez Suite 1
Santa Fe, NM 87505-1816

*RE: Application for Renewal of Title V Permit P094-R2*
*DCP Operating Company, LP – Linam Ranch Gas Plant*

Dear Mr. Schooley:

On behalf of DCP Operating Company, LP we are submitting this application to renew the Title V permit for the Linam Ranch Gas Plant. The facility is located approximately 7 miles west of Hobbs, NM. Linam Ranch Gas Plant is currently permitted under Operating Permit P094-R2 and NSR Permit 0039-M8R3. The facility removes hydrogen sulfide, water and carbon dioxide from field natural gas and separates natural gas liquids from the field natural gas stream.

The format and content of this application are consistent with the Bureau's current policy regarding Title V applications; it is a complete application package using the most current Universal Application Forms. Title V Permit P094-R2 expires on April 17, 2020. DCP Operating Company, LP is submitting this application in accordance with 20.2.70.300.B.2 NMAC, requiring a timely application for a Title V renewal be submitted at least 12 months prior to the date of permit expiration.

Enclosed are two hard copies of the application, including an original certification and two discs containing the electronic files. Please feel free to contact either myself at (505) 266-6611 or Jennifer Hanna, Principal Environmental Specialist for DCP Operating Company, LP at (432) 249-2702 if you have any questions regarding this application.

Sincerely,

Adam Erenstein
Manager of Consulting Services

Cc: Jennifer Hanna – DCP Operating Company, LP
Trinity Project File 193201.0085

| **Mail Application To:**<br><br>New Mexico Environment Department<br>Air Quality Bureau<br>Permits Section<br>525 Camino de los Marquez, Suite 1<br>Santa Fe, New Mexico, 87505<br><br>Phone: (505) 476-4300<br>Fax: (505) 476-4375<br>www.env.nm.gov/aqb | | **For Department use only:**<br><br>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.: **N/A** in the amount of **N/A**
☑ 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: **20.2.70.300.B.2 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.): 589 | Updating Permit/NOI #: P094-R2 |
|---|---|---|---|
| 1 | Facility Name:<br>Linam Ranch Gas Plant | Plant primary SIC Code (4 digits): 1321 | |
| | | Plant NAIC code (6 digits): 211130 | |
| a | Facility Street Address (If no facility street address, provide directions from a prominent landmark): From Hobbs, NM travel 7 miles west on Hwy 62/180. Plant is adjacent to highway on the south. | | |
| 2 | Plant Operator Company Name: DCP Operating Company, LP | Phone/Fax: (432) 249-2702 / (432) 620-4143 | |
| a | Plant Operator Address: 10 Desta Drive, Suite 400 West, Midland, TX 79705 | | |

| | | |
|---|---|---|
| b | Plant Operator's New Mexico Corporate ID or Tax ID: 036785 | |
| 3 | Plant Owner(s) name(s): DCP Operating Company, LP | Phone/Fax: (432) 249-2702 / (432) 620-4143 |
| a | Plant Owner(s) Mailing Address(s): 10 Desta Drive, Suite 400 West, Midland, TX 79705 | |
| 4 | Bill To (Company): DCP Operating Company, LP | Phone/Fax: (432) 249-2702 / (432) 620-4143 |
| a | Mailing Address: 10 Desta Drive, Suite 400 West, Midland, TX 79705 | E-mail: JHanna@dcpmidstream.com |
| 5 | ☑ Preparer:<br>☑ Consultant: Adam Erenstein / Trinity Consultants | Phone/Fax: (505) 266-6611 / N/A |
| a | Mailing Address: 9400 Holly Blvd NE, Building 3, Suite 300<br>Albuquerque, NM 87122 | E-mail: aerenstein@trinityconsultants.com |
| 6 | Plant Operator Contact: Wade J. Lynch | Phone/Fax: (575) 394-5010 / N/A |
| a | Address: 136 State Hwy 175, Oil Center, NM 88240 | E-mail: WJLynch@dcpmidstream.com |
| 7 | Air Permit Contact: Jennifer Hanna | Title: Principal Environmental Specialist |
| a | E-mail: JHanna@dcpmidstream.com | Phone/Fax: (432) 249-2702 / (432) 620-4143 |
| b | Mailing Address: 10 Desta Drive, Suite 400 West, Midland, TX 79705 | |

## 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?<br>☐ 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?<br>☑ 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?<br>☑Yes ☐No ☐N/A | |
| 6 | Does this facility have a Title V operating permit (20.2.70 NMAC)?<br>☑ Yes ☐ No | If yes, the permit No. is: P-094-R2 |
| 7 | Has this facility been issued a No Permit Required (NPR)?<br>☐ 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)?<br>☑ Yes ☐ No | If yes, the permit No. is: 0039-M8R3 |
| 10 | Is this facility registered under a General permit (GCP-1, GCP-2, etc.)?<br>☐ 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: 9.44 MMscf (actual) | Daily: 225 MMscf (approximate) | Annually: 82,125 MMscf (approximate) |
| b | Proposed | Hourly: * | Daily: * | Annually: * |
| 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: 9.44 MMscf (actual) | Daily: 225 MMscf (approximate) | Annually: 82,125 MMscf (approximate) |
| b | Proposed | Hourly: * | Daily: * | Annually: * |

"*" = There is not an increase in facility capacity or production with this application.

## Section 1-D: Facility Location Information

| | | | | | |
|---|---|---|---|---|---|
| 1 | Section: 6 | Range: 37 E | Township: 19 S | County: Lea | Elevation (ft): 3,710 |
| 2 | UTM Zone: ☐ 12 or ☑ 13 | | | Datum: ☐ NAD 27 ☐ NAD 83 ☑ WGS 84 | |
| a | UTM E (in meters, to nearest 10 meters): 660,738 m E | | | UTM N (in meters, to nearest 10 meters: 3,618,810 m N | |
| b | **AND** Latitude (deg., min., sec.): 32° 41' 43" | | | Longitude (deg., min., sec.): -103° 17' 7" | |
| 3 | Name and zip code of nearest New Mexico town: Hobbs, NM 88240 | | | | |
| 4 | Detailed Driving Instructions from nearest NM town (attach a road map if necessary): From Hobbs, NM, travel 7 miles west on Hwy 62/180. Plant is adjacent to highway on the south. | | | | |
| 5 | The facility is 7 (distance) miles west (direction) of Hobbs. (nearest town). | | | | |
| 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:** Monument, Hobbs; **Counties:** Lea; **Indian Tribes:** None | | | | |
| 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: N/A – This application is submitted under 20.2.70 NMAC. | | | | |
| 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): 117 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: 220 m | | | | |
| 12 | Method(s) used to delineate the Restricted Area: Continuous fencing<br><br>"**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<br>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<br>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 ($\frac{\text{hours}}{\text{day}}$): 24 | ($\frac{\text{days}}{\text{week}}$): 7 | | ($\frac{\text{weeks}}{\text{year}}$): 52 | ($\frac{\text{hours}}{\text{year}}$): 8,760 | |
| 2 | Facility's maximum daily operating schedule (if less than 24 $\frac{\text{hours}}{\text{day}}$)? Start: N/A | | ☐AM ☐PM | | End: N/A | ☐AM ☐PM |
| 3 | Month and year of anticipated start of construction: N/A – No construction is proposed | | | | | |
| 4 | Month and year of anticipated construction completion: N/A – No construction is proposed | | | | | |
| 5 | Month and year of anticipated startup of new or modified facility: N/A – No construction is proposed | | | | | |
| 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: NOVs 589-1702, 589-1801, and 589-1802 |

| | | | |
|---|---|---|---|
| a | If yes, NOV date or description of issue:<br>589-1702 - 2/8/2018<br>589-1801 - 3/12/2018<br>589-1802 - 10/5/2018 | | NOV Tracking No:<br>589-1702, 589-1801, and 589-1802 |
| 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** (☑ $\geq$10 tpy of any single HAP **OR** ☑ $\geq$25 tpy of any combination of HAPS)<br>**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 .<br><br>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<br>(20.2.70.300.D.2 NMAC): Randy C. DeLaune | Phone: (713) 268-7488 |
| a | R.O. Title: VP Operations Services | R.O. e-mail: RCDeLaune@Dcpmidstream.com |
| b | R. O. Address: 5718 Westheimer, Suite 1900, Houston, TX 77057-7057 | |
| 2 | Alternate Responsible Official<br>(20.2.70.300.D.2 NMAC): Michael T. Allison | Phone: (575) 234-6425 |
| a | A. R.O. Title: Asset Director I | A. R.O. e-mail: MTAllison@dcpmidstream.com |
| b | A. R. O. Address: 1625 W Marland Street, Hobbs, NM 88240 | |
| 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): None | |
| 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.): None | |
| a | Address of Parent Company: None | |
| 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.): None | |
| 6 | Telephone numbers & names of the owners' agents and site contacts familiar with plant operations: None | |
| 7 | Affected Programs to include Other States, local air pollution control programs (i.e. Bernalillo) and Indian tribes:<br>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: 20.6 kilometers from Texas. | |

# 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 # | Manufact-urer's Rated Capacity[3] (Specify Units) | Requested Permitted Capacity[3] (Specify Units) | Date of Manufacture[2] | Date of Construction/ Reconstruction[2] | Controlled by Unit # | Emissions vented to Stack # | Source Classi-fication Code (SCC) | For Each Piece of Equipment, Check One | RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4] | Replacing Unit No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Amine Plant Flare East | Flare King | N/A | N/A | 1.2 MMBtu/hr | 1.2 MMBtu/hr | 2005 | 2005 | N/A | 2 | 3100 0205 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| 4A | ESD Flare | John Zink | N/A | N/A | 3.2 MMBtu/hr | 3.2 MMBtu/hr | 2006 | 2008 | N/A | 4A | 3100 0209 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| 6 | 2SLB RICE | Clark | TLA-6 | 73779 | 2000 HP | 2000 HP | 1974 or before | 1974 | N/A | 6 | 2020 0252 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | 2SLB | N/A |
| 7 | 2SLB RICE | Clark | TLA-6 | 73780 | 2000 HP | 2000 HP | 1974 or before | 1974 | N/A | 7 | 2020 0252 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | 2SLB | N/A |
| 8 | 2SLB RICE | Clark | HBA-6 | 36288 | 1267 HP | 1267 HP | 1951 | 1954 | N/A | 8 | 2020 0252 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | 2SLB | N/A |
| 9 | 2SLB RICE | Clark | HBA-6 | 736290 | 1267 HP | 1267 HP | 1951 | 1954 | N/A | 9 | 2020 0252 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | 2SLB | N/A |
| 10 | 2SLB RICE | Clark | HBA-6 | 36289 | 1267 HP | 1267 HP | 1951 | 1954 | N/A | 10 | 2020 0252 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | 2SLB | N/A |
| 11 | 2SLB RICE | Clark | HBA-6 | 36303 | 1267 HP | 1267 HP | 1951 | 1954 | N/A | 11 | 2020 0252 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | 2SLB | N/A |
| *Note regarding Units 6-11: These units will be dual-service (inlet / residue compression). These units will operate under either scenario A and B. These scenarios are described in Section 15 of this application.* | | | | | | | | | | | | | | |
| 28 | Turbine | Solar | T-60 | TC12227 | 63.4 MMBtu/hr | 63.4 MMBtu/hr | 2011 | 2012 | N/A | 28 | 2020 0201 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| 29 | Turbine | Solar | T-70 | DCC0050 | 77.6 MMBtu/hr | 77.6 MMBtu/hr | 1995 | 1995 | N/A | 29 | 2020 0201 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| 30 | Turbine | Solar | T-70 | TC95593 | 73.95 MMBtu/hr | 73.95 MMBtu/hr | 1995 | 1995 | N/A | 30 | 2020 0201 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| 31 | Turbine | Solar | T-4700 | 3000724 | 36.8 MMBtu/hr | 36.8 MMBtu/hr | 1995 | 1995 | N/A | 31 | 2020 0201 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| 32B | Turbine | Solar | T-4000 | CM79453 | 36.2 MMBtu/hr | 36.2 MMBtu/hr | 1979 | 1995 | N/A | 32B | 2020 0201 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| 34 | Regenerator Heater | Heatec | Heatec | H191-095 | 15 MMBtu/hr | 15 MMBtu/hr | 1991 | 1995 | N/A | 34 | 3100 0404 | ☑ 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 # | Manufact-urer's Rated Capacity[3] (Specify Units) | Requested Permitted Capacity[3] (Specify Units) | Date of Manufacture[2]<br>Date of Construction/ Reconstruction[2] | Controlled by Unit #<br>Emissions vented to Stack # | Source Classi-fication Code (SCC) | For Each Piece of Equipment, Check One | RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4] | Replacing Unit No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | Boiler | Rentech/Zinc | N/A | 9049307 | 99 MMBtu/hr | 99 MMBtu/hr | 2005<br>2006 | N/A<br>36 | 3100 0404 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |
| 37 | Boiler | Rentech/Zinc | N/A | 9049303 | 99 MMBtu/hr | 99 MMBtu/hr | 2012<br>2010 | N/A<br>37 | 3100 0404 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |
| FUG | Fugitive Equipment Leak Emissions | N/A | N/A | N/A | N/A | N/A | N/A<br>N/A | N/A<br>FUG | 3100 0306 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |
| TK-2 | Storage Tank - Gasoline | N/A | N/A | N/A | 11.9 bbl | 11.9 bbl | 1985<br>2005 | N/A<br>TK-2 | 4060 0061 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |
| AGI Flare | AGI Flare | Flare King | Flare King | N/A | 1.2 MMscf/d | 1.2 MMscf/d | 2009<br>2009 | N/A<br>50 | 3100 0209 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |
| AM-10 | Amine Unit | N/A | N/A | N/A | 225 MMscf/d | 225 MMscf/d | N/A<br>N/A | 2, AGI<br>2, AGI Flare | 3100 0305 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |
| DH-10 | Glycol Dehydrator | N/A | N/A | N/A | 27 MMscf/d | 27 MMscf/d | 2012<br>6/1/2012 | N/A<br>4a | 3100 0303 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |
| CT-1 | South Cooling Tower | N/A | N/A | N/A | 12,800 gpm | 12,800 gpm | Unknown | N/A<br>CT-1 | 3850 0101 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |
| CT-2 | North Cooling Tower | N/A | N/A | N/A | 4,090 gpm | 4,090 gpm | Unknown | N/A<br>CT-2 | 3850 0101 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |
| TK-VRU[5] | Seven Condensate Tanks controlled by common VRU | N/A | N/A | N/A | 750 bbl x 5 (1-5), 400 bbl (6), 210 bbl (7) | 750 bbl x 5 (1-5), 400 bbl (6), 210 bbl (7) | 2012<br>TBD | VRU<br>TK-VRU | 4040 0321 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |
| TK-VRUTMP | Two Condensate Tanks controlled by common VRU. (Previously listed as TK39 and 40) | N/A | N/A | N/A | 1500 bbl x 2 | 1500 bbl x 2 | 1954<br>1996 | VRU-TMP<br>TK-VRUTMP | 4040 0321 | ☑ Existing (unchanged)<br>☐ To be Removed<br>☐ New/Additional<br>☐ Replacement Unit<br>☐ To Be Modified<br>☐ To be Replaced | N/A | N/A |

[1] Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.

[2] Specify dates required to determine regulatory applicability.

[3] To properly account for power conversion efficiencies, generator set rated capacity shall be reported as the rated capacity of the engine in horsepower, not the kilowatt capacity of the generator set.

[4] "4SLB" means four stroke lean burn engine, "4SRB" means four stroke rich burn engine, "2SLB" means two stroke lean burn engine, "CI" means compression ignition, and "SI" means spark ignition

[5] The TK-VRU units are currently permitted but have not been installed at the time of application. TK-VRU and TK-VRUTMP will not run simultaneously.

# 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.<br>Serial No. | Max Capacity<br>Capacity Units | List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5)<br>Insignificant Activity citation (e.g. IA List Item #1.a) | Date of Manufacture /Reconstruction[2]<br>Date of Installation /Construction[2] | For Each Piece of Equipment, Check Onc |
|---|---|---|---|---|---|---|---|
| TK-1 | Firewater | Unknown | N/A<br>N/A | 9065<br>bbls | Not a source of regulated pollutants<br>Insignificant Activity Item #1.a | 1/1/1995<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-2 | Firewater | Unknown | N/A<br>N/A | 3500<br>bbls | Not a source of regulated pollutants<br>Insignificant Activity Item #1.a | 1/1/1995<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-3 | Firewater | Unknown | N/A<br>N/A | 3500<br>bbls | Not a source of regulated pollutants<br>Insignificant Activity Item #1.a | 1/1/1995<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-4 | Stoddard | Unknown | N/A<br>N/A | 564<br>gal | 20.2.72.202.B.2.a NMAC<br>Insignificant Activity Item #5 | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-5 | Detergent | Unknown | N/A<br>N/A | 225<br>gal | 20.2.72.202.B.2.a NMAC<br>Insignificant Activity Item #5 | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-6 | Detergent | Unknown | N/A<br>N/A | 300<br>gal | 20.2.72.202.B.2.a NMAC<br>Insignificant Activity Item #5 | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-7 | Solvent | Unknown | N/A<br>N/A | 300<br>gal | 20.2.72.202.B.2.a NMAC<br>Insignificant Activity Item #5 | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-8 | Lube Oil | Unknown | N/A<br>N/A | 564<br>gal | 20.2.72.202.B.2.a NMAC<br>Insignificant Activity Item #5 | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-9 | Ethylene Glycol | Unknown | N/A<br>N/A | 564<br>gal | 20.2.72.202.B.2.a NMAC<br>Insignificant Activity Item #5 | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-10 | Lube Oil | Unknown | N/A<br>N/A | 30<br>gal | 20.2.72.202.B.2.a NMAC<br>Insignificant Activity Item #5 | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-11 | Methanol | Unknown | N/A<br>N/A | 168<br>gal | 20.2.72.202.B.5 NMAC<br>Insignificant Activity Item #1.a | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-12 | Sodium Hypochlorite | Unknown | N/A<br>N/A | 479<br>gal | 20.2.72.202.B.2.a NMAC<br>Insignificant Activity Item #5 | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-13 | Sodium Hypochlorite | Unknown | N/A<br>N/A | 479<br>gal | 20.2.72.202.B.2.a NMAC<br>Insignificant Activity Item #5 | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| TK-14 | Chemtreat BL-4830 | Unknown | N/A<br>N/A | 500<br>gal | 20.2.72.202.B.5 NMAC<br>Insignificant Activity Item #1.a | Unknown<br>Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |

| Unit Number | Source Description | Manufacturer | Model No. | Max Capacity | List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) | Date of Manufacture /Reconstruction[2] | For Each Piece of Equipment, Check Onc |
|---|---|---|---|---|---|---|---|
| | | | Serial No. | Capacity Units | Insignificant Activity citation (e.g. IA List Item #1.a) | Date of Installation /Construction[2] | |
| TK-15 | 93% Sulfuric Acid | Unknown | N/A | 7000 | 20.2.72.202.B.5 NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #1.a | Unknown | |
| TK-16 | Chemtreat BL-4830 | Unknown | N/A | 500 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-17 | Chemtreat BL-1258 | Unknown | N/A | 550 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-18 | Lube Oil | Unknown | N/A | 55 | 20.2.72.202.B.5 NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #1.a | Unknown | |
| TK-19 | Lube Oil | Unknown | N/A | 55 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-20 | Ethylene Glycol | Unknown | N/A | 1128 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-21 | BL-4350 | Unknown | N/A | 500 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-22 | BL-1558 | Unknown | N/A | 500 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-23 | Water | Unknown | N/A | 500 | Not a source of regulated pollutants | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbls | Insignificant Activity Item #1.a | Unknown | |
| TK-24 | Water | Unknown | N/A | 500 | Not a source of regulated pollutants | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbls | Insignificant Activity Item #1.a | Unknown | |
| TK-25 | Sodium Hydroxide | Unknown | N/A | 220 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-26 | Nalco EC15380 | Unknown | N/A | 479 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-27 | Lube Oil | Unknown | N/A | 55 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-28 | Lube Oil | Unknown | N/A | 55 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-29 | Nalco 1538A | Unknown | N/A | 718 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbl | Insignificant Activity Item #5 | Unknown | |
| TK-30 | Synergy Pertosolv | Unknown | N/A | 300 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-31 | Lube Oil | Unknown | N/A | 564 | 20.2.72.202.B.2.a NMAC | unknown | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |

| Unit Number | Source Description | Manufacturer | Model No. / Serial No. | Max Capacity / Capacity Units | List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a) | Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2] | For Each Piece of Equipment, Check Onc |
|---|---|---|---|---|---|---|---|
| TK-32 | Synergy Pertosolv | Unknown | N/A | 525 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-33 | Synergy Pertosolv | Unknown | N/A | 525 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbl | Insignificant Activity Item #5 | Unknown | |
| TK-34 | Gyptron | Unknown | N/A | 55 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbl | Insignificant Activity Item #5 | Unknown | |
| TK-35 | Gyptron | Unknown | N/A | 55 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbl | Insignificant Activity Item #5 | Unknown | |
| TK-36 | Methanol | Unknown | N/A | 564 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbl | Insignificant Activity Item #5 | Unknown | |
| TK-37 | Lube Oil | Unknown | N/A | 752 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-38 | Methanol | Unknown | N/A | 1128 | 20.2.72.202.B.5 NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #1.a | Unknown | |
| TK-39 | Defoam | Unknown | N/A | 55 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-40 | North Amine Tank | Unknown | N/A | 5000 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-41 | South Amine Tank | Unknown | N/A | 5000 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-42 | Glycol | Unknown | N/A | 1128 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbls | Insignificant Activity Item #5 | Unknown | |
| TK-43 | West Amine Surge Tank | Unknown | N/A | 5000 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbls | Insignificant Activity Item #5 | Unknown | |
| TK-44 | East Amine Surge Tank | Unknown | N/A | 5000 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbls | Insignificant Activity Item #5 | Unknown | |
| TK-45 | Lube Oil | Unknown | N/A | 55 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-46 | Detergent | Unknown | N/A | 300 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-47 | Lube Oil | Unknown | N/A | 752 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-48 | Lube Oil | Unknown | N/A | 752 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |

| Unit Number | Source Description | Manufacturer | Model No. | Max Capacity | List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) | Date of Manufacture /Reconstruction[2] | For Each Piece of Equipment, Check Onc |
|---|---|---|---|---|---|---|---|
| | | | Serial No. | Capacity Units | Insignificant Activity citation (e.g. IA List Item #1.a) | Date of Installation /Construction[2] | |
| TK-49 | Lube Oil | Unknown | N/A | 150 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-50 | Clark Lube Oil Drain Tk | Unknown | N/A | 564 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-51 | Clark Lube Oil Drain Tk | Unknown | N/A | 564 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-52 | Clark Jacket Water Drain Tk | Unknowm | N/A | 564 | Not a source of regulated pollutants | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #1.a | Unknown | |
| TK-53 | Clark Jacket Water Feed Tk | Unknown | N/A | 1128 | Not a source of regulated pollutants | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #1.a | Unknown | |
| TK-54 | Lube Oil | Unknown | N/A | 564 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-55 | Lube Oil | Unknowm | N/A | 564 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-56 | Firewater Pump Diesel Tk | Unknown | N/A | 564 | 20.2.72.202.B.2.a NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #5 | Unknown | |
| TK-57 | Water | Unknown | N/A | 224 | 20.2.72.202.B.5 NMAC | Unknown | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gal | Insignificant Activity Item #1.a | Unknown | |
| TK-GBW1 | Gunbarrel Water Tank | Lide | Lide | 500 | Not a source of regulated pollutants | N/A | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | 1 9095 | bbl | Insignificant Activity Item #1.a | Unknown | |
| TK-GBW2 | Gunbarrel Water Tank | Lide | Lide | 500 | Not a source of regulated pollutants | N/A | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | 1 9098 | bbl | Insignificant Activity Item #1.a | Unknown | |
| TK-GBW3 | Gunbarrel Water Tank | Lide | N/A | 500 | Not a source of regulated pollutants | N/A | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbl | Insignificant Activity Item #1.a | Unknown | |

[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 |
|---|---|---|---|---|---|---|
| 2 | Amine Plant Flare East | 2005 | $H_2S$, VOC | Amine Treating , DH-10 | ~ 98% | Eng. Judgement |
| 4A | ESD Flare | 2008 | $H_2S$, VOC | All Units | ~ 98% | Eng. Judgement |
| AGI | Acid Gas Injection (AGI) Well | 12/1/2009 | $H_2S$, VOC | Amine Treating | 1 | Eng. Judgement |
| AGI Flare | AGI Flare | 12/1/2009 | $H_2S$, VOC | AGI | ~ 98% | Eng. Judgement |
| VRU | Vapor Recovery Unit (VRU) | TBD | VOC | TK-VRU | 95% | Eng. Judgement |
| VRU-TMP | Vapor Recovery Unit (VRU) | 5/1/2011 | VOC | TK-VRUTMP | 95% | Eng. Judgement |
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[1] List each control device on a separate line. For each control device, list all emission units controlled by the control device.

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

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

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

| Unit No. | NOx | | CO | | VOC | | SOx | | 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 |
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| Totals | | | | | | | | | | | | | | | | | | |

[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[1,2] | | PM10[1] | | PM2.5[1] | | $H_2S$ | | Lead | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr |
| 2 | 0.085 | 0.37 | 0.39 | 1.69 | 0.027 | 0.12 | 0.0083 | 0.036 | - | - | - | - | - | - | - | - | - | - |
| 4A | 0.23 | 1.00 | 1.05 | 4.58 | 0.17 | 0.76 | 0.023 | 0.10 | - | - | - | - | - | - | - | - | - | - |
| 6 | 39.29 | | 19.84 | | 3.05 | | 0.010 | | - | - | 0.86 | | 0.86 | | - | - | - | - |
| 7 | 39.29 | 566.08 | 19.84 | 283.08 | 3.05 | 60.77 | 0.010 | 0.12 | - | - | 0.86 | 10.01 | 0.86 | 10.01 | - | - | - | - |
| 8,9,10, or 11 | 47.49 | | 23.52 | | 6.45 | | 0.0070 | | - | - | 0.57 | | 0.57 | | - | - | - | - |
| 28 | 3.47 | 15.20 | 3.52 | 15.42 | 2.01 | 8.82 | 0.91 | 4.01 | - | - | 1.33 | 5.83 | 1.33 | 5.83 | - | - | - | - |
| 29 | 11.82 | 51.78 | 9.47 | 41.48 | 0.33 | 1.42 | 0.26 | 1.16 | - | - | 0.51 | 2.24 | 0.51 | 2.24 | - | - | - | - |
| 30 | 11.26 | 49.32 | 9.02 | 39.51 | 0.31 | 1.36 | 0.25 | 1.10 | - | - | 0.49 | 2.14 | 0.49 | 2.14 | - | - | - | - |
| 31 | 26.03 | 114.01 | 4.95 | 21.60 | 0.35 | 1.53 | 0.13 | 0.55 | - | - | 0.24 | 1.06 | 0.24 | 1.06 | - | - | - | - |
| 32B | 23.72 | 103.88 | 4.38 | 19.19 | 2.50 | 10.94 | 0.12 | 0.54 | - | - | 0.24 | 1.05 | 0.24 | 1.05 | - | - | - | - |
| 34 | 1.67 | 7.30 | 1.40 | 6.13 | 0.092 | 0.40 | 0.010 | 0.044 | - | - | 0.13 | 0.044 | 0.13 | 0.044 | - | - | - | - |
| 36 | 5.53 | 24.21 | 9.29 | 40.68 | 0.61 | 2.66 | 0.066 | 0.29 | - | - | 0.84 | 3.68 | 0.84 | 3.68 | - | - | - | - |
| 37 | 5.53 | 24.21 | 9.29 | 40.68 | 0.61 | 2.66 | 0.066 | 0.29 | - | - | 0.84 | 3.68 | 0.84 | 3.68 | - | - | - | - |
| TK-2 | - | - | - | - | 0.16 | 0.70 | - | - | - | - | - | - | - | - | - | - | - | - |
| AGI Flare | 0.085 | 0.37 | 0.39 | 1.69 | 0.027 | 0.12 | 0.0083 | 0.036 | - | - | - | - | - | - | - | - | - | - |
| AM-10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DH-10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TK-VRU | - | - | - | - | 27.54 | 6.03 | - | - | - | - | - | - | - | - | - | - | - | - |
| TK-VRUTMP[3] | - | - | - | - | 24.56 | 5.38 | - | - | - | - | - | - | - | - | - | - | - | - |
| CT-1 | - | - | - | - | - | - | - | - | - | - | 1.92 | 8.42 | 0.0078 | 0.034 | - | - | - | - |
| CT-2 | - | - | - | - | - | - | - | - | - | - | 0.61 | 2.69 | 0.0025 | 0.011 | - | - | - | - |
| FUG | - | - | - | - | 17.74 | 77.01 | - | - | - | - | - | - | - | - | 0.11 | 0.48 | - | - |
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| **Totals** | **215.48** | **957.74** | **116.34** | **515.72** | **89.59** | **175.32** | **1.89** | **8.27** | **-** | **-** | **9.44** | **40.85** | **6.92** | **29.79** | **0.11** | **0.48** | **-** | **-** |

[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.

[2] TSP not included because the the NM TSP standard was repealed on 11/30/2018.

[3] Unit TK-VRUTMP will not run while unit TK-VRU is running. Emissions from unit TK-VRUTMP are shown here but are not included in the totals.

# 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[2,3] | | 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 |
| *Start-up, Shutdown & Maintenance Flaring* | | | | | | | | | | | | | | | | | | |
| 2 | 14.80 | 0.88 | 80.51 | 4.77 | 1.56 | 0.0090 | 7751.21 | 45.59 | - | - | - | - | - | - | 84.02 | 0.48 | - | - |
| 4A | 17.75 | 0.71 | 96.59 | 44.39 | 1.87 | 7.98E-04 | 9301.45 | 4.13 | - | - | - | - | - | - | 100.83 | 0.043 | - | - |
| AGI Flare | 287.65 | 4.33 | 1565.15 | 23.57 | 862.27 | 7.35 | 2148.40 | 18.91 | - | - | - | - | - | - | 23.29 | 0.20 | - | - |
| *Start-up, Shutdown & Maintenance Venting* | | | | | | | | | | | | | | | | | | |
| SSM Venting | - | - | - | - | 5,391.12 | 36.26 | - | - | - | - | - | - | - | - | 62.59 | 0.31 | - | - |
| *Malfuction Flaring & Venting* | | | | | | | | | | | | | | | | | | |
| Malfuction[4] | 287.65 | 10.00 | 1565.15 | 10.00 | 3029.49 | 10.00 | 9301.45 | 10.00 | - | - | - | - | - | - | 100.83 | 10.00 | - | - |
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| **Total SSM & Malfuction** | **320.20** | **15.92** | **1,742.25** | **82.73** | **6,021.35** | **53.63** | **19,201.06** | **78.64** | **-** | **-** | **-** | **-** | **-** | **-** | **270.73** | **11.04** | **-** | **-** |

[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.

[3] TSP not included because the the NM TSP standard was repealed on 11/30/2018.

[4] Hourly emission rate shown for informational purposes only; emissions were calculated assuming each activity lasts 1 hour.

# 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 |
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| Totals: | | | | | | | | | | | | | | | | | |

# Table 2-H: Stack Exit Conditions

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

| Stack Number | Serving Unit Number(s) from Table 2-A | Orientation (H-Horizontal V=Vertical) | Rain Caps (Yes or No) | Height Above Ground (ft) | Temp. (F) | Flow Rate | | Moisture by Volume (%) | Velocity (ft/sec) | Inside Diameter (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (acfs) | (dscfs) | | | |
| 2 | 2 | V | No | 222.0 | 1832.0 | 131.2 | - | | 65.6 | 2.0 |
| 4A | 4A | V | No | 175.0 | 1832.0 | 131.2 | - | - | 65.6 | 2.0 |
| 6 | 6 | V | No | 74.0 | 750.0 | 318.3 | - | - | 132.3 | 1.8 |
| 7 | 7 | V | No | 74.0 | 750.0 | 318.3 | - | - | 132.3 | 1.8 |
| 8 | 8 | V | No | 75.0 | 650.0 | 216.7 | - | - | 122.6 | 1.5 |
| 9 | 9 | V | No | 75.0 | 650.0 | 216.7 | - | - | 122.6 | 1.5 |
| 10 | 10 | V | No | 74.0 | 650.0 | 215.8 | - | - | 122.1 | 1.5 |
| 11 | 11 | V | No | 74.0 | 650.0 | 215.8 | - | - | 122.1 | 1.5 |
| 28 | 28 | V | No | 35.8 | 890.0 | 1787.4 | - | - | 154.9 | 3.8 |
| 29 | 29 | V | No | 44.0 | 858.0 | 1964.1 | - | - | 156.3 | 4.0 |
| 30 | 30 | V | No | 44.0 | 826.0 | 1916.4 | - | - | 67.8 | 6.0 |
| 31 | 31 | V | No | 44.0 | 817.0 | 1300.0 | - | - | 103.5 | 4.0 |
| 32B | 32B | V | No | 32.0 | 817.0 | 1307.7 | - | - | 104.1 | 4.0 |
| 34 | 34 | V | No | 45.0 | 600.0 | 114.1 | - | - | 36.3 | 2.0 |
| 36 | 36 | V | No | 50.0 | 300.0 | 552.2 | - | - | 50.0 | 3.8 |
| 37 | 37 | V | No | 50.0 | 300.0 | 552.2 | - | - | 50.0 | 3.8 |
| AGI Flare | AGI Flare | V | No | 210.0 | 1831.7 | 15.1 | - | - | 65.6 | 2.0 |
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# 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 | | Benzene ☑ HAP or ☐ TAP | | Toluene ☑ HAP or ☐ TAP | | Ethylbenzene ☑ HAP or ☐ TAP | | Xylenes ☑ HAP or ☐ TAP | | Formaldehyde ☑ HAP or ☐ TAP | | Acetaldehyde ☑ HAP or ☐ TAP | | n-Hexane ☑ HAP or ☐ TAP | | Acrolein ☑ HAP or ☐ TAP | | Acrolein ☑ 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 | lb/hr | ton/yr |
| 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4A | 4A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 6 | 1.36 | 5.97 | 0.034 | 0.15 | 0.017 | 0.075 | 0.0019 | 0.0084 | 0.0048 | 0.021 | 0.98 | 4.29 | 0.14 | 0.60 | 0.0079 | 0.035 | 0.14 | 0.60 | 0.044 | 0.19 |
| 7 | 7 | 1.36 | 5.97 | 0.034 | 0.15 | 0.017 | 0.075 | 0.0019 | 0.0084 | 0.0048 | 0.021 | 0.98 | 4.29 | 0.14 | 0.60 | 0.0079 | 0.035 | 0.14 | 0.60 | 0.044 | 0.19 |
| 8,9,10, or 11 | 8,9,10, or 11 | 0.91 | 4.00 | 0.023 | 0.10 | 0.011 | 0.050 | 0.0013 | 0.0056 | 0.0032 | 0.014 | 0.65 | 2.87 | 0.092 | 0.40 | 0.0053 | 0.023 | 0.092 | 0.40 | 0.029 | 0.13 |
| 28 | 28 | 0.17 | 0.75 | 7.61E-04 | 0.0033 | 0.0082 | 0.036 | 0.0020 | 0.0089 | 0.0041 | 0.018 | 0.15 | 0.67 | 0.0025 | 0.011 | - | - | 4.06E-04 | 0.0018 | - | - |
| 29 | 29 | 0.077 | 0.34 | 9.32E-04 | 0.0041 | 0.010 | 0.044 | 0.0025 | 0.011 | 0.0050 | 0.022 | 0.055 | 0.24 | 0.0031 | 0.014 | - | - | 4.97E-04 | 0.0022 | - | - |
| 30 | 30 | 0.074 | 0.32 | 8.87E-04 | 0.0039 | 0.0096 | 0.042 | 0.0024 | 0.010 | 0.0047 | 0.02 | 0.053 | 0.23 | 0.0030 | 0.013 | - | - | 4.73E-04 | 0.0021 | - | - |
| 31 | 31 | 0.037 | 0.16 | 4.42E-04 | 0.0019 | 0.0048 | 0.021 | 0.0012 | 0.0052 | 0.0024 | 0.010 | 0.026 | 0.11 | 0.0015 | 0.0064 | - | - | 2.36E-04 | 0.0010 | - | - |
| 32B | 32B | 0.036 | 0.16 | 4.35E-04 | 0.0019 | 0.0047 | 0.021 | 0.0012 | 0.0051 | 0.0023 | 0.010 | 0.026 | 0.11 | 0.0014 | 0.0063 | - | - | 2.32E-04 | 0.0010 | - | - |
| 34 | 34 | 0.031 | 0.14 | 3.50E-05 | 1.53E-04 | 5.67E-05 | 2.48E-04 | - | - | - | - | 0.0013 | 0.0055 | - | - | 0.030 | 0.13 | - | - | - | - |
| 36 | 36 | 0.21 | 0.91 | 2.32E-04 | 0.0010 | 3.76E-04 | 0.0016 | - | - | - | - | 0.0083 | 0.036 | - | - | 0.20 | 0.87 | - | - | - | - |
| 37 | 37 | 0.21 | 0.91 | 2.32E-04 | 0.0010 | 3.76E-04 | 0.0016 | - | - | - | - | 0.0083 | 0.036 | - | - | 0.20 | 0.87 | - | - | - | - |
| TK-2 | TK-2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| AM-10 | AM-10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DH-10 | DH-10 | 0.14 | 0.59 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TK-VRU | TK-VRU | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| AGI flare | AGI flare | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TK-VRUTMP | TK-VRUTMP | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CT-1 | CT-1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CT-2 | CT-2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| N/A | FUG | 5.16 | 22.60 | 0.013 | 0.055 | 0.0064 | 0.028 | 0.00027 | 0.0012 | 0.0012 | 0.0052 | - | - | - | - | 5.14 | 22.51 | - | - | - | - |
| N/A | SSM | 71.33 | 5.38 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Totals:** | | 81.11 | 48.21 | 0.11 | 0.47 | 0.090 | 0.40 | 0.015 | 0.064 | 0.032 | 0.14 | 2.94 | 12.88 | 0.38 | 1.66 | 5.59 | 24.48 | 0.37 | 1.62 | 0.12 | 0.51 |

# 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 |
| 2 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 1.2 Mscf | 10.2 MMscf | 5 grains/100 scf | - |
| 4A | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 3.2 Mscf | 28.0 MMscf | 5 grains/100 scf | - |
| 6 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 19.7 Mscf | 172.5 MMscf | 5 grains/100 scf | - |
| 7 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 19.7 Mscf | 172.5 MMscf | 5 grains/100 scf | - |
| 8,9,10, or 11 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 13.2 Mscf | 115.4 MMscf | 5 grains/100 scf | - |
| 28 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 64.1 Mscf | 561.2 MMscf | 5 grains/100 scf | - |
| 29 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 82.7 Mscf | 724.2 MMscf | 5 grains/100 scf | - |
| 30 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 78.7 Mscf | 689.8 MMscf | 5 grains/100 scf | - |
| 31 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 40.9 Mscf | 358.2 MMscf | 5 grains/100 scf | - |
| 32B | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 40.2 Mscf | 352.4 MMscf | 5 grains/100 scf | - |
| 34 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 16.7 Mscf | 146.0 MMscf | 5 grains/100 scf | - |
| 36 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 110.6 Mscf | 968.5 MMscf | 5 grains/100 scf | - |
| 37 | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 110.6 Mscf | 968.5 MMscf | 5 grains/100 scf | - |
| AGI Flare | Natural Gas | Pipeline Quality Natural Gas | 900 Btu/scf | 1.2 Mscf | 10.2 MMscf | 5 grains/100 scf | - |
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# 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-2 | 40600061 | Gasoline (fuel) | Mixed C8+ hydrocarbons | 5.6 | 62 | 76 | 9.34 | 93 | 12.45 |
| TK-VRU1 | 40400321 | Gasoline (RVP 10) | Mixed C8+ hydrocarbons | 5.6 | 66 | 63 | 5.52 | 71 | 6.36 |
| TK-VRU2 | 40400321 | Gasoline (RVP 10) | Mixed C8+ hydrocarbons | 5.6 | 66 | 63 | 5.52 | 71 | 6.36 |
| TK-VRU3 | 40400321 | Gasoline (RVP 10) | Mixed C8+ hydrocarbons | 5.6 | 66 | 63 | 5.52 | 71 | 6.36 |
| TK-VRU4 | 40400321 | Gasoline (RVP 10) | Mixed C8+ hydrocarbons | 5.6 | 66 | 63 | 5.52 | 71 | 6.36 |
| TK-VRU5 | 40400321 | Gasoline (RVP 10) | Mixed C8+ hydrocarbons | 5.6 | 66 | 63 | 5.52 | 71 | 6.36 |
| TK-VRUTMP1 | 40400321 | Gasoline (RVP 10) | Mixed C8+ hydrocarbons | 5.6 | 66 | 63 | 5.52 | 71 | 6.36 |
| TK-VRUTMP2 | 40400321 | Gasoline (RVP 10) | Mixed C8+ hydrocarbons | 5.6 | 66 | 63 | 5.52 | 71 | 6.36 |
| TK-VRU6 | 40400321 | Gasoline (RVP 10) | Mixed C8+ hydrocarbons | 5.6 | 66 | 63 | 5.52 | 71 | 6.36 |
| TK-VRU7 | 40400321 | Gasoline (RVP 10) | Mixed C8+ hydrocarbons | 5.6 | 66 | 63 | 5.52 | 71 | 6.36 |
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# 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-2 | 2005 | Gasoline fuel | N/A | N/A | 12 | 2 | 1.2 | 0.01 | WH | WH | Good | 3,000 | 6.00 |
| TK-VRU1 | TBD | Gasoline (RVP 10) | N/A | N/A | 750 | 119 | 4.7 | 3.7 | WH | WH | Good | 27,594,000 | 876.00 |
| TK-VRU2 | TBD | Gasoline (RVP 10) | N/A | N/A | 750 | 119 | 4.7 | 3.7 | WH | WH | Good | | |
| TK-VRU3 | TBD | Gasoline (RVP 10) | N/A | N/A | 750 | 119 | 4.7 | 3.7 | WH | WH | Good | | |
| TK-VRU4 | TBD | Gasoline (RVP 10) | N/A | N/A | 750 | 119 | 4.7 | 3.7 | WH | WH | Good | | |
| TK-VRU5 | TBD | Gasoline (RVP 10) | N/A | N/A | 750 | 119 | 4.7 | 3.7 | WH | WH | Good | | |
| TK-VRUTMP1 | 1996 | Gasoline (RVP 10) | N/A | N/A | 1,500 | 363 | 3.65 | 0.25 | WH | WH | Good | 27,594,000 | 438.00 |
| TK-VRUTMP2 | 1996 | Gasoline (RVP 10) | N/A | N/A | 1,500 | 363 | 3.65 | 0.25 | WH | WH | Good | | |
| TK-VRU6 | TBD | Gasoline (RVP 10) | N/A | N/A | 400 | 64 | 3.6576 | 1.8288 | WH | WH | Good | 15,768,000 | 931.88 |
| TK-VRU7 | TBD | Gasoline (RVP 10) | N/A | N/A | 210 | 33 | 3.048 | 1.524 | WH | WH | Good | 6,832,800 | 775.33 |

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

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

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

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

| Material Processed | | | | Material Produced | | | |
|---|---|---|---|---|---|---|---|
| **Description** | **Chemical Composition** | **Phase (Gas, Liquid, or Solid)** | **Quantity (specify units)** | **Description** | **Chemical Composition** | **Phase** | **Quantity (specify units)** |
| Natural gas | Mixed hydrocarbons | Gas | 225 MMscf/day | Natural gas | Mixed hydrocarbons | Gas | 225 MMscf/day |
| | | | | Condesate | Mixed hydrocarbons and water | Liquid | 1,800 bbl/day |
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# 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 at this facility. | | | | | | | | | |
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# 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 at this facility. | | | | | | | | |
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# 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** | | | | | | | | | | |
| **2** | **mass GHG** | 611.42 | 0.0012 | 3.65 | - | - | | | | | | | | | 615.07 | |
| | **$CO_2e$** | 611.42 | 0.36 | 91.29 | - | - | | | | | | | | | | 703.07 |
| **4A** | **mass GHG** | 2,153.59 | 0.0042 | 12.86 | - | - | | | | | | | | | 2,166.46 | |
| | **$CO_2e$** | 2,153.59 | 1.26 | 321.54 | - | - | | | | | | | | | | 2,476.40 |
| **6** | **mass GHG** | 10,369.98 | 0.020 | 0.20 | - | - | | | | | | | | | 10,370.19 | |
| | **$CO_2e$** | 10,369.98 | 5.83 | 4.89 | - | - | | | | | | | | | | 10,380.69 |
| **7** | **mass GHG** | 10,369.98 | 0.020 | 0.20 | - | - | | | | | | | | | 10,370.19 | |
| | **$CO_2e$** | 10,369.98 | 5.83 | 4.89 | - | - | | | | | | | | | | 10,380.69 |
| **8, 9, 10, or 11** | **mass GHG** | 6,933.34 | 0.013 | 0.13 | - | - | | | | | | | | | 6,933.49 | |
| | **$CO_2e$** | 6,933.34 | 3.90 | 3.27 | - | - | | | | | | | | | | 6,940.51 |
| **28** | **mass GHG** | 33,718.89 | 0.064 | 0.64 | - | - | | | | | | | | | 33,719.59 | |
| | **$CO_2e$** | 33,718.89 | 18.95 | 15.90 | - | - | | | | | | | | | | 33,753.74 |
| **29** | **mass GHG** | 43,513.05 | 0.082 | 0.82 | - | - | | | | | | | | | 43,513.95 | |
| | **$CO_2e$** | 43,513.05 | 24.46 | 20.52 | - | - | | | | | | | | | | 43,558.02 |
| **30** | **mass GHG** | 41,446.86 | 0.078 | 0.78 | - | - | | | | | | | | | 41,447.72 | |
| | **$CO_2e$** | 41,446.86 | 23.30 | 19.54 | - | - | | | | | | | | | | 41,489.70 |
| **31** | **mass GHG** | 21,521.01 | 0.041 | 0.41 | - | - | | | | | | | | | 21,521.45 | |
| | **$CO_2e$** | 21,521.01 | 12.10 | 10.15 | - | - | | | | | | | | | | 21,543.25 |
| **32B** | **mass GHG** | 21,174.94 | 0.040 | 0.40 | - | - | | | | | | | | | 21,175.38 | |
| | **$CO_2e$** | 21,174.94 | 11.90 | 9.98 | - | - | | | | | | | | | | 21,196.83 |
| **34** | **mass GHG** | 8,771.82 | 0.017 | 0.17 | - | - | | | | | | | | | 8,772.00 | |
| | **$CO_2e$** | 8,771.82 | 4.93 | 4.14 | - | - | | | | | | | | | | 8,780.89 |
| **36** | **mass GHG** | 58,186.62 | 0.11 | 1.10 | - | - | | | | | | | | | 58,187.83 | |
| | **$CO_2e$** | 58,186.62 | 32.70 | 27.44 | - | - | | | | | | | | | | 58,246.76 |
| **37** | **mass GHG** | 58,186.62 | 0.11 | 1.10 | - | - | | | | | | | | | 58,187.83 | |
| | **$CO_2e$** | 58,186.62 | 32.70 | 27.44 | - | - | | | | | | | | | | 58,246.76 |
| **AGI Flare** | **mass GHG** | 611.42 | 0.0012 | 3.65 | - | - | | | | | | | | | 615.07 | |
| | **$CO_2e$** | 611.42 | 0.36 | 91.29 | - | - | | | | | | | | | | 703.07 |
| **Fug** | **mass GHG** | - | - | 11.67 | - | - | | | | | | | | | 11.67 | |
| | **CO2e** | - | - | 291.78 | - | - | | | | | | | | | | 291.78 |
| **SSM** | **mass GHG** | 4,525.91 | 1.0E-04 | 31.48 | - | - | | | | | | | | | 4,557.39 | |
| | **$CO_2e$** | 4,525.91 | 0.030 | 787.05 | - | - | | | | | | | | | | 5,312.98 |
| **Total** | **mass GHG** | 322,095.44 | 0.60 | 69.24 | | | | | | | | | | | **322,165.28** | |
| | **$CO_2e$** | 322,095.44 | 178.60 | 1,731.09 | | | | | | | | | | | | **324,005.13** |

[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

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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.

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Linam Ranch Gas Plant (Linam) is a natural gas processing plant owned and operated by DCP Operating Company, LP (DCP) located 7 miles west of Hobbs, New Mexico in Lea County. The facility removes hydrogen sulfide, water and carbon dioxide from field natural gas and separates natural gas liquids from the field natural gas stream. The facility is currently permitted under NSR permit 0039-M8R3 and Title V permit P094-R2.

DCP Operating Company, LP (DCP) is submitting this application to renew the current Title V permit in accordance with 20.2.70.300.B.2 NMAC, which requires a timely application be submitted at least 12 months prior to the expiration date of the current Title V permit. The facility is currently authorized to operate under Title V permit P094-R2, which expires on April 17, 2020.

The Linam Ranch Gas Plant is a major source under the Prevention of Significant Deterioration (PSD) rules as currently permitted, and will remain a major source after the proposed Title V renewal. This facility will also remain a major source for operating permit purposes under Title V (20.2.70 NMAC).

This renewal will incorporate three technical revisions made to the facility's NSR permit: 0039-M8R1 (issued April 30, 2015), 0039-M8R2 (issued May 6, 2016), and 0039-M8R3 (issued July 25, 2018). These revisions are described below. No other changes to the facility are proposed with this renewal.

Technical revision 0039-M8R1 was submitted to correct the transposed emission figures for flare units 4A and AGI flare in Table 107.A of the permit.

The 0039-M8R2 technical revision consisted of replacing the 2.2 gallon per minute glycol dehydrator pump associated with unit DH-10 (TEG dehydrator) with a 25 gallon per minute rated pump. In addition, this revision included updating the emissions calculation methodology for the following emission units: unit 2 (amine flare), unit 4A (ESD flare), and unit AGI flare. The criteria pollutant emissions for each of the flares were updated to utilize a new site-specific fuel gas analyses and the then new AP-42, Section 13 flaring emission factors. Additionally, since the controlled emissions from the TEG Dehydrator (unit DH-10) are sent to the ESD flare (unit 4A), the emission calculations for the ESD flare were further updated to account for the increased flow rate resulting from the dehydrator pump replacement. Finally, greenhouse gas emission calculations for each of these units was updated to be based on the 40 CFR Part 98 - Mandatory Greenhouse Gas Reporting methodology.

The 0039-M8R3 revision updated language in the monitoring requirement under NSR Permit Condition A212. The condition previously required monitoring of cooling tower TDS content on an annual basis (with one sample). This revision updated the monitoring condition to use an average of several samples as monitoring is performed on a daily basis for operational purposes.

Table 1, on the following page, is a list of emissions sources at the facility. Emissions from these units have been previously reviewed and approved. Start-up, Shutdown, Maintenance (SSM) and Malfunction emissions for all sources and operations that are performed at this site have been previously estimated and are included with this application. No changes are being made.

| Table 1 – List of Regulated Emission Sources | |
|---|---|
| **Emission Source** | **Description** |
| 2 | Amine Plant Flare East; Installed in 2005 |
| 4A | ESD Flare; Installed in 2008 |
| 6 | Clark TLA-6; 2SLB; 2000 hp RICE with an installation date on or before 1974 |
| 7 | Clark TLA-6; 2SLB; 1267 hp RICE with an installation date on or before 1974 |
| 8 | Clark HBA-6; 2SLB; 800 hp RICE with an installation date of 1954 |
| 9 | Clark HBA-6; 2SLB; 800 hp RICE with an installation date of 1954 |
| 10 | Clark HBA-6; 2SLB; 800 hp RICE with an installation date of 1954 |
| 11 | Clark HBA-6; 2SLB; 800 hp RICE with an installation date of 1954 |
| 28 | Solar Saturn Turbine; 63.43 MMBtu/hr Turbine; Installed in 2012 |
| 29 | Solar Saturn Turbine; 77.63 MMBtu/hr Turbine; Installed in 1995 |
| 30 | Solar Saturn Turbine; 73.95 MMBtu/hr Turbine; Installed in 1995 |
| 31 | Solar Saturn Turbine; 48.1 MMBtu/hr Turbine; Installed in 1995 |
| 32B | Solar Saturn Turbine; 36.2 MMBtu/hr Turbine; Installed in 1995 |
| 34 | Regeneration Gas Heater; 15 MMBtu/hr; Installed in 1995 |
| 36 | Boiler; 99 MMBtu/hr; Installed in 2006 |
| 37 | Boiler; 99 MMBtu/hr; Installed in 2010 |
| TK-2 | Storage Tank – Gasoline; 11.9 bbl; Installed in 2005 |
| AGI Flare | Acid Gas Flare; Installed in 2009 |
| AM-10 | Amine Unit; 225 MMscf/d |
| DH-10 | Glycol Dehydrator; 27 MMscf/d |
| TK-VRU | Seven Condensate Tanks controlled by a common VRU; Five (1-5) 750 bbl tanks, one (6) 400 bbl tank, and one (7) 210 bbl tank. These tanks have not been installed. |
| TK-VRUTMP | Two Condensate Tanks controlled by a common VRU (previously listed as TK39 and TK40); Both tanks are 1,500 bbl tanks. Tanks were installed in 1996. |
| CT-1 | South Cooling Tower; 3,200 gpm |
| CT-2 | North Cooling Tower; 2,045 gpm |
| FUG | Facility-wide Fugitives |

# Section 4

## Process Flow Sheet

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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.

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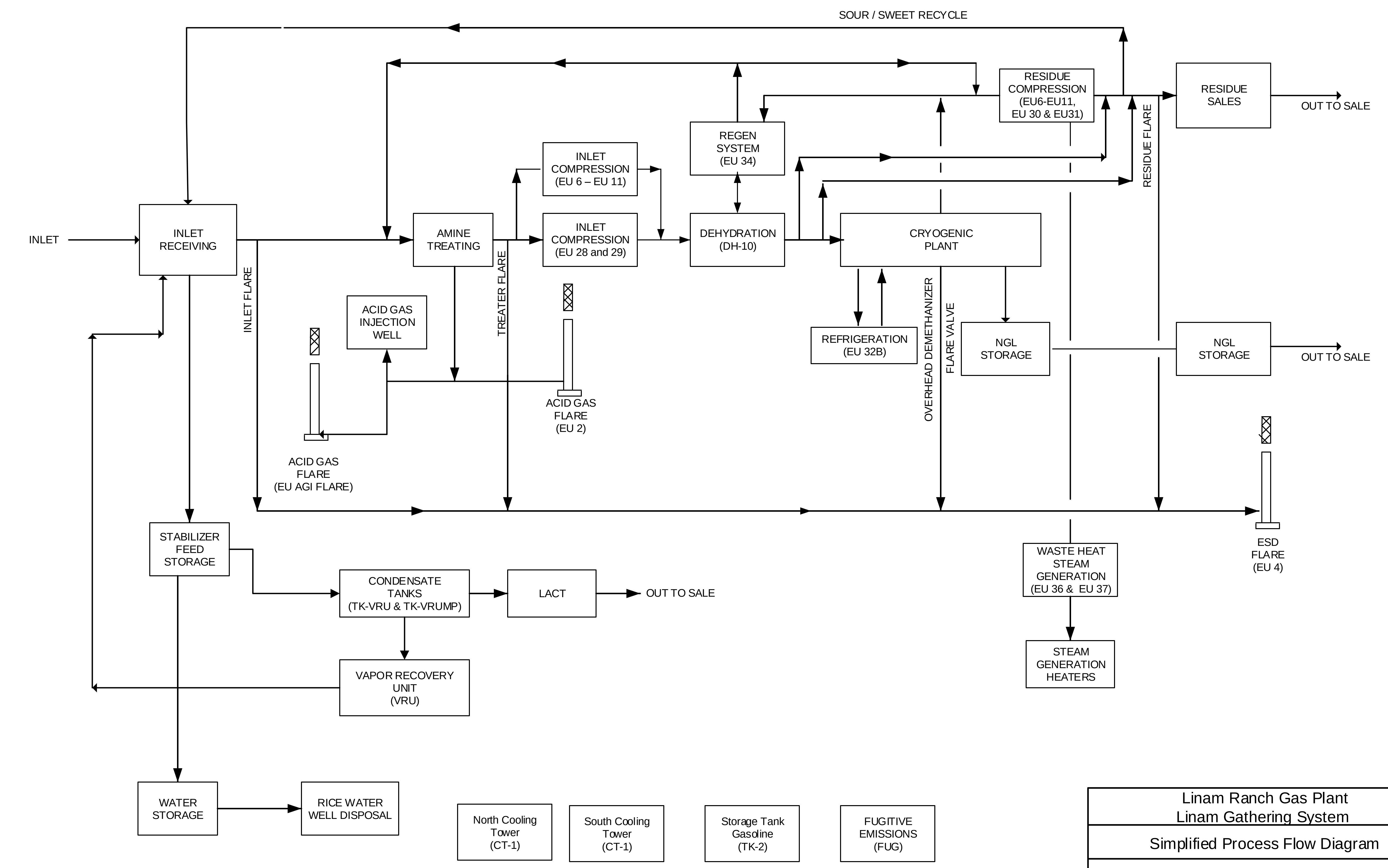
A process flow diagram is included in this section.




| |
|---|
| Linam Ranch Gas Plant<br>Linam Gathering System |
| Simplified Process Flow Diagram |
| December 2013 |

# Section 5

## Plot Plan Drawn To Scale

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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.

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A plot plan is included in this section.


| REV. | DATE | REVISION | BY | CHK'D | ENGR. | REV. | DATE | REVISION | BY | CHK'D | ENGR. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4/11/95 | ISSUED FOR CONSTRUCTION | E.A. M. | D.C. | | 5 | 12/05/05 | UPDATED PLOT PLAN | P.L. | | |
| 1 | 522/95 | REVOSED MPTES 16, 19 & 27 | E.A. M. | D.C. | | 6 | 07/26/06 | ADDED WATER WASH EQP. | P.L. | | |
| 2 | 7/20/95 | ADDED INLET REC.'S, REGEN COMP., PROPANE COOL | JAM | | | 7 | 8/23/06 | REMOVED EQUIPMENT PER FIELD MARKS | wrt | | |
| 3 | 11/7/95 | REMOVED GENERAL NOTES AND LEGEND | JAM | | | 8 | IN PROG | ADD AGI EQUIPMENT | MAC | | |
| 4 | 3/30/99 | UPDATED DRAWING | JC | | | | | | | | |

NOTES:

dcp Midstream

# PLOT PLAN LINAM RANCH GAS PLANT

LINAM RANCH PLANT — WEST PERMIAN BASIN

| | | | |
|---|---|---|---|
| DRAWN: | E.A. MOWERS | DATE: | 9/6/94 |

| | |
|---|---|
| JA NO. | FILE NAME 07307MP002 |
| AFE NO. | SCALE 1"=80' |
| BASE NO. | 07-3-07 |
| DWG. NO. | MP-002 (8) |

PLOT TIME: January 18 2008 - 12:17 pm

# 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.

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## Steady State Calculations

All calculations for existing permitted emission rates at the facility are shown in this section for convenience purposes.

Engines (Units 6, 7, 8, 9, 10, and 11)
Engine $NO_x$, CO, and VOC emissions were calculated using manufacturer's data. Total HAPs, formaldehyde, $SO_2$, and PM were calculated using EPA AP-42 emission factors from Table 3.2-1. Units 8 and 9 used manufacturer's data to estimate $SO_2$ emissions.

Turbine (Units 29, 30, 31, and 32B)
Turbine $NO_x$, CO, and VOC emissions were calculated using manufacturer's data. Total HAPs, formaldehyde, $SO_2$, and PM were calculated using EPA AP-42 emission factors from Tables 3.1-2a and 3.1-3.

Heaters/Boilers (Units 34, 36, and 37)
Heater/boiler emissions are calculated using emission factors from EPA AP-42 Tables 1.4-1, 1.4-2, and 1.4-3.

Tank (Unit TK-2)
Tank emissions were calculated using Tanks 4.09d. No flashing losses are associated with this tank as the contents are at atmospheric conditions.

Dehydrator (Unit DH-10)
Gri-GlyCalc was used to calculate emissions for the dehydrator. The simulation shows flow rates, the uncontrolled / controlled regeneration emissions as well as Flash Tank Off Gas. This calculations were done using a pump flow rate of 25 gpm.

Tanks (Units TK-VRU and TK-VRUTMP)
Tanks 4.09d was used to calculate working and breathing emissions from the tanks. ProMax analysis was used to calculate flash emissions from the tanks. All the tanks are controlled by a VRU. The VRU is 100% efficient as a control system for the tanks but a 95% annual control was used in the calculations to account for a 5% annual downtime for the VRU. The VRU is designed to minimize vapor losses and is inherent to the process at Linam Ranch. All recovered vapors are returned back into the low pressure gathering system.

Turbine (Unit 28)
Turbine $NO_x$, CO, and VOC emissions were calculated using manufacturer's data. A manufacturer-recommended emission factor was used for particulate emissions. $PM_{10}$ and $PM_{2.5}$ emissions are set equal to PM emissions as a conservative measure. $SO_2$ emissions are based on fuel sulfur content of 5 grains of sulfur per 100 scf.

Unit 2 Gas Flare
Emissions associated with this unit was calculated using a site-specific gas analysis dated 1/20/2016. With this analysis, the specific heat value per volume for each of the gases detected was obtained using the Physical Properties of Hydrocarbon information as shown in the API Research Project 44, Fig. 16-1, Rev. 1981. Then, assist gas heating value was calculated based on the flare pilot and the purge gas activities, which was based on engineering judgment and technical information provided by DCP officials. With this information and AP-42 Tables 13.5-1 and 13.5-2 (4/15) $NO_X$, VOC and CO emissions were calculated. The GHG Emissions calculations are based on the 40 CFR Part 98- Mandatory Greenhouse Gas Reporting. Specifically on 98.233(n).

AGI Flare
Emissions associated with this unit were calculated using a site-specific gas analysis dated 1/20/2016. With this analysis, the specific heat value per volume for each of the gases detected was obtained using the Physical Properties of Hydrocarbon information as shown in the API Research Project 44, Fig. 16-1, Rev. 1981. Then, assist gas heating value was calculated based on the flare pilot and the purge gas activities, which was based on engineering judgment and technical information provided by DCP officials. With this information and AP-42 Tables 13.5-1 and 13.5-2 (4/15) $NO_X$, VOC and CO emissions were calculated. The GHG Emissions calculations are based on the 40 CFR Part 98- Mandatory Greenhouse Gas Reporting. Specifically on 98.233(n).

Unit 4A ESD Flare
These emissions were calculated in a similar form to those performed for the Unit 2 Gas Flare and AGI Flare. Calculations were done using residue-fuel and acid gas analysis results dated 1/20/2016. The rest of the calculations was performed in the same form as the two other flares with the only exception that this calculation takes into account a larger flow rate associated with unit DH-10 due to use of a bigger pump.

Cooling Towers (Units CT-1 and CT-2)
The particulate emissions were calculated using the procedure described in AP-42 Section 13.4 – Wet Cooling Towers. A Frisbee table was created to determine the particle distribution and subsequently $PM_{10}$ and $PM_{2.5}$ emissions.

Fugitive Emissions (Unit FUG)
The EPA Protocol for Equipment Leak Emissions Estimates Table 2-4 (VOC fugitive emissions) and Table 2-10 ($H_2S$ fugitive emissions) were used to calculate fugitive emissions. A conservative screening value of 35 ppmv was used for the $H_2S$ fugitive emissions.

Methanol Tanks (TK-20, TK-21, TK-27, TK-77, TK-1370)
Emissions for the methanol tanks are calculated using Tanks 4.09d. No flashing losses are associated with these tanks as the tank contents are at atmospheric conditions. These tanks are exempt units per 20.2.72.202.B.5 NMAC.

Greenhouse Gas (GHG) Emissions
GHG emissions were calculated using 40 CFR 98 Subpart W. These emissions are shown on Table 2-P and the actual calculations are included in this section.

## Routine or Predictable Emissions during Startup, Shutdown, and Scheduled Maintenance (SSM)

Emissions from Startup, Shutdown, and Maintenance (SSM) were estimated for SSM venting, Unit 2 Gas Flare, AGI Flare, and Unit 4A ESD Flare. SSM venting emissions include estimated emissions for the following activities: plant turnaround, plant startup (post turnaround), condensate tank degassing during VRU downtime, gas piping degassing, pig launcher degassing, vacuum trucks, engine startup, turbine blowdowns, and compressor blowdowns. Malfunction emissions are also accounted for. Hourly malfunction emissions are set equal to the largest anticipated SSM release for each pollutant.

Unit 2 Gas Flare & AGI Flare
SSM emissions from the acid gas and AGI flares are calculated using the estimated maximum hourly and annual SSM flow rates routed to the respective flares. VOC, HAP and $H_2S$ emissions are a site-specific acid gas analysis dated 11/4/13. $NO_x$ and CO emissions are calculated using AP-42 Tables 13.5-1 and 13.5-2 (4/15). SO2 emissions are based on a sulfur content of 5 gr S / 100 scf. The GHG Emissions calculations are calculated using the methodology in 40 CFR Part 98 - Mandatory Greenhouse Gas Reporting.

Unit 4A ESD Flare
SSM emissions from the acid gas flare for are calculated using the estimated maximum hourly and annual SSM flow rates routed to the flare. VOC, HAP and $H_2S$ emissions are a site-specific inlet gas analysis dated 11/11/13. $NO_x$ and CO emissions are calculated using AP-42 Tables 13.5-1 and 13.5-2 (4/15). SO2 emissions are based on a sulfur content of 5 gr S / 100 scf. The GHG Emissions calculations are calculated using the methodology in 40 CFR Part 98 - Mandatory Greenhouse Gas Reporting.

SSM Venting

*Plant Turnaround*
Multiple steps comprise a plant turnaround. Step 1 - For the natural gas system, emissions to the atmosphere after opening pipelines are calculated using the Ideal Gas Law and are based on the entire pipe volume venting to the atmosphere at pipeline pressure. Step 2 - For systems in liquid service clingage emissions degassing emissions occur after the system is de-inventoried. Degassing emissions are calculated using the Ideal Gas Law. Step 3 - After systems are degassed and opened, residual materials (clingage) may be emitted to the atmosphere. Clingage emissions are estimated using system volumes and an assumed clingage amount.

Total hourly emissions from each liquid system turnaround step (degassing, clingage) assume that any liquid system may undergo turnaround at any time. Maximum hourly emissions from all turnaround steps are calculated as the maximum hourly emission rate from any step.

*Plant Startup (post turnaround)*
For the natural gas system, emissions to the atmosphere occur from a three step pressure test and purge prior to plant startup. These emissions are calculated using the Ideal Gas Law and are based on the entire pipe volume venting to the atmosphere at each purge step pressure.

*Gas Piping Degassing & Pig Launcher Degassing*
Emissions to the atmosphere after opening pipelines are calculated using the Ideal Gas Law and are based on the entire pipe volume venting to the atmosphere at pipeline pressure.

*Vacuum Trucks*
Emissions from vacuum trucks are estimated using the loading loss method of AP-42, Chapter 5.2: Transportation and Marketing of Petroleum Liquids, 1995. Calculations are performed based on the concentrations of the individual organic species since the wastes contain significant non-volatile content (i.e. solids). A truck can be loaded in one hour; therefore the emissions per loading activity reflect the hourly emission rate.

*Engine Startup & Compressor Blowdown*
Emissions are calculated based on an estimated volume of gas released from each unit for engine startup and compressor blowdown multiplied by the number of activities throughout the year. This volume is then multiplied by the gas analysis mol% divided by the flow rate in scf/mol then multiplied by molecular weight to arrive at a lb/event.

*Turbine Blowdown*
Emissions to the atmosphere are from two types of turbine blowdowns: maintenance and washing related blowdowns. During a turbine wash blowdown occurs in three steps: a pre-wash blowdown to take the turbine out of service, a starter run (used to move turbine during washing) and finally a blowdown associated with turbine startup at completion of the wash. During a maintenance event blowdown occurs from an initial blowdown and starter blowdown. Emissions are calculated using a mass balance and are based on the volume vented to the atmosphere.

*Compressor Blowdown*
Emissions to the atmosphere are the result of a compressor blowdown activity and are calculated using a mass balance analysis and are based on the volume vented to the atmosphere. Setting the Compressor Blowdown volume to 2,500 scf per activity and using the chemical analysis of the inlet gas a unitary value, per each event, is obtained. Knowing that this installation has six (6) compressors and that the frequency of blowdowns per turbine per year is 20 the total amount of blowdowns equals 120. Thus, we multiple the yearly total amount of blowdown per unitary values previously obtained provide the emissions of regulated contaminants associated to this activity.

# Section 6.a

## Green House Gas Emissions

(Submitting under 20.2.70, 20.2.72 20.2.74 NMAC)

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**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)

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Greenhouse gas emissions are included in this section.

# Steady-State Calculations

*DCP Operating Company, LP - Linam Ranch Gas Plant*

## Summary of Steady State Emissions

**Uncontrolled Emissions**

| Unit # | Description | $NO_x$ | | CO | | VOC | | $SO_2$ | | TSP | | $PM_{10}$ | | $PM_{2.5}$ | | $H_2S$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| 2 | E. Amine Plnt Acid Gas Flare | 0.085 | 0.37 | 0.39 | 1.7 | 1.3 | 5.9 | 0.0083 | 0.036 | - | - | - | - | - | - | - | - |
| 4A | ESD Flare | 0.23 | 1.0 | 1.0 | 4.6 | 8.7 | 38.2 | 0.023 | 0.099 | - | - | - | - | - | - | - | - |
| 6 | RICE, Clark TLA-6 | 39.3 | 566.1 | 19.8 | 283.1 | 3.1 | 60.8 | 0.010 | 0.12 | 0.86 | 10.0 | 0.86 | 10.0 | 0.86 | 10.0 | - | - |
| 7 | RICE Clark TLA-6 | 39.3 | | 19.8 | | 3.1 | | 0.010 | | 0.86 | | 0.86 | | 0.86 | | - | |
| 8,9,10, or 11 | RICE, Clark HBA-6 | 47.5 | | 23.5 | | 6.5 | | 0.0070 | | 0.57 | | 0.57 | | 0.57 | | - | |
| 28 | Solar T-60 | 3.5 | 15.2 | 3.5 | 15.4 | 2.0 | 8.8 | 0.91 | 4.0 | 1.3 | 5.8 | 1.3 | 5.8 | 1.3 | 5.8 | - | - |
| 29 | Solar T-70-10302 | 11.8 | 51.8 | 9.5 | 41.5 | 0.3 | 1.4 | 0.26 | 1.2 | 0.51 | 2.2 | 0.51 | 2.2 | 0.51 | 2.2 | - | - |
| 30 | Solar T-70-9702S | 11.3 | 49.3 | 9.0 | 39.5 | 0.3 | 1.4 | 0.25 | 1.1 | 0.49 | 2.1 | 0.49 | 2.1 | 0.49 | 2.1 | - | - |
| 31 | Solar T-4700 | 26.0 | 114.0 | 5.0 | 21.6 | 0.4 | 1.5 | 0.13 | 0.55 | 0.24 | 1.1 | 0.24 | 1.1 | 0.24 | 1.1 | - | - |
| 32B | Solar T-4700 | 23.7 | 103.9 | 4.4 | 19.2 | 2.5 | 10.9 | 0.12 | 0.54 | 0.24 | 1.0 | 0.24 | 1.0 | 0.24 | 1.0 | - | - |
| 34 | Regenerative Heater | 1.7 | 7.3 | 1.4 | 6.1 | 0.1 | 0.4 | 0.010 | 0.044 | 0.13 | 0.044 | 0.13 | 0.044 | 0.13 | 0.044 | - | - |
| 36 | Rentech Boiler | 5.5 | 24.2 | 9.3 | 40.7 | 0.6 | 2.7 | 0.066 | 0.29 | 0.84 | 3.7 | 0.84 | 3.7 | 0.84 | 3.7 | - | - |
| 37 | Rentech Boiler | 5.5 | 24.2 | 9.3 | 40.7 | 0.6 | 2.7 | 0.066 | 0.29 | 0.84 | 3.7 | 0.84 | 3.7 | 0.84 | 3.7 | - | - |
| TK-2 | 11.9 bbl gasoline tank | - | - | - | - | 0.2 | 0.7 | - | - | - | - | - | - | - | - | - | - |
| AGI Flare | AGI Flare | 0.085 | 0.37 | 0.39 | 1.7 | 1.3 | 5.9 | 0.0083 | 0.036 | - | - | - | - | - | - | - | - |
| AM-10 | Amine Unit | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DH-10 | Glycol Contactor Dehy & Mol Sieve Dehy. | - | - | - | - | 5.1 | 22.2 | - | - | - | - | - | - | - | - | - | - |
| TK-VRU | 7 condensate tanks VRU controlled | - | - | - | - | 27.5 | 6.0 | - | - | - | - | - | - | - | - | - | - |
| TK-VRUTMP | 7 condensate tanks VRUTMP controlled | - | - | - | - | 24.6 | 5.4 | - | - | - | - | - | - | - | - | - | - |
| CT-1 | South Cooling Tower | - | - | - | - | - | - | - | - | 3.6 | 15.9 | 1.9 | 8.4 | 0.0078 | 0.034 | - | - |
| CT-2 | North Cooling Tower | - | - | - | - | - | - | - | - | 1.2 | 5.1 | 0.61 | 2.7 | 0.0025 | 0.011 | - | - |
| FUG | Fugitive Leaks | - | - | - | - | 17.7 | 77.0 | - | - | - | - | - | - | - | - | 0.11 | 0.48 |
| | | | | | | | | | | | | | | | | | |
| **TOTAL** | | **215.5** | **957.7** | **116.3** | **515.7** | **81.3** | **246.6** | **1.9** | **8.3** | **11.7** | **50.8** | **9.4** | **40.8** | **6.9** | **29.8** | **0.11** | **0.48** |

"*" Denotes hourly emission limits are not applicable for this unit. Any hourly emissions shown for this unit are for informational purposes only.

"-" Denotes emissions of this pollutant are not expected.

*DCP Operating Company, LP - Linam Ranch Gas Plant*

## Summary of Steady State Emissions

**Uncontrolled Emissions**

| Unit # | Description | $CO_2e$ | | Formaldehyde | | Acetaldehyde | | Acrolein | | Hexane | | Total HAP | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| 2 | E. Amine Plnt Acid Gas Flare | * | 703.1 | - | - | - | - | - | - | - | - | - | - |
| 4A | ESD Flare | * | 2,476.4 | - | - | - | - | - | - | - | - | - | - |
| 6 | RICE, Clark TLA-6 | * | 10,380.7 | 0.98 | 4.3 | 0.14 | 0.60 | 0.14 | 0.60 | 0.0079 | 0.035 | 1.4 | 6.0 |
| 7 | RICE Clark TLA-6 | * | 10,380.7 | 0.98 | 4.3 | 0.14 | 0.60 | 0.14 | 0.60 | 0.0079 | 0.035 | 1.4 | 6.0 |
| 8,9,10, or 11 | RICE, Clark HBA-6 | * | 6,940.5 | 0.65 | 2.9 | 0.092 | 0.40 | 0.092 | 0.40 | 0.0053 | 0.023 | 0.91 | 4.0 |
| 28 | Solar T-60 | * | 33,753.7 | 0.15 | 0.67 | 0.0025 | 0.011 | 4.1E-04 | 0.0018 | - | - | 0.17 | 0.75 |
| 29 | Solar T-70-10302 | * | 43,558.0 | 0.055 | 0.24 | 0.0031 | 0.014 | 5.0E-04 | 0.0022 | - | - | 0.077 | 0.34 |
| 30 | Solar T-70-9702S | * | 41,489.7 | 0.053 | 0.23 | 0.0030 | 0.013 | 4.7E-04 | 0.0021 | - | - | 0.074 | 0.32 |
| 31 | Solar T-4700 | * | 21,543.2 | 0.026 | 0.11 | 0.0015 | 0.0064 | 2.4E-04 | 0.0010 | - | - | 0.037 | 0.16 |
| 32B | Solar T-4700 | * | 21,196.8 | 0.026 | 0.11 | 0.0015 | 0.0064 | 2.4E-04 | 0.0010 | - | - | 0.037 | 0.16 |
| 34 | Regenerative Heater | * | 8,780.9 | 0.0013 | 0.0055 | - | - | - | - | 0.030 | 0.13 | 0.031 | 0.14 |
| 36 | Rentech Boiler | * | 58,246.8 | 0.0083 | 0.036 | - | - | - | - | 0.20 | 0.87 | 0.21 | 0.91 |
| 37 | Rentech Boiler | * | 58,246.8 | 0.0083 | 0.036 | - | - | - | - | 0.20 | 0.87 | 0.21 | 0.91 |
| TK-2 | 11.9 bbl gasoline tank | - | - | - | - | - | - | - | - | - | - | - | - |
| AGI Flare | AGI Flare | * | 703.1 | - | - | - | - | - | - | - | - | - | - |
| AM-10 | Amine Unit | - | - | - | - | - | - | - | - | - | - | - | - |
| DH-10 | Glycol Contactor Dehy & Mol Sieve Dehy. | - | - | - | - | - | - | - | - | - | - | 0.0022 | 0.0096 |
| TK-VRU | 7 condensate tanks VRU controlled | - | - | - | - | - | - | - | - | - | - | - | - |
| TK-VRUTMP | 7 condensate tanks VRUTMP controlled | - | - | - | - | - | - | - | - | - | - | - | - |
| CT-1 | South Cooling Tower | - | - | - | - | - | - | - | - | - | - | - | - |
| CT-2 | North Cooling Tower | - | - | - | - | - | - | - | - | - | - | - | - |
| FUG | Fugitive Leaks | - | 291.8 | - | - | - | - | - | - | 5.1 | 22.5 | 5.2 | 22.6 |
| **TOTAL** | | **-** | **318,692.1** | **2.9** | **12.9** | **0.38** | **1.7** | **0.37** | **1.6** | **5.6** | **24.5** | **9.6** | **42.2** |

"*" Denotes hourly emission limits are not applicable for this unit. Any hourly emissions shown for this unit are for informational purposes only.

"-" Denotes emissions of this pollutant are not expected.

*DCP Operating Company, LP - Linam Ranch Gas Plant*

## *Summary of Steady State Emissions*

**Controlled Emissions**

| Unit # | Description | $NO_x$ | | CO | | VOC | | $SO_2$ | | TSP | | $PM_{10}$ | | $PM_{2.5}$ | | $H_2S$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| 2 | E. Amine Plnt Acid Gas Flare | 0.085 | 0.37 | 0.39 | 1.7 | 0.027 | 0.12 | 0.0083 | 0.036 | - | - | - | - | - | - | - | - |
| 4A | ESD Flare | 0.23 | 1.0 | 1.0 | 4.6 | 0.17 | 0.76 | 0.023 | 0.099 | - | - | - | - | - | - | - | - |
| 6 | RICE, Clark TLA-6 | 39.3 | | 19.8 | | 3.1 | | 0.010 | | 0.86 | | 0.86 | | 0.86 | | - | |
| 7 | RICE Clark TLA-6 | 39.3 | 566.1 | 19.8 | 283.1 | 3.1 | 60.8 | 0.010 | 0.12 | 0.86 | 10.0 | 0.86 | 10.0 | 0.86 | 10.0 | - | - |
| 8,9,10, or 11 | RICE, Clark HBA-6 | 47.5 | | 23.5 | | 6.5 | | 0.0070 | | 0.57 | | 0.57 | | 0.57 | | - | |
| 28 | Solar T-60 | 3.5 | 15.2 | 3.5 | 15.4 | 2.0 | 8.8 | 0.91 | 4.0 | 1.3 | 5.8 | 1.3 | 5.8 | 1.3 | 5.8 | - | - |
| 29 | Solar T-70-10302 | 11.8 | 51.8 | 9.5 | 41.5 | 0.33 | 1.4 | 0.26 | 1.2 | 0.51 | 2.2 | 0.51 | 2.2 | 0.51 | 2.2 | - | - |
| 30 | Solar T-70-9702S | 11.3 | 49.3 | 9.0 | 39.5 | 0.31 | 1.4 | 0.25 | 1.1 | 0.49 | 2.1 | 0.49 | 2.1 | 0.49 | 2.1 | - | - |
| 31 | Solar T-4700 | 26.0 | 114.0 | 5.0 | 21.6 | 0.35 | 1.5 | 0.13 | 0.55 | 0.24 | 1.1 | 0.24 | 1.1 | 0.24 | 1.1 | - | - |
| 32B | Solar T-4700 | 23.7 | 103.9 | 4.4 | 19.2 | 2.5 | 10.9 | 0.12 | 0.54 | 0.24 | 1.0 | 0.24 | 1.0 | 0.24 | 1.0 | - | - |
| 34 | Regenerative Heater | 1.7 | 7.3 | 1.4 | 6.1 | 0.09 | 0.40 | 0.010 | 0.044 | 0.13 | 0.044 | 0.13 | 0.044 | 0.13 | 0.044 | - | - |
| 36 | Rentech Boiler | 5.5 | 24.2 | 9.3 | 40.7 | 0.61 | 2.7 | 0.066 | 0.29 | 0.84 | 3.7 | 0.84 | 3.7 | 0.84 | 3.7 | - | - |
| 37 | Rentech Boiler | 5.5 | 24.2 | 9.3 | 40.7 | 0.61 | 2.7 | 0.066 | 0.29 | 0.84 | 3.7 | 0.84 | 3.7 | 0.84 | 3.7 | - | - |
| TK-2 | 11.9 bbl gasoline tank | - | - | - | - | 0.16 | 0.70 | - | - | - | - | - | - | - | - | - | - |
| AGI Flare | AGI Flare | 0.085 | 0.37 | 0.39 | 1.7 | 0.027 | 0.12 | 0.0083 | 0.036 | - | - | - | - | - | - | - | - |
| AM-10 | Amine Unit | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DH-10[3] | Glycol Contactor Dehy & Mol Sieve Dehy. | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TK-VRU | 7 condensate tanks VRU controlled | - | - | - | - | 27.5 | 6.0 | - | - | - | - | - | - | - | - | - | - |
| TK-VRUTMP | 7 condensate tanks VRUTMP controlled | - | - | - | - | 24.6 | 5.4 | - | - | - | - | - | - | - | - | - | - |
| CT-1 | South Cooling Tower | - | - | - | - | - | - | - | - | 3.6 | 15.9 | 1.9 | 8.4 | 0.0078 | 0.034 | - | - |
| CT-2 | North Cooling Tower | - | - | - | - | - | - | - | - | 1.2 | 5.1 | 0.61 | 2.7 | 0.0025 | 0.011 | - | - |
| FUG | Fugitive Leaks | - | - | - | - | 17.7 | 77.0 | - | - | - | - | - | - | - | - | 0.11 | 0.48 |
| | | | | | | | | | | | | | | | | | |
| **TOTAL** | | **215.5** | **957.7** | **116.3** | **515.7** | **65.0** | **175.3** | **1.9** | **8.3** | **11.7** | **50.8** | **9.4** | **40.8** | **6.9** | **29.8** | **0.11** | **0.48** |

"*" Denotes hourly emission limits are not applicable for this unit. Any hourly emissions shown for this unit are for informational purposes only.

"-" Denotes emissions of this pollutant are not expected.

[1] warming potential of CH4 is 25 times greater than CO2

[2] warming potential of N2O is 298 times greater than CO2

*DCP Operating Company, LP - Linam Ranch Gas Plant*

## Summary of Steady State Emissions

**Controlled Emissions**

| Unit # | Description | $CO_2e$ | | Formaldehyde | | Acetaldehyde | | Acrolein | | Hexane | | Total HAP | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| 2 | E. Amine Plnt Acid Gas Flare | * | 703.1 | - | - | - | - | - | - | - | - | - | - |
| 4A | ESD Flare | * | 2,476.4 | - | - | - | - | - | - | - | - | - | - |
| 6 | RICE, Clark TLA-6 | * | 10,380.7 | 0.98 | 4.3 | 0.14 | 0.60 | 0.14 | 0.60 | 0.0079 | 0.035 | 1.4 | 6.0 |
| 7 | RICE Clark TLA-6 | * | 10,380.7 | 0.98 | 4.3 | 0.14 | 0.60 | 0.14 | 0.60 | 0.0079 | 0.035 | 1.4 | 6.0 |
| 8,9,10, or 11 | RICE, Clark HBA-6 | * | 6,940.5 | 0.65 | 2.9 | 0.092 | 0.40 | 0.092 | 0.40 | 0.0053 | 0.023 | 0.91 | 4.0 |
| 28 | Solar T-60 | * | 33,753.7 | 0.15 | 0.67 | 0.0025 | 0.011 | 4.1E-04 | 0.0018 | - | - | 0.17 | 0.75 |
| 29 | Solar T-70-10302 | * | 43,558.0 | 0.055 | 0.24 | 0.0031 | 0.014 | 5.0E-04 | 0.0022 | - | - | 0.077 | 0.34 |
| 30 | Solar T-70-9702S | * | 41,489.7 | 0.053 | 0.23 | 0.0030 | 0.013 | 4.7E-04 | 0.0021 | - | - | 0.074 | 0.32 |
| 31 | Solar T-4700 | * | 21,543.2 | 0.026 | 0.11 | 0.0015 | 0.0064 | 2.4E-04 | 0.0010 | - | - | 0.037 | 0.16 |
| 32B | Solar T-4700 | * | 21,196.8 | 0.026 | 0.11 | 0.0015 | 0.0064 | 2.4E-04 | 0.0010 | - | - | 0.037 | 0.16 |
| 34 | Regenerative Heater | * | 8,780.9 | 0.0013 | 0.0055 | - | - | - | - | 0.030 | 0.13 | 0.031 | 0.14 |
| 36 | Rentech Boiler | * | 58,246.8 | 0.0083 | 0.036 | - | - | - | - | 0.20 | 0.87 | 0.21 | 0.91 |
| 37 | Rentech Boiler | * | 58,246.8 | 0.0083 | 0.036 | - | - | - | - | 0.20 | 0.87 | 0.21 | 0.91 |
| TK-2 | 11.9 bbl gasoline tank | - | - | - | - | - | - | - | - | - | - | - | - |
| AGI Flare | AGI Flare | * | 703.1 | - | - | - | - | - | - | - | - | - | - |
| AM-10 | Amine Unit | - | - | - | - | - | - | - | - | - | - | - | - |
| DH-10 | Glycol Contactor Dehy & Mol Sieve Dehy. | - | - | - | - | - | - | - | - | - | - | - | - |
| TK-VRU | 7 condensate tanks VRU controlled | - | - | - | - | - | - | - | - | - | - | - | - |
| TK-VRUTMP | 7 condensate tanks VRUTMP controlled | - | - | - | - | - | - | - | - | - | - | - | - |
| CT-1 | South Cooling Tower | - | - | - | - | - | - | - | - | - | - | - | - |
| CT-2 | North Cooling Tower | - | - | - | - | - | - | - | - | - | - | - | - |
| FUG | Fugitive Leaks | - | 291.8 | - | - | - | - | - | - | 5.1 | 22.5 | 5.2 | 22.6 |
| | | | | | | | | | | | | | |
| **TOTAL** | | **-** | **318,692.1** | **2.9** | **12.9** | **0.38** | **1.7** | **0.37** | **1.6** | **5.6** | **24.5** | **9.6** | **42.2** |

"*" Denotes hourly emission limits are not applicable for this unit. Any hourly emissions shown for this unit are for informational purposes only.

"-" Denotes emissions of this pollutant are not expected.

# GHG Summary Page

Facility: Linam Ranch Gas Plant

**Emission Totals**

| Emission Unit # | Description | $CH_4$[1] tonnes per year | $CH_4$[1] TPY | $CO_2$ tonnes per year | $CO_2$ TPY | $N_2O$[2] tonnes per year | $N_2O$[2] TPY | $CO_2e$ tonnes per year | $CO_2e$ TPY |
|---|---|---|---|---|---|---|---|---|---|
| 2 | Fuel/Residue Gas Combustion | 3.3 | 3.7 | 555 | 611 | 1.1E-03 | 1.2E-03 | 637.8 | 703 |
| 4A | Fuel/Residue Gas Combustion | 11.7 | 12.9 | 1954 | 2,154 | 3.8E-03 | 4.2E-03 | 2246.6 | 2,476 |
| 6 | Natural Gas Combustion | 0.18 | 0.20 | 9407 | 10,370 | 1.8E-02 | 2.0E-02 | 9417.2 | 10,381 |
| 7 | Natural Gas Combustion | 0.18 | 0.20 | 9407 | 10,370 | 1.8E-02 | 2.0E-02 | 9417.2 | 10,381 |
| 8, 9, 10, or 11 | Natural Gas Combustion | 0.12 | 0.13 | 6290 | 6,933 | 1.2E-02 | 1.3E-02 | 6296.3 | 6,941 |
| 28 | Natural Gas Combustion | 0.58 | 0.64 | 30589 | 33,719 | 5.8E-02 | 6.4E-02 | 30620.9 | 33,754 |
| 29 | Natural Gas Combustion | 0.74 | 0.82 | 39474 | 43,513 | 7.4E-02 | 8.2E-02 | 39515.2 | 43,558 |
| 30 | Natural Gas Combustion | 0.71 | 0.78 | 37600 | 41,447 | 7.1E-02 | 7.8E-02 | 37638.8 | 41,490 |
| 31 | Natural Gas Combustion | 0.37 | 0.41 | 19524 | 21,521 | 3.7E-02 | 4.1E-02 | 19543.7 | 21,543 |
| 32B | Natural Gas Combustion | 0.36 | 0.40 | 19210 | 21,175 | 3.6E-02 | 4.0E-02 | 19229.4 | 21,197 |
| 34 | Natural Gas Combustion | 0.15 | 0.17 | 7958 | 8,772 | 1.5E-02 | 1.7E-02 | 7965.9 | 8,781 |
| 36 | Natural Gas Combustion | 1.00 | 1.1 | 52786 | 58,187 | 1.0E-01 | 1.1E-01 | 52840.6 | 58,247 |
| 37 | Natural Gas Combustion | 1.00 | 1.1 | 52786 | 58,187 | 1.0E-01 | 1.1E-01 | 52840.6 | 58,247 |
| AGI Flare | Fuel/Residue Gas Combustion | 3.3 | 3.7 | 555 | 611 | 1.1E-03 | 1.2E-03 | 637.8 | 703 |
| **Total** | | | | | | | | | **318,400** |

1 warming potential of CH4 is 25 times greater than CO2

2 warming potential of N2O is 298 times greater than CO2

# Flare

Emission Unit: 2

Source Description: Amine Flare

**Fuel Gas Composition: Used for Pilot and Purge Fuel**

| Component | MW | Flared Gas[1] Mol% | MW * wet vol % | HHV Btu/scf[2] | Btu/scf * wet vol % | Mass Fraction (wet) | Spec. Volume[2] $ft^3$/lb | Spec. Volume VOC $ft^3$/lb |
|---|---|---|---|---|---|---|---|---|
| Water | 18.02 | 0.000% | 0.00 | 0.0 | 0.0 | 0.00 | 21.06 | |
| Hydrogen Sulfide | 34.08 | 0.000% | 0.00 | 637.02 | 0.0 | 0.00 | 11.136 | |
| Carbon Dioxide | 44.01 | 0.003% | 0.00 | 0.0 | 0.0 | 0.00 | 8.623 | |
| Nitrogen | 28.01 | 2.681% | 0.75 | 0.0 | 0.0 | 0.04 | 13.547 | |
| Oxygen | 32.00 | 0.000% | 0.00 | 0.0 | 0.0 | 0.00 | 13.5 | |
| Methane | 16.04 | 87.057% | 13.97 | 1,010 | 879.0 | 0.78 | 23.65 | |
| Ethane | 30.07 | 9.274% | 2.79 | 1,769 | 164.0 | 0.16 | 12.62 | |
| Propane | 44.10 | 0.959% | 0.42 | 2,517 | 24.1 | 0.02 | 8.606 | 8.306 |
| i-Butane | 58.12 | 0.013% | 0.01 | 3,253 | 0.4 | 0.00 | 6.529 | 0.115 |
| n-Butane | 58.12 | 0.013% | 0.01 | 3,262 | 0.4 | 0.00 | 6.529 | 0.109 |
| i-Pentane | 72.15 | 0.0002% | 0.00 | 3999.7 | 0.0 | 0.00 | 4.26 | 0.001 |
| Pentanes | 72.15 | 0.0001% | 0.00 | 4008.7 | 0.0 | 0.00 | 5.26 | 0.001 |
| Hexanes+ | 86.18 | 0.000% | 0.00 | 4756.1 | 0.0 | 0.00 | 4.404 | 0.000 |
| | | 100% | 17.94 | | 1068.0 | 1.00 | | 8.533 |
| NMNEHC (VOC) | | 0.99% | | | | 2.4% | | |

[1] *Based on Linam Ranch Fuel Gas Analysis dated 1/20/2016*

[2] *Component HHVs based on DCP Gas Analysis; specific volumes obtained from Physical Properties of Hydrocarbons, API Research Project 44, Fig. 16-1, Rev. 1981.*

**Fuel Data**

| | | | | |
|---|---|---|---|---|
| *Flare Pilot* | | | | |
| | 1068 | Btu/scf | Field gas heating value | Pipeline gas HHV, nominal |
| | 500 | scf/hr | Fuel Usage Rate | Engineering judgement |
| | 0.50 | Mscf/hr | Fuel Usage Rate | scf/hr / 1e3 |
| | 0.00050 | MMscf/hr | Fuel Usage Rate | scf/hr / 1e6 |
| | 0.53 | MMBtu/hr | Flare Pilot Heat Input | Gas heat value * Fuel usage rate/1e6 |
| *Purge Gas* | 16 | Mscf/day | per DCP (Jennifer Corser 10/29/13 email) | |
| | 0.67 | Mscf/hr | Mscf/d / 24 hr/day | |
| | 0.00067 | MMscf/hr | Mscf/hr / 1000 | |
| | 1068 | Btu/scf | Pipeline Gas, HHV, nominal from Linam T5 app. | |
| | 0.71 | MMBtu/hr | MMscf/hr * Btu/scf | |
| *Total* | 1.17 | Mscf/hr | Fuel Usage Rate | pilot + purge |
| | 1.2 | MMBtu/hr | Total heat input | pilot + purge |

**Emission Rates**

| ***Flare Pilot & Purge*** | NOx | CO | VOC | SO2 | Units | |
|---|---|---|---|---|---|---|
| | 0.068 | 0.31 | | | lb/MMBtu | AP-42 Table 13.5-1 and 13.5-2, published on April 2015 |
| | | | | 50 | grains sulfur | per Mscf FERC limit |
| | | | 0.99% | | mol% | Fuel Gas |
| | | | 8.53 | | $ft^3$/lb | Specific Volume |
| | 0.085 | 0.39 | 1.3 | | lb/hr | pilot + purge |
| | | | | 0.0083 | lb/hr | 50gr S/Mscf *Mscf/hr*0.00014 lb/gr |
| | | | 98.0% | | | Flare DRE |
| **Requested Emisisons** | **0.085** | **0.39** | **0.027** | **0.0083** | **lb/hr** | **Controlled Emission Rate** |
| | **0.37** | **1.7** | **0.12** | **0.036** | **tpy** | **lb/hr *(8760/2000)** |

**Stack Parameters**

| | | | |
|---|---|---|---|
| 1000 | °C | Exhaust temperature | Per NMAQB guidelines |
| 20 | m/sec | Exhaust velocity | Per NMAQB guidelines |
| 65.6 | ft/s | Exhaust velocity | m/sec * 3.28ft/m |
| 222.0 | ft | Flare height | |
| 17.94 | lb/mol | Field gas molecular weight | See attached |
| 87,223 | cal/sec | Heat release (q) | MMBtu/hr * $10^6$ * 252 cal/Btu ÷ 3600 sec/hr |
| 69,488 | | $q_n$ | $q_n = q(1-0.048(MW)^{1/2})$ |
| 0.26 | m | Effective stack diameter (D) | $D = (10^{-6} q_n)^{1/2}$ |

## Flare GHG Emissions - Unit 2

**§98.233(n) Flare stack GHG emissions.**

**Pilot & Purge Gas**

**Step 1. Calculate contribution of un-combusted $CH_4$ emissions**

$E_{a,CH4}$ (un-combusted) = $V_a$ * (1- η)* $X_{CH4}$ *(Equation W-39B)*

where:

$E_{a,CH4}$ = contribution of annual un-combusted $CH_4$ emissions from regenerator in cubic feet under actual conditions.

$V_a$ = volume of gas sent to combustion unit during the year (cf)

η = Fraction of gas combusted by a burning flare (or regenerator), default value from Subpart W = 0.98

For gas sent to an unlit flare, η is zero.

$X_{CH4}$ = Mole fraction of $CH_4$ in gas to the flare = 0.8706 (Client gas analysis)

**Step 2. Calculate contribution of un-combusted $CO_2$ emissions**

$E_{a,CO2}$ = $V_a$ * $X_{CO2}$ *(Equation W-20)*

where:

$E_{a,CO2}$ = contribution of annual un-combusted $CO_2$ emissions from regenerator in cubic feet under actual conditions.

$V_a$ = volume of gas sent to combustion unit during the year (cf)

$X_{CO2}$ = Mole fraction of $CO_2$ in gas to the flare = 0.00003

**Step 3. Calculate contribution of combusted $CO_2$ emissions**

$E_{a,CO2}$ (combusted) = ∑ (η * $V_a$ * $Y_j$ * $R_j$) *(Equation W-21)*

where:

η = Fraction of gas combusted by a burning flare (or regenerator) = 0.98

For gas sent to an unlit flare, η is zero.

$V_a$ = volume of gas sent to combustion unit during the year (cf)

$Y_j$ = mole fraction of gas hydrocarbon constituents j:

| | | |
|---|---|---|
| Constituent j, Methane = | 0.8706 | (Client gas analysis) |
| Constituent j, Ethane = | 0.0927 | |
| Constituent j, Propane = | 0.0096 | |
| Constituent j, Butane = | 0.00026 | |
| Constituent j, Pentanes Plus = | 0.0000030 | |

$R_j$ = number of carbon atoms in the gas hydrocarbon constituent j:

| | |
|---|---|
| Constituent j, Methane = | 1 |
| Constituent j, Ethane = | 2 |
| Constituent j, Propane = | 3 |
| Constituent j, Butane = | 4 |
| Constituent j, Pentanes Plus = | 5 |

**Step 4. Calculate GHG volumetric emissions at standard conditions (scf).**

$$E_{s,n} = \frac{E_{a,n} * (459.67 + T_s) * P_a}{(459.67 + T_a) * P_s}$$ *(Equation W-33)*

where:

$E_{s,n}$ = GHG i volumetric emissions at standard temperature and pressure (STP) in cubic feet

$E_{a,n}$ = GHG i volumetric emissions at actual conditions (cf)

$T_s$ = Temperature at standard conditions (F) = 60 F

$T_a$ = Temperature at actual conditions (F) = 76 F (Based on Annual Avg Max Temperature for Hobbs, NM from Western Regional Climate Center)

$P_s$ = Absolute pressure at standard conditions (psia) = 14.7 psia

$P_a$ = Absolute pressure at actual conditions (psia) = 14.7 psia (Assumption)

Constant = 459.67 (temperature conversion from F to R)

**Step 5. Calculate annual $CH_4$ and $CO_2$ mass emissions (ton).**

$Mass_{s,i}$ = $E_{s,i}$ * $\rho_i$ * 0.0011023 *(Equation W-36)*

where:

$Mass_{s,i}$ = GHG i ($CO_2$, $CH_4$, or $N_2O$) mass emissions at standard conditions in tons (tpy)

$E_{s,i}$ = GHG i ($CO_2$, $CH_4$, or $N_2O$) volumetric emissions at standard conditions (cf)

$\rho_i$ = Density of GHG i. Use:

$CH_4$: 0.0192 kg/ft$^3$ (at 60F and 14.7 psia)

$CO_2$: 0.0526 kg/ft$^3$ (at 60F and 14.7 psia)

**Step 6. Calculate annual $N_2O$ emissions from portable or stationary fuel combustion sources under actual conditions (cf) using Equation W-40 .**

$Mass_{N2O}$ = 0.0011023 * Fuel * HHV * EF *(Equation W-40)*

where:

$Mass_{N2O}$ = annual $N_2O$ emissions from combustion of a particular type of fuel ( tons ).

Fuel = mass or volume of the fuel combusted

HHV = high heat value of the fuel

Pilot & Purge gas HHV = 1.068E-03 MMBtu/scf

EF = 1.00E-04 kg $N_2O$/MMBtu

$10^{-3}$ = conversion factor from kg to metric tons.

**Step 7. Calculate total annual emission from flare by summing Equations W-40, W-19, W-20, and W-21.**

| Gas Sent to Flare | Gas Sent to Flare (cf/yr) | $CH_4$ Un-Combusted, $E_{a,CH4}$ (cf) | $CO_2$ Un-Combusted, $E_{a,CO2}$ (cf) | $CO_2$ Combusted, $E_{a,CO2}$ (cf) | $CH_4$ Un-Combusted, $E_{a,CH4}$ (scf) | $CO_2$ Un-Combusted, $E_{a,CO2}$ (scf) | $CO_2$ Combusted, $E_{a,CO2}$ (scf) | $CH_4$ Un-Combusted, $E_{a,CH4}$ (tpy) | $CO_2$ Un-Combusted, $E_{a,CO2}$ (tpy) | $CO_2$ Combusted, $E_{a,CO2}$ (tpy) | $N_2O$ Mass Emissions (tpy) | CO2e (tpy) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pilot & Purge | 10,220,000 | 177945 | 307 | 10,875,620 | 172,533 | 297 | 10,544,869 | 3.65 | 0.02 | 611.40 | 0.00120 | 703.1 |

| | $CO_2$ | $CH_4$ | $N_2O$ |
|---|---|---|---|
| GWP | 1 | 25 | 298 |

# Flare

Emission Unit: 4A
Source Description: ESD Flare

**Fuel Gas Composition: Used for Pilot and Purge Fuel**

| Component | MW | Flared Gas[1] Mol% | MW * wet vol % | HHV Btu/scf[2] | Btu/scf * wet vol % | Mass Fraction (wet) | Spec. Volume[2] $ft^3/lb$ | Spec. Volume VOC $ft^3/lb$ |
|---|---|---|---|---|---|---|---|---|
| Water | 18.02 | 0.000% | 0.00 | 0.0 | 0.0 | 0.00 | 21.06 | |
| Hydrogen Sulfide | 34.08 | 0.000% | 0.00 | 637.02 | 0.0 | 0.00 | 11.136 | |
| Carbon Dioxide | 44.01 | 0.003% | 0.00 | 0.0 | 0.0 | 0.00 | 8.623 | |
| Nitrogen | 28.01 | 2.681% | 0.75 | 0.0 | 0.0 | 0.04 | 13.547 | |
| Oxygen | 32.00 | 0.000% | 0.00 | 0.0 | 0.0 | 0.00 | 13.5 | |
| Methane | 16.04 | 87.057% | 13.97 | 1,010 | 879.0 | 0.78 | 23.65 | |
| Ethane | 30.07 | 9.274% | 2.79 | 1,769 | 164.0 | 0.16 | 12.62 | |
| Propane | 44.10 | 0.959% | 0.42 | 2,517 | 24.1 | 0.02 | 8.606 | 8.306 |
| i-Butane | 58.12 | 0.013% | 0.01 | 3,253 | 0.4 | 0.00 | 6.529 | 0.115 |
| n-Butane | 58.12 | 0.013% | 0.01 | 3,262 | 0.4 | 0.00 | 6.529 | 0.109 |
| i-Pentane | 72.15 | 0.0002% | 0.00 | 3999.7 | 0.0 | 0.00 | 4.26 | 0.001 |
| Pentanes | 72.15 | 0.0001% | 0.00 | 4008.7 | 0.0 | 0.00 | 5.26 | 0.001 |
| Hexanes+ | 86.18 | 0.000% | 0.00 | 4756.1 | 0.0 | 0.00 | 4.404 | 0.000 |
| | | 100% | 17.94 | | 1068.0 | 1.00 | | 8.533 |
| NMNEHC (VOC) | | 0.99% | | | | 2.4% | | |

*[1] Based on Linam Ranch Fuel Gas Analysis dated 1/20/2016*
*[2] Component HHVs based on DCP Gas Analysis; specific volumes obtained from Physical Properties of Hydrocarbons, API Research Project 44, Fig. 16-1, Rev. 1981.*

**Fuel Data**

*Flare Pilot*

| | | | |
|---|---|---|---|
| 1068 | Btu/scf | Field gas heating value | Pipeline Natural Gas, nominal |
| 500 | scf/hr | Fuel Usage Rate | Engineering judgement |
| 0.50 | Mscf/hr | Fuel Usage Rate | scf/hr / 1e3 |
| 0.00050 | MMscf/hr | Fuel Usage Rate | scf/hr / 1e6 |
| 0.53 | MMBtu/hr | Flare Pilot Heat Input | Gas heat value * Fuel usage rate/1e6 |

*Purge Gas*

| | | | |
|---|---|---|---|
| 63.8 | Mscf/day | per DCP (Jennifer Corser 10/29/13 email) | |
| 2.7 | Mscf/hr | Mscf/d / 24 hr/day | |
| 0.0027 | MMscf/hr | Mscf/hr / 1000 | |
| 1068 | Btu/scf | Pipeline Gas, HHV, nominal from Linam T5 app. | |
| 2.8 | MMBtu/hr | MMscf/hr * Btu/scf | |

| | | | | |
|---|---|---|---|---|
| *Total Pilot + Purge Gas* | 3.2 | Mscf/hr | Fuel Usage Rate | pilot + purge |
| | 3.4 | MMBtu/hr | Total heat input | pilot + purge |

| | | | |
|---|---|---|---|
| *DH-10* [1] | 130.0 | scf/hr | Condenser Vent Gas Stream from GlyCalc |
| | 821.0 | scf/hr | DH-10 Flash Tank Off Gas stream from GlyCalc |
| | 951.0 | scf/hr | Total DH-10 |
| | 0.95 | Mscf/hr | Total DH-10 |

**Emission Rates**

| *are Pilot + Purge+DH-10* | NOx | CO | VOC | SO2 | Units | |
|---|---|---|---|---|---|---|
| | 0.068 | 0.31 | | | lb/MMBtu | AP-42 Table 13.5-1 and 13.5-2, published on April 2015 |
| | | | | 50 | grains sulfur | per Mscf FERC limit |
| | | | 0.99% | | mol% | Fuel Gas |
| | | | 8.53 | | $ft^3/lb$ | Specific Volume |
| | 0.23 | 1.05 | 3.6 | | lb/hr | pilot + purge |
| | | | 1.6 | | lb/hr | DH-10 Regenerator Emissions from GRI-GLYCalc |
| | | | 3.5 | | lb/hr | DH-10 Flash Tank Off Gas Emissions from GRI-GLYCalc |
| | | | | 0.023 | lb/hr | 50gr S/Mscf *Mscf/hr*0.00014 lb/gr |
| | | | 98.0% | | | Flare DRE |
| **Requested Emisisons** | **0.23** | **1.0** | **0.17** | **0.023** | **lb/hr** | **Controlled Emission Rate** |
| | **1.00** | **4.6** | **0.76** | **0.10** | **tpy** | **lb/hr *(8760/2000),** |

**Stack Parameters**

| | | | |
|---|---|---|---|
| 1000 | °C | Exhaust temperature | Per NMAQB guidelines |
| 20 | m/sec | Exhaust velocity | Per NMAQB guidelines |
| 66 | ft/s | Exhaust velocity | m/sec * 3.28ft/m |
| 175.0 | ft | Flare height | |
| 17.94 | lb/mol | Field gas molecular weight | Attached |
| 236,125 | cal/sec | Heat release (q) | MMBtu/hr * $10^6$ * 252 cal/Btu ÷ 3600 sec/hr |
| 188,113 | | $q_n$ | $q_n = q(1-0.048(MW)^{1/2})$ |
| 0.43 | m | Effective stack diameter (D) | $D = (10^{-6}q_n)^{1/2}$ |

## Flare GHG Emissions - Unit 4A

**§98.233(n) Flare stack GHG emissions.**

**Pilot & Purge Gas**

**Step 1. Calculate contribution of un-combusted $CH_4$ emissions**

$E_{a,CH4}$ (un-combusted) = $V_a$ * (1- η)* $X_{CH4}$ *(Equation W-39B)*

where:

$E_{a,CH4}$ = contribution of annual un-combusted $CH_4$ emissions from regenerator in cubic feet under actual conditions.

$V_a$ = volume of gas sent to combustion unit during the year (cf)

η = Fraction of gas combusted by a burning flare (or regenerator), default value from Subpart W = 0.98

For gas sent to an unlit flare, η is zero.

$X_{CH4}$ = Mole fraction of $CH_4$ in gas to the flare = 0.8706 (Client gas analysis)

**Step 2. Calculate contribution of un-combusted $CO_2$ emissions**

$E_{a,CO2}$ = $V_a$ * $X_{CO2}$ *(Equation W-20)*

where:

$E_{a,CO2}$ = contribution of annual un-combusted $CO_2$ emissions from regenerator in cubic feet under actual conditions.

$V_a$ = volume of gas sent to combustion unit during the year (cf)

$X_{CO2}$ = Mole fraction of $CO_2$ in gas to the flare = 0.00003

**Step 3. Calculate contribution of combusted $CO_2$ emissions**

$E_{a,CO2}$ (combusted) = ∑ (η * $V_a$ * $Y_j$ * $R_j$) *(Equation W-21)*

where:

η = Fraction of gas combusted by a burning flare (or regenerator) = 0.98

For gas sent to an unlit flare, η is zero.

$V_a$ = volume of gas sent to combustion unit during the year (cf)

$Y_j$ = mole fraction of gas hydrocarbon constituents j:

| | | |
|---|---|---|
| Constituent j, Methane = | 0.8706 | (Client gas analysis) |
| Constituent j, Ethane = | 0.0927 | |
| Constituent j, Propane = | 0.0096 | |
| Constituent j, Butane = | 0.00026 | |
| Constituent j, Pentanes Plus = | 0.0000030 | |

$R_j$ = number of carbon atoms in the gas hydrocarbon constituent j:

| | |
|---|---|
| Constituent j, Methane = | 1 |
| Constituent j, Ethane = | 2 |
| Constituent j, Propane = | 3 |
| Constituent j, Butane = | 4 |
| Constituent j, Pentanes Plus = | 5 |

**Step 4. Calculate GHG volumetric emissions at standard conditions (scf).**

$$E_{s,n} = \frac{E_{a,n} * (459.67 + T_s) * P_a}{(459.67 + T_a) * P_s}$$ *(Equation W-33)*

where:

$E_{s,n}$ = GHG i volumetric emissions at standard temperature and pressure (STP) in cubic feet

$E_{a,n}$ = GHG i volumetric emissions at actual conditions (cf)

$T_s$ = Temperature at standard conditions (F) = 60 F

$T_a$ = Temperature at actual conditions (F) = 76 F (Based on Annual Avg Max Temperature for Hobbs, NM from Western Regional Climate Center)

$P_s$ = Absolute pressure at standard conditions (psia) = 14.7 psia

$P_a$ = Absolute pressure at actual conditions (psia) = 14.7 psia (Assumption)

Constant = 459.67 (temperature conversion from F to R)

**Step 5. Calculate annual $CH_4$ and $CO_2$ mass emissions (ton).**

$Mass_{s,i}$ = $E_{s,i}$ * $\rho_i$ * 0.0011023 *(Equation W-36)*

where:

$Mass_{s,i}$ = GHG i ($CO_2$, $CH_4$, or $N_2O$) mass emissions at standard conditions in tons (tpy)

$E_{s,i}$ = GHG i ($CO_2$, $CH_4$, or $N_2O$) volumetric emissions at standard conditions (cf)

$\rho_i$ = Density of GHG i. Use:

$CH_4$: 0.0192 kg/ft$^3$ (at 60F and 14.7 psia)

$CO_2$: 0.0526 kg/ft$^3$ (at 60F and 14.7 psia)

**Step 6. Calculate annual $N_2O$ emissions from portable or stationary fuel combustion sources under actual conditions (cf) using Equation W-40 .**

$Mass_{N2O}$ = 0.0011023 * Fuel * HHV * EF *(Equation W-40)*

where:

$Mass_{N2O}$ = annual $N_2O$ emissions from combustion of a particular type of fuel ( tons ).

Fuel = mass or volume of the fuel combusted

HHV = high heat value of the fuel

Pilot & Purge gas HHV = 1.068E-03 MMBtu/scf

EF = 1.00E-04 kg $N_2O$/MMBtu

$10^{-3}$ = conversion factor from kg to metric tons.

**Step 7. Calculate total annual emission from flare by summing Equations W-40, W-19, W-20, and W-21.**

| Gas Sent to Flare | Gas Sent to Flare (cf/yr) | $CH_4$ Un-Combusted, $E_{a,CH4}$ (cf) | $CO_2$ Un-Combusted, $E_{a,CO2}$ (cf) | $CO_2$ Combusted, $E_{a,CO2}$ (cf) | $CH_4$ Un-Combusted, $E_{a,CH4}$ (scf) | $CO_2$ Un-Combusted, $E_{a,CO2}$ (scf) | $CO_2$ Combusted, $E_{a,CO2}$ (scf) | $CH_4$ Un-Combusted, $E_{a,CH4}$ (tpy) | $CO_2$ Un-Combusted, $E_{a,CO2}$ (tpy) | $CO_2$ Combusted, $E_{a,CO2}$ (tpy) | $N_2O$ Mass Emissions (tpy) | CO2e (tpy) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pilot & Purge | 35,997,760 | 626772 | 1,080 | 38,307,039 | 607,711 | 1,047 | 37,142,040 | 12.86 | 0.06 | 2,153.53 | 0.00424 | 2476.4 |

| | $CO_2$ | $CH_4$ | $N_2O$ |
|---|---|---|---|
| GWP | 1 | 25 | 298 |

# Flare

| | |
|---|---|
| Emission Unit: | AGI Flare |
| Source Description: | East Amine Flare |

**Fuel Gas Composition: Used for Pilot and Purge Fuel**

| **Component** | **MW** | **Flared Gas[1] Mol%** | **MW * wet vol %** | **HHV Btu/scf[2]** | **Btu/scf * wet vol %** | **Mass Fraction (wet)** | **Spec. Volume[2] $ft^3/lb$** | **Spec. Volume VOC $ft^3/lb$** |
|---|---|---|---|---|---|---|---|---|
| Water | 18.02 | 0.000% | 0.00 | 0.0 | 0.0 | 0.00 | 21.06 | |
| Hydrogen Sulfide | 34.08 | 0.000% | 0.00 | 637.02 | 0.0 | 0.00 | 11.136 | |
| Carbon Dioxide | 44.01 | 0.003% | 0.00 | 0.0 | 0.0 | 0.00 | 8.623 | |
| Nitrogen | 28.01 | 2.681% | 0.75 | 0.0 | 0.0 | 0.04 | 13.547 | |
| Oxygen | 32.00 | 0.000% | 0.00 | 0.0 | 0.0 | 0.00 | 13.5 | |
| Methane | 16.04 | 87.057% | 13.97 | 1,010 | 879.0 | 0.78 | 23.65 | |
| Ethane | 30.07 | 9.274% | 2.79 | 1,769 | 164.0 | 0.16 | 12.62 | |
| Propane | 44.10 | 0.959% | 0.42 | 2,517 | 24.1 | 0.02 | 8.606 | 8.306 |
| i-Butane | 58.12 | 0.013% | 0.01 | 3,253 | 0.4 | 0.00 | 6.529 | 0.115 |
| n-Butane | 58.12 | 0.013% | 0.01 | 3,262 | 0.4 | 0.00 | 6.529 | 0.109 |
| i-Pentane | 72.15 | 0.0002% | 0.00 | 3999.7 | 0.0 | 0.00 | 4.26 | 0.001 |
| Pentanes | 72.15 | 0.0001% | 0.00 | 4008.7 | 0.0 | 0.00 | 5.26 | 0.001 |
| Hexanes+ | 86.18 | 0.000% | 0.00 | 4756.1 | 0.0 | 0.00 | 4.404 | 0.000 |
| | | 100% | 17.94 | | 1068.0 | 1.00 | | 8.533 |
| NMNEHC (VOC) | | 0.99% | | | | 2.4% | | |

[1] *Based on Linam Ranch Fuel Gas Analysis dated 1/20/2016*

[2] *Component HHVs based on DCP Gas Analysis; specific volumes obtained from Physical Properties of Hydrocarbons, API Research Project 44, Fig. 16-1, Rev. 1981.*

**Fuel Data**

*Flare Pilot*

| | | | | |
|---|---|---|---|---|
| | 1068 | Btu/scf | Field gas heating value | Pipeline gas HHV, nominal |
| | 500 | scf/hr | Fuel Usage Rate | Engineering judgement |
| | 0.50 | Mscf/hr | Fuel Usage Rate | scf/hr / 1e3 |
| | 0.00050 | MMscf/hr | Fuel Usage Rate | scf/hr / 1e6 |
| | 0.53 | MMBtu/hr | Flare Pilot Heat Input | Gas heat value * Fuel usage rate/1e6 |
| *Purge Gas* | 16 | Mscf/day | per DCP | |
| | 0.67 | Mscf/hr | Mscf/d / 24 hr/day | |
| | 0.00067 | MMscf/hr | Mscf/hr / 1000 | |
| | 1068 | Btu/scf | Pipeline Gas, HHV, nominal from Linam T5 app. | |
| | 0.71 | MMBtu/hr | MMscf/hr * Btu/scf | |
| *Total* | 1.2 | Mscf/hr | Fuel Usage Rate | pilot + purge |
| | 1.2 | MMBtu/hr | Total heat input | pilot + purge |

**Emission Rates**

| *Flare Pilot & Purge* | NOx | CO | VOC | SO2 | Units | |
|---|---|---|---|---|---|---|
| | 0.068 | 0.31 | | | lb/MMBtu | AP-42 Table 13.5-1 and 13.5-2, published on April 2015 |
| | | | | 50 | grains sulfur per Mscf | FERC limit |
| | | | 0.99% | | mol% | Fuel Gas |
| | | | 8.53 | | $ft^3/lb$ | Specific Volume |
| | 0.085 | 0.39 | 1.3 | | lb/hr | pilot + purge |
| | | | | 0.0083 | lb/hr | 50gr S/Mscf *Mscf/hr*0.00014 lb/gr |
| | | | 98.0% | | | Flare DRE |
| **Requested Emisisons** | **0.085** | **0.39** | **0.027** | **0.0083** | **lb/hr** | **Controlled Emission Rate** |
| | **0.37** | **1.7** | **0.12** | **0.036** | **tpy** | **lb/hr *(8760/2000)** |

**Stack Parameters**

| | | | |
|---|---|---|---|
| 1000 | ˚C | Exhaust temperature | Per NMAQB guidelines |
| 20 | m/sec | Exhaust velocity | Per NMAQB guidelines |
| 66 | ft/s | Exhaust velocity | m/sec * 3.28ft/m |
| 222.0 | ft | Flare height | |
| 17.94 | lb/mol | Field gas molecular weight | See attached |
| 87,223 | cal/sec | Heat release (q) | MMBtu/hr * $10^6$ * 252 cal/Btu ÷ 3600 sec/hr |
| 69,488 | | $q_n$ | $q_n = q(1-0.048(MW)^{1/2})$ |
| 0.26 | m | Effective stack diameter (D) | $D = (10^{-6}q_n)^{1/2}$ |

# Flare GHG Emissions - Unit AGI Flare

**§98.233(n) Flare stack GHG emissions.**

**Pilot & Purge Gas**

**Step 1. Calculate contribution of un-combusted $CH_4$ emissions**

$E_{a,CH4}$ (un-combusted) = $V_a$ * (1- η)* $X_{CH4}$ *(Equation W-39B)*

where:

$E_{a,CH4}$ = contribution of annual un-combusted $CH_4$ emissions from regenerator in cubic feet under actual conditions.

$V_a$ = volume of gas sent to combustion unit during the year (cf)

η = Fraction of gas combusted by a burning flare (or regenerator), default value from Subpart W = 0.98

For gas sent to an unlit flare, η is zero.

$X_{CH4}$ = Mole fraction of $CH_4$ in gas to the flare = 0.8706 (Client gas analysis)

**Step 2. Calculate contribution of un-combusted $CO_2$ emissions**

$E_{a,CO2}$ = $V_a$ * $X_{CO2}$ *(Equation W-20)*

where:

$E_{a,CO2}$ = contribution of annual un-combusted $CO_2$ emissions from regenerator in cubic feet under actual conditions.

$V_a$ = volume of gas sent to combustion unit during the year (cf)

$X_{CO2}$ = Mole fraction of $CO_2$ in gas to the flare = 0.00003

**Step 3. Calculate contribution of combusted $CO_2$ emissions**

$E_{a,CO2}$ (combusted) = ∑ (η * $V_a$ * $Y_j$ * $R_j$) *(Equation W-21)*

where:

η = Fraction of gas combusted by a burning flare (or regenerator) = 0.98

For gas sent to an unlit flare, η is zero.

$V_a$ = volume of gas sent to combustion unit during the year (cf)

$Y_j$ = mole fraction of gas hydrocarbon constituents j:

| | | |
|---|---|---|
| Constituent j, Methane = | 0.8706 | (Client gas analysis) |
| Constituent j, Ethane = | 0.0927 | |
| Constituent j, Propane = | 0.0096 | |
| Constituent j, Butane = | 0.00026 | |
| Constituent j, Pentanes Plus = | 0.0000030 | |

$R_j$ = number of carbon atoms in the gas hydrocarbon constituent j:

| | |
|---|---|
| Constituent j, Methane = | 1 |
| Constituent j, Ethane = | 2 |
| Constituent j, Propane = | 3 |
| Constituent j, Butane = | 4 |
| Constituent j, Pentanes Plus = | 5 |

**Step 4. Calculate GHG volumetric emissions at standard conditions (scf).**

$$E_{s,n} = \frac{E_{a,n} * (459.67 + T_s) * P_a}{(459.67 + T_a) * P_s}$$ *(Equation W-33)*

where:

$E_{s,n}$ = GHG i volumetric emissions at standard temperature and pressure (STP) in cubic feet

$E_{a,n}$ = GHG i volumetric emissions at actual conditions (cf)

$T_s$ = Temperature at standard conditions (F) = 60 F

$T_a$ = Temperature at actual conditions (F) = 76 F (Based on Annual Avg Max Temperature for Hobbs, NM from Western Regional Climate Center)

$P_s$ = Absolute pressure at standard conditions (psia) = 14.7 psia

$P_a$ = Absolute pressure at actual conditions (psia) = 14.7 psia (Assumption)

Constant = 459.67 (temperature conversion from F to R)

**Step 5. Calculate annual $CH_4$ and $CO_2$ mass emissions (ton).**

$Mass_{s,i} = E_{s,i} * \rho_i * 0.0011023$ *(Equation W-36)*

where:

$Mass_{s,i}$ = GHG i ($CO_2$, $CH_4$, or $N_2O$) mass emissions at standard conditions in tons (tpy)

$E_{s,i}$ = GHG i ($CO_2$, $CH_4$, or $N_2O$) volumetric emissions at standard conditions (cf)

$\rho_i$ = Density of GHG i. Use:

| | | |
|---|---|---|
| $CH_4$: | 0.0192 | $kg/ft^3$ (at 60F and 14.7 psia) |
| $CO_2$: | 0.0526 | $kg/ft^3$ (at 60F and 14.7 psia) |

**Step 6. Calculate annual $N_2O$ emissions from portable or stationary fuel combustion sources under actual conditions (cf) using Equation W-40 .**

$Mass_{N2O}$ = 0.0011023 * Fuel * HHV * EF *(Equation W-40)*

where:

$Mass_{N2O}$ = annual $N_2O$ emissions from combustion of a particular type of fuel ( tons ).

Fuel = mass or volume of the fuel combusted

HHV = high heat value of the fuel

| | | |
|---|---|---|
| Pilot & Purge gas HHV = | 1.068E-03 | MMBtu/scf |
| EF = | 1.00E-04 | kg $N_2O$/MMBtu |

$10^{-3}$ = conversion factor from kg to metric tons.

**Step 7. Calculate total annual emission from flare by summing Equations W-40, W-19, W-20, and W-21.**

| Gas Sent to Flare | Gas Sent to Flare (cf/yr) | $CH_4$ Un-Combusted, $E_{a,CH4}$ (cf) | $CO_2$ Un-Combusted, $E_{a,CO2}$ (cf) | $CO_2$ Combusted, $E_{a,CO2}$ (cf) | $CH_4$ Un-Combusted, $E_{a,CH4}$ (scf) | $CO_2$ Un-Combusted, $E_{a,CO2}$ (scf) | $CO_2$ Combusted, $E_{a,CO2}$ (scf) | $CH_4$ Un-Combusted, $E_{a,CH4}$ (tpy) | $CO_2$ Un-Combusted, $E_{a,CO2}$ (tpy) | $CO_2$ Combusted, $E_{a,CO2}$ (tpy) | $N_2O$ Mass Emissions (tpy) | CO2e (tpy) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pilot & Purge | 10,220,000 | 177945 | 307 | 10,875,620 | 172,533 | 297 | 10,544,869 | 3.65 | 0.02 | 611.40 | 0.00120 | 703.1 |

| | $CO_2$ | $CH_4$ | $N_2O$ |
|---|---|---|---|
| GWP | 1 | 25 | 298 |

## Engine Scenarios

### Scenario A

**2 TLA Engines (Units 6+7) and 1 HBA Engine (Unit 8, 9, 10, or 11) for 8760 hr/yr**

**Unit 6**
**Operating 8760 hr/yr**

| Pollutant | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) |
|---|---|---|---|
| Nitrogen Oxides | 8760 | 39.28658039 | 172.0752 |
| Carbon Monoxide | 8760 | 19.84170727 | 86.90668 |
| VOC | 8760 | 3.051213651 | 13.36432 |
| Formaldehyde | 8760 | 0.9785856 | 4.286205 |
| Sulfur Dioxide | 8760 | 0.010424064 | 0.045657 |
| PM10 | 8760 | 0.85643968 | 3.751206 |

**Unit 7**
**Operating 8760 hr/yr**

| Pollutant | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) |
|---|---|---|---|
| Nitrogen Oxides | 8760 | 39.28658 | 172.0752221 |
| Carbon Monoxide | 8760 | 19.84171 | 86.90667784 |
| VOC | 8760 | 3.051214 | 13.36431579 |
| Formaldehyde | 8760 | 0.978586 | 4.286204928 |
| Sulfur Dioxide | 8760 | 0.010424 | 0.0456574 |
| PM10 | 8760 | 0.85644 | 3.751205798 |

**Unit 8,9,10 or 11**
**Operating 8760 hr/yr**

| Pollutant | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) |
|---|---|---|---|
| Nitrogen Oxides | 8760 | 47.48561 | 207.987 |
| Carbon Monoxide | 8760 | 23.51935 | 103.0147 |
| VOC | 8760 | 6.452457 | 28.26176 |
| Formaldehyde | 8760 | 0.654414 | 2.866332 |
| PM10 | 8760 | 0.572612 | 2.50804 |
| Sulfur Dioxide | 8760 | 0.006995 | 0.030637 |

**Total Potential Emission Rates for Scenario A**

| Pollutant | (tpy) |
|---|---|
| Nitrogen Oxides | 552.1374369 |
| Carbon Monoxide | 276.8280897 |
| VOC | 54.99039353 |
| Formaldehyde | 11.43874146 |
| Sulfur Dioxide | 0.121951316 |
| PM10 | 10.01045175 |

### Scenario B

**1 TLA Engine (Unit 6 or 7) and 2 HBA Engines (Units 8, 9, 10, or 11) for 3400 hr/yr**
**2 TLA Engines (Unit 6 +7) and 1 HBA Engine (Unit 8, 9, 10, or 11) for 5360 hr/yr**

**Unit 6 or 7**
**Operating 3400 hr/yr**

| Pollutant | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) |
|---|---|---|---|
| Nitrogen Oxides | 8760 | 15.24821613 | 66.78719 |
| Carbon Monoxide | 8760 | 7.70111926 | 33.7309 |
| VOC | 8760 | 1.184261006 | 5.187063 |
| Formaldehyde | 8760 | 0.379816329 | 1.663596 |
| Sulfur Dioxide | 8760 | 0.00404587 | 0.017721 |
| PM10 | 8760 | 0.332408095 | 1.455947 |

**Unit 8,9,10 or 11**
**Operating 3400 hr/yr**

| Pollutant | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) |
|---|---|---|---|
| Nitrogen Oxides | 8760 | 18.43049 | 80.7255451 |
| Carbon Monoxide | 8760 | 9.128513 | 39.98288763 |
| VOC | 8760 | 2.504378 | 10.96917701 |
| Formaldehyde | 8760 | 0.253996 | 1.112503135 |
| PM10 | 8760 | 0.222247 | 0.973440243 |
| Sulfur Dioxide | 8760 | 0.002715 | 0.011890885 |

**Unit 8,9,10 or 11**
**Operating 3400 hr/yr**

| Pollutant | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) |
|---|---|---|---|
| Nitrogen Oxides | 8760 | 18.43049 | 80.72555 |
| Carbon Monoxide | 8760 | 9.128513 | 39.98289 |
| VOC | 8760 | 2.504378 | 10.96918 |
| Formaldehyde | 8760 | 0.253996 | 1.112503 |
| PM10 | 8760 | 0.222247 | 0.97344 |
| Sulfur Dioxide | 8760 | 0.002715 | 0.011891 |

**Unit 6**
**Operating 5360 hr/yr**

| Pollutant | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) |
|---|---|---|---|
| Nitrogen Oxides | 8760 | 24.03836426 | 105.288 |
| Carbon Monoxide | 8760 | 12.14058801 | 53.17578 |
| VOC | 8760 | 1.866952645 | 8.177253 |
| Formaldehyde | 8760 | 0.598769271 | 2.622609 |
| Sulfur Dioxide | 8760 | 0.006378194 | 0.027936 |
| PM10 | 8760 | 0.524031585 | 2.295258 |

**Unit 7**
**Operating 5360 hr/yr**

| Pollutant | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) |
|---|---|---|---|
| Nitrogen Oxides | 8760 | 24.03836 | 105.2880355 |
| Carbon Monoxide | 8760 | 12.14059 | 53.17577548 |
| VOC | 8760 | 1.866953 | 8.177252585 |
| Formaldehyde | 8760 | 0.598769 | 2.622609408 |
| Sulfur Dioxide | 8760 | 0.006378 | 0.027936492 |
| PM10 | 8760 | 0.524032 | 2.295258342 |

**Unit 8,9,10 or 11**
**Operating 5360 hr/yr**

| Pollutant | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) |
|---|---|---|---|
| Nitrogen Oxides | 8760 | 29.05513 | 127.2614 |
| Carbon Monoxide | 8760 | 14.39083 | 63.03185 |
| VOC | 8760 | 3.948079 | 17.29258 |
| Formaldehyde | 8760 | 0.400417 | 1.753828 |
| PM10 | 8760 | 0.350365 | 1.5346 |
| Sulfur Dioxide | 8760 | 0.00428 | 0.018746 |

**Total Potential Emission Rates for Scenario B**

| Pollutant | (tpy) |
|---|---|
| Nitrogen Oxides | 566.0757953 |
| Carbon Monoxide | 283.080075 |
| VOC | 60.77250733 |
| Formaldehyde | 10.88764908 |
| Sulfur Dioxide | 0.116121292 |
| PM10 | 9.52794454 |

## Emissions Calculation: ENGINE

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 6 | Model: | Clark TLA-6 |
| Name 2: | Clark T1 | Serial Number: | 73779 |
| Name 3: | #5TLA | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Horsepower (bhp): | 2000 |
| Status: | Active | Heat Rate (MMBtu/hr): | 17.73 |
| Service Type: | Other | Rotations per Minute (rpm): | 300 |
| Configuration: | 2-Cycle, Lean Burn | Fuel Consumption (btu/hp-hr): | 8864 |
| Fuel Type: | Residue | Fuel Heat Value (btu/scf): | 900 |
| Oil Type: | Unknown | Oil Usage (gal/month): | 30 |
| Compression Ratio: | | Cylinders: | |
| Ignition Timing: | | Potential fuel usage (MMscf/yr): | 172.55 |
| Operating Range (%): | | Potential fuel usage (Mscf/hr): | 19.70 |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 6 | Height (ft): | 74 |
| Stack Number: | 1 | Diameter (ft): | 1.75 |
| Emission Percent: | 100.00% | Temperature ($^oF$): | 750 |
| Stack Angle ($^o$): | 0 | Flow (ACFM): | 19100 |
| Raincap: | No | Velocity (ft/s): | 132.3 |

**Control Model**

**Emission Controls:**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor | | Nominal Rating | Hrs of Operation | Estimated Emissions | | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| | EF | Units | (hp) | (hrs/yr) | (lb/hr) | (tpy) | |
| Nitrogen Oxides | 8.91 | g/hp-hr | 2000 | 8760 | 39.287 | 172.075 | Other |
| Carbon Monoxide | 4.50 | g/hp-hr | 2000 | 8760 | 19.842 | 86.907 | Other |
| VOC | 0.692 | g/hp-hr | 2000 | 8760 | 3.051 | 13.364 | Other |
| Formaldehyde | 0.0552 | lb/mmBtu | 2000 | 8760 | 0.979 | 4.286 | AP42 |
| Sulfur Dioxide | 0.000588 | lb/mmBtu | 2000 | 8760 | 0.010 | 0.046 | AP42 |
| PM10 | 0.04831 | lb/mmBtu | 2000 | 8760 | 0.856 | 3.751 | AP42 |

## Emissions Calculation: ENGINE

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 7 | Model: | Clark TLA-6 |
| Name 2: | Clark T2 | Serial Number: | 73780 |
| Name 3: | #6TLA | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Horsepower (bhp): | 2000 |
| Status: | Active | Heat Rate (MMBtu/hr): | 17.73 |
| Service Type: | Other | Rotations per Minute (rpm): | 300 |
| Configuration: | 2-Cycle, Lean Burn | Fuel Consumption (btu/hp-hr): | 8864 |
| Fuel Type: | Residue | Fuel Heat Value (btu/scf): | 900 |
| Oil Type: | Unknown | Oil Usage (gal/month): | 30 |
| Compression Ratio: | | Cylinders: | |
| Ignition Timing: | | Potential fuel usage (MMscf/yr): | 172.55 |
| Operating Range (%): | | Potential fuel usage (Mscf/hr): | 19.70 |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 7 | Height (ft): | 74 |
| Stack Number: | 1 | Diameter (ft): | 1.75 |
| Emission Percent: | 100.00% | Temperature ($^{o}$F): | 750 |
| Stack Angle ($^{o}$): | 0 | Flow (ACFM): | 19100 |
| Raincap: | No | Velocity (ft/s): | 132.3 |

**Control Model**

**Emission Controls:**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor | | Nominal Rating | Hrs of Operation | Estimated Emissions | | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| | EF | Units | (hp) | (hrs/yr) | (lb/hr) | (tpy) | |
| Nitrogen Oxides | 8.91 | g/hp-hr | 2000 | 8760 | 39.29 | 172.08 | Other |
| Carbon Monoxide | 4.50 | g/hp-hr | 2000 | 8760 | 19.84 | 86.91 | Other |
| VOC | 0.692 | g/hp-hr | 2000 | 8760 | 3.05 | 13.36 | Other |
| Formaldehyde | 0.0552 | lb/mmBtu | 2000 | 8760 | 0.98 | 4.29 | AP42 |
| Sulfur Dioxide | 0.000588 | lb/mmBtu | 2000 | 8760 | 0.01 | 0.05 | AP42 |
| PM10 | 0.04831 | lb/mmBtu | 2000 | 8760 | 0.86 | 3.75 | AP42 |

# Engine GHG Calculation

## 40 CFR 98 Subpart C TIER 1

Emission unit(s): Units 6 and 7
Source description: 2000 HP RICE
Manufacturer: Clark
Maximum fuel usage: 172.6 MMscf/yr

### $CO_2$ Calculation[1] (Eq C-1)

Click here to view Table C-1 to Subpart C of Part 98.

$$CO_2 = 1 \times 10^{-3} \times \frac{172.60 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{53 \text{ kg CO2}}{\text{MMbtu}}$$

**$CO_2$ = 9407 tonnes $CO_2$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $CH_4$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$CH_4 = 1 \times 10^{-3} \times \frac{172.60 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-3} \text{ kg } CH_4}{\text{MMbtu}}$$

**$CH_4$ = 1.8E-01 tonnes $CH_4$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $N_2O$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$N_2O = 1 \times 10^{-3} \times \frac{172.60 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-4} \text{ kg } N_2O}{\text{MMbtu}}$$

**$N_2O$ = 1.8E-02 tonnes $N_2O$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

Notes:

1 $$CO_2 = 1 \, x \, 10^{-3} * Fuel * HHV * EF$$

2 $$CH_4 \text{ or } N_2O = 1 \, x \, 10^{-3} * Fuel * HHV * EF \quad \text{(Eq. C-8)}$$

Where:
$CH_4$ or $N_2O$ = Annual $CH_4$ or $N_2O$ emissions from the combustion of a particular type of fuel (metric tons).
Fuel = Mass or volume of the fuel combusted, either from company records or directly measured by a fuel flow meter, as applicable (mass or volume per year).
HHV = Default high heat value of the fuel from Table C–1 of this subpart (mmBtu per mass or volume).
EF = Fuel-specific default emission factor for $CH_4$ or $N_2O$, from Table C–2 of this subpart (kg $CH_4$ or $N_2O$ per mmBtu).
$1 \times 10^{-3}$ = Conversion factor from kilograms to metric tons.

## Emissions Calculation: ENGINE

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 8 | Model: | Clark HBA-6 |
| Name 2: | Clark H1 | Serial Number: | 36288 |
| Name 3: | #1HBA | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DCP owned | Horsepower (bhp): | 1267 |
| Status: | Active | Heat Rate (MMBtu/hr): | 11.86 |
| Service Type: | Inlet/Wet Gas | Rotations per Minute (rpm): | 300 |
| Configuration: | 2-Cycle, Lean Burn | Fuel Consumption (btu/hp-hr): | 9357 |
| Fuel Type: | Residue | Fuel Heat Value (btu/scf): | 900 |
| Oil Type: | Unknown | Oil Usage (gal/month): | 30 |
| Compression Ratio: | | Cylinders: | |
| Ignition Timing: | | Potential fuel usage (MMscf/yr): | 115.39 |
| Operating Range (%): | | | |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 8 | Height (ft): | 75 |
| Stack Number: | 1 | Diameter (ft): | 1.5 |
| Emission Percent: | 100.00% | Temperature ($^oF$): | 650 |
| Stack Angle ($^o$): | 0 | Flow (ACFM): | 13000 |
| Raincap: | No | Velocity (ft/s): | 122.6 |

**Emission Controls:** **Control Model**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor | | Nominal Rating | Hrs of Operation | Estimated Emissions | | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| | EF | Units | (hp) | (hrs/yr) | (lb/hr) | (tpy) | |
| Nitrogen Oxides | 17 | g/hp-hr | 1267 | 8760 | 47.49 | 207.99 | Manufacturer Data |
| Carbon Monoxide | 8.42 | g/hp-hr | 1267 | 8760 | 23.52 | 103.01 | Manufacturer Data |
| VOC | 2.31 | g/hp-hr | 1267 | 8760 | 6.45 | 28.26 | Manufacturer Data |
| Formaldehyde | 0.0552 | lb/mmBTU | 1267 | 8760 | 0.65 | 2.87 | AP42 |
| PM10 | 0.0483 | lb/mmBTU | 1267 | 8760 | 0.57 | 2.51 | AP42 |
| Sulfur Dioxide | 0.00059 | lb/mmBTU | 1267 | 8760 | 0.01 | 0.03 | Manufacturer Data |

## Emissions Calculation: ENGINE

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 9 | Model: | Clark HBA-6 |
| Name 2: | Clark H2 | Serial Number: | 736290 |
| Name 3: | #2HBA | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DCP owned | Horsepower (bhp): | 1267 |
| Status: | Active | Heat Rate (MMBtu/hr): | 11.86 |
| Service Type: | Inlet/Wet Gas | Rotations per Minute (rpm): | 300 |
| Configuration: | 2-Cycle, Lean Burn | Fuel Consumption (btu/hp-hr): | 9357 |
| Fuel Type: | Residue | Fuel Heat Value (btu/scf): | 1019 |
| Oil Type: | Unknown | Oil Usage (gal/month): | 30 |
| Compression Ratio: | | Cylinders: | |
| Ignition Timing: | | Potential fuel usage (MMscf/yr): | 101.92 |
| Operating Range (%): | | | |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 9 | Height (ft): | 75 |
| Stack Number: | 1 | Diameter (ft): | 1.5 |
| Emission Percent: | 100.00% | Temperature ($^oF$): | 650 |
| Stack Angle ($^o$): | 0 | Flow (ACFM): | 13000 |
| Raincap: | No | Velocity (ft/s): | 122.6 |

**Control Model**

**Emission Controls:**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor EF | Units | Nominal Rating (hp) | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| Nitrogen Oxides | 17 | g/hp-hr | 1267 | 8760 | 47.49 | 207.99 | Manufacturer Data |
| Carbon Monoxide | 8.42 | g/hp-hr | 1267 | 8760 | 23.52 | 103.01 | Manufacturer Data |
| VOC | 2.31 | g/hp-hr | 1267 | 8760 | 6.45 | 28.26 | Manufacturer Data |
| Formaldehyde | 0.0552 | lb/mmBTU | 1267 | 8760 | 0.65 | 2.87 | AP42 |
| PM10 | 0.0483 | lb/mmBTU | 1267 | 8760 | 0.57 | 2.51 | AP42 |
| Sulfur Dioxide | 0.00059 | lb/mmBTU | 1267 | 8760 | 0.01 | 0.03 | Manufacturer Data |

## Emissions Calculation: ENGINE

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 10 | Model: | Clark HBA-6 |
| Name 2: | Clark H3 | Serial Number: | 36289 |
| Name 3: | #3HBA | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Horsepower (bhp): | 1267 |
| Status: | Active | Heat Rate (MMBtu/hr): | 11.86 |
| Service Type: | Other | Rotations per Minute (rpm): | 300 |
| Configuration: | 2-Cycle, Lean Burn | Fuel Consumption (btu/hp-hr): | 9357 |
| Fuel Type: | Residue | Fuel Heat Value (btu/scf): | 900 |
| Oil Type: | Unknown | Oil Usage (gal/month): | 30 |
| Compression Ratio: | | Cylinders: | |
| Ignition Timing: | | Potential fuel usage (MMscf/yr): | 115.39 |
| Operating Range (%): | | Potential fuel usage (Mscf/hr): | 13.17 |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 10 | Height (ft): | 74 |
| Stack Number: | 1 | Diameter (ft): | 1.5 |
| Emission Percent: | 100.00% | Temperature ($^{o}$F): | 650 |
| Stack Angle ($^{o}$): | 0 | Flow (ACFM): | 12950 |
| Raincap: | No | Velocity (ft/s): | 122.1 |

**Emission Controls:** **Control Model**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor | | Nominal Rating | Hrs of Operation | Estimated Emissions | | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| | EF | Units | (hp) | (hrs/yr) | (lb/hr) | (tpy) | |
| Nitrogen Oxides | 17 | g/hp-hr | 1267 | 8760 | 47.49 | 208.0 | Other |
| Carbon Monoxide | 8.42 | g/hp-hr | 1267 | 8760 | 23.52 | 103.00 | Other |
| VOC | 2.31 | g/hp-hr | 1267 | 8760 | 6.45 | 28.26 | Other |
| Formaldehyde | 0.0552 | lb/mmBtu | 1267 | 8760 | 0.65 | 2.8663 | AP42 |
| Sulfur Dioxide | 0.000588 | lb/mmBtu | 1267 | 8760 | 0.01 | 0.03 | AP42 |
| PM10 | 0.04831 | lb/mmBtu | 1267 | 8760 | 0.57 | 2.51 | AP42 |

## Emissions Calculation: ENGINE

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

### Equipment Information

| | | | |
|---|---|---|---|
| Source ID Number: | 11 | Model: | Clark HBA-6 |
| Name 2: | Clark H4 | Serial Number: | 36303 |
| Name 3: | #4HBA | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Horsepower (bhp): | 1267 |
| Status: | Active | Heat Rate (MMBtu/hr): | 11.86 |
| Service Type: | Other | Rotations per Minute (rpm): | 300 |
| Configuration: | 2-Cycle, Lean Burn | Fuel Consumption (btu/hp-hr): | 9357 |
| Fuel Type: | Residue | Fuel Heat Value (btu/scf): | 900 |
| Oil Type: | Unknown | Oil Usage (gal/month): | 30 |
| Compression Ratio: | | Cylinders: | |
| Ignition Timing: | | Potential fuel usage (MMscf/yr): | 115.39 |
| Operating Range (%): | | Potential fuel usage (Mscf/hr): | 13.17 |

### Stack Parameters

| | | | |
|---|---|---|---|
| Stack Name: | 11 | Height (ft): | 74 |
| Stack Number: | 1 | Diameter (ft): | 1.5 |
| Emission Percent: | 100.00% | Temperature ($^oF$): | 650 |
| Stack Angle ($^o$): | 0 | Flow (ACFM): | 12950 |
| Raincap: | No | Velocity (ft/s): | 122.1 |

**Control Model**

**Emission Controls:**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor | | Nominal Rating | Hrs of Operation | Estimated Emissions | | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| | EF | Units | (hp) | (hrs/yr) | (lb/hr) | (tpy) | |
| Nitrogen Oxides | 17 | g/hp-hr | 1267 | 8760 | 47.49 | 207.99 | Other |
| Carbon Monoxide | 8.42 | g/hp-hr | 1267 | 8760 | 23.52 | 103.01 | Other |
| VOC | 2.31 | g/hp-hr | 1267 | 8760 | 6.45 | 28.26 | Other |
| Formaldehyde | 0.0552 | lb/mmBtu | 1267 | 8760 | 0.65 | 2.87 | AP42 |
| Sulfur Dioxide | 0.000588 | lb/mmBtu | 1267 | 8760 | 0.01 | 0.03 | AP42 |
| PM10 | 0.04831 | lb/mmBtu | 1267 | 8760 | 0.57 | 2.51 | AP42 |

# Furnace GHG Calculation

## 40 CFR 98 Subpart C TIER 1

Emission unit(s): 8, 9, 10, or 11
Source description: 1267 HP RICE
Manufacturer: Clark
Maximum fuel usage: 115.4 MMscf/yr

### $CO_2$ Calculation[1] (Eq C-1)

Click here to view Table C-1 to Subpart C of Part 98.

$$CO_2 = 1 \times 10^{-3} \times \frac{115.40\ \text{MMscf}}{\text{yr}} \times \frac{1028\ \text{MMbtu}}{\text{MMscf}} \times \frac{53.02\ \text{kg CO2}}{\text{MMbtu}}$$

**$CO_2$ = 6290 tonnes $CO_2$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $CH_4$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$CH_4 = 1 \times 10^{-3} \times \frac{115.40\ \text{MMscf}}{\text{yr}} \times \frac{1028\ \text{MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-3}\ \text{kg}\ CH_4}{\text{MMbtu}}$$

**$CH_4$ = 1.2E-01 tonnes $CH_4$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $N_2O$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$N_2O = 1 \times 10^{-3} \times \frac{115.40\ \text{MMscf}}{\text{yr}} \times \frac{1028\ \text{MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-4}\ \text{kg}\ N_2O}{\text{MMbtu}}$$

**$N_2O$ = 1.2E-02 tonnes $N_2O$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

Notes:

1 $$CO_2 = 1 x 10^{-3} * Fuel * HHV * EF$$

2 $$CH_4\ or\ N_2O = 1 x 10^{-3} * Fuel * HHV * EF \qquad \text{(Eq. C-8)}$$

Where:
$CH_4$ or $N_2O$ = Annual $CH_4$ or $N_2O$ emissions from the combustion of a particular type of fuel (metric tons).
Fuel = Mass or volume of the fuel combusted, either from company records or directly measured by a fuel flow meter, as applicable (mass or volume per year).
HHV = Default high heat value of the fuel from Table C–1 of this subpart (mmBtu per mass or volume).
EF = Fuel-specific default emission factor for $CH_4$ or $N_2O$, from Table C–2 of this subpart (kg $CH_4$ or $N_2O$ per mmBtu).
$1 \times 10^{-3}$ = Conversion factor from kilograms to metric tons.

# Turbine

| | |
|---|---|
| Emission Unit: | 28 |
| Source Description: | Natural gas fueled turbine |
| Manufacturer: | Solar |
| Model: | T60-7800S |

| | | | |
|---|---|---|---|
| Fuel heat value | 900 | Btu/scf | LHV heat content of fuel gas |
| Heat rate | 57.66 | MMbtu/hr | Manufacturer's data (LHV) |
| | 63.43 | MMbtu/hr | Manufacturer's data (HHV) |
| Fuel consumption: | 64.1 | Mscf/hr | Manufacturer's heat rate / fuel heat value |
| Annual fuel usage: | 561.2 | MMscf/yr | Manufacturer's heat rate / fuel heat value * 8760 hrs |

**Emission Calculations**

*Uncontrolled Emissions*

| NOx | CO | VOC[1] | $SO_2$[2] | PM | | |
|---|---|---|---|---|---|---|
| 3.47 | 3.52 | 2.01 | | | lb/hr | Mfg Data; full load @ 0 degrees F |
| | | | 0.915 | | lb/hr | Note 1 |
| | | | | 0.021 | lb/MMBtu | Mfr rec'd emission factor (HHV basis) |
| 3.470 | 3.520 | 2.014 | 0.915 | 1.332 | lb/hr | Hourly emission rate |
| 15.199 | 15.418 | 8.821 | 4.007 | 5.834 | tpy | Annual emission rate (8760 hrs/yr) |

*Notes*

[1] VOC emissions set equal to unburned hydrocarbon (UHC) emissions

[2] $SO_2$ emissions based on fuel sulfur content of 50 gr S/Mscf, or 0.00714 lb S/Mscf
0.007146 lb S/Mscf * fuel consumption (Mscf/hr) * 64 lb $SO_2$/32 lb S = lb/hr $SO_2$

**Exhaust Parameters**

| | | | |
|---|---|---|---|
| Exhaust temp (Tstk): | 890 | °F | Manufacturer data |
| Stack height: | 35.78 | ft | Design |
| Stack diameter: | 3.83 | ft | Design |
| Exhaust flow: | 163,305 | lb/hr | Manufacturer data |
| | 28.58 | MW; nominal exhaust for natural gas combustion | |
| | 3610 | ft MSL | Site Elevation |
| | 12.88 | psia | Pressure at Elevation |
| | 1784.9 | acfs; Ideal gas law, nominal MW and stack | |
| Exhaust velocity: | 154.7 | ft/sec | Exhaust flow ÷ stack area |

# Engine GHG Calculation

## 40 CFR 98 Subpart C TIER 1

Emission unit(s): 28
Source description: Turbine
Manufacturer: Solar
Maximum fuel usage: 561.2 MMscf/yr

### $CO_2$ Calculation[1] (Eq C-1)

Click here to view Table C-1 to Subpart C of Part 98.

$$CO_2 = 1 \times 10^{-3} \times \frac{561.22 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{53.02 \text{ kg CO2}}{\text{MMbtu}}$$

**$CO_2$ = 30589 tonnes $CO_2$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $CH_4$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$CH_4 = 1 \times 10^{-3} \times \frac{561.22 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-3} \text{ kg } CH_4}{\text{MMbtu}}$$

**$CH_4$ = 5.8E-01 tonnes $CH_4$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $N_2O$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$N_2O = 1 \times 10^{-3} \times \frac{561.22 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-4} \text{ kg } N_2O}{\text{MMbtu}}$$

**$N_2O$ = 5.8E-02 tonnes $N_2O$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

Notes:

1 $$CO_2 = 1 x 10^{-3} * Fuel * HHV * EF$$

2 $$CH_4 \text{ or } N_2O = 1 x 10^{-3} * Fuel * HHV * EF \qquad \text{(Eq. C-8)}$$

Where:
$CH_4$ or $N_2O$ = Annual $CH_4$ or $N_2O$ emissions from the combustion of a particular type of fuel (metric tons).
Fuel = Mass or volume of the fuel combusted, either from company records or directly measured by a fuel flow meter, as applicable (mass or volume per year).
HHV = Default high heat value of the fuel from Table C–1 of this subpart (mmBtu per mass or volume).
EF = Fuel-specific default emission factor for $CH_4$ or $N_2O$, from Table C–2 of this subpart (kg $CH_4$ or $N_2O$ per mmBtu).
$1 \times 10^{-3}$ = Conversion factor from kilograms to metric tons.

## Emissions Calculation: TURBINE

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 29 | Model: | Solar Taurus 70-10302S |
| Name 2: | Turbine 1 | Serial Number: | 0021B |
| Name 3: | Inlet | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Turbine HP (hp): | 10702 |
| Status: | Active | Fuel Heat Value (btu/scf): | 939 |
| Fuel Type: | Other | Heat Rate (MMBtu/hr): | 77.63 |
| Service Type: | Other | Oil Usage (gal/month): | 30 |
| Cycle Type: | Other | | |
| Oil Type: | Unknown | Potential fuel usage (MMscf/yr) | 724.24 |
| | | Potential fuel usage (Mscf/hr): | 82.68 |
| | | Heat Rate (BTU/bhp-hr) | 7254 |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 29 | Height (ft): | 44 |
| Stack Number: | 1 | Diameter (ft): | 4 |
| Emission Percent: | 100.00% | Temperature ($^oF$): | 858 |
| Stack Angle ($^o$): | 0 | Flow (ACFM): | 117844 |
| Raincap: | No | Velocity (ft/s): | 156.3 |
| | | Exh Flow (lbm/hr): | 216169 |

**Control Model** 119609.8833 (ACFM=lb/hr*(T+460)/2382)

**Emission Controls:**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor EF | Units | Nominal Rating (hp) | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| Nitrogen Oxides | 11.82 | lb/hr | 10702 | 8760 | 11.823 | 51.785 | Manufacturer Data |
| Carbon Monoxide | 9.47 | lb/hr | 10702 | 8760 | 9.470 | 41.479 | Manufacturer Data |
| VOC | 0.33 | lb/hr | 10702 | 8760 | 0.325 | 1.424 | Manufacturer Data |
| Formaldehyde | 0.00071 | lb/mmBtu | 10702 | 8760 | 0.055 | 0.241 | AP42 |
| Sulfur Dioxide | 0.0034 | lb/mmBtu | 10702 | 8760 | 0.264 | 1.156 | AP42 |
| PM10 | 0.0066 | lb/mmBtu | 10702 | 8760 | 0.512 | 2.244 | AP42 |

# Engine GHG Calculation

## 40 CFR 98 Subpart C TIER 1

Emission unit(s): 29
Source description: Turbine
Manufacturer: Solar
Maximum fuel usage: 724.24 MMscf/yr

### $CO_2$ Calculation[1] (Eq C-1)

Click here to view Table C-1 to Subpart C of Part 98.

$$CO_2 = 1 \times 10^{-3} \times \frac{724.24 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{53.02 \text{ kg CO2}}{\text{MMbtu}}$$

**$CO_2$ = 39474 tonnes $CO_2$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $CH_4$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$CH_4 = 1 \times 10^{-3} \times \frac{724.24 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-3} \text{ kg } CH_4}{\text{MMbtu}}$$

**$CH_4$ = 7.4E-01 tonnes $CH_4$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $N_2O$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$N_2O = 1 \times 10^{-3} \times \frac{724.24 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-4} \text{ kg } N_2O}{\text{MMbtu}}$$

**$N_2O$ = 7.4E-02 tonnes $N_2O$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

Notes:

1 $CO_2 = 1 x 10^{-3} * Fuel * HHV * EF$

2 $CH_4 \text{ or } N_2O = 1 x 10^{-3} * Fuel * HHV * EF$ (Eq. C-8)

Where:
$CH_4$ or $N_2O$ = Annual $CH_4$ or $N_2O$ emissions from the combustion of a particular type of fuel (metric tons).
Fuel = Mass or volume of the fuel combusted, either from company records or directly measured by a fuel flow meter, as applicable (mass or volume per year).
HHV = Default high heat value of the fuel from Table C–1 of this subpart (mmBtu per mass or volume).
EF = Fuel-specific default emission factor for $CH_4$ or $N_2O$, from Table C–2 of this subpart (kg $CH_4$ or $N_2O$ per mmBtu).
$1 \times 10^{-3}$ = Conversion factor from kilograms to metric tons.

## Emissions Calculation: TURBINE

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 30 | Model: | Solar Taurus 70-9702S |
| Name 2: | Solar Taurus 70 | Serial Number: | 0146B |
| Name 3: | Residue | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Turbine HP (hp): | 9990 |
| Status: | Active | Fuel Heat Value (btu/scf): | 939 |
| Fuel Type: | Other | Heat Rate (MMBtu/hr): | 73.95 |
| Service Type: | Other | Oil Usage (gal/month): | 30 |
| Cycle Type: | Other | | |
| Oil Type: | Unknown | Potential fuel usage (MMscf/yr) | 689.85 |
| | | Potential fuel usage (Mscf/hr): | 78.75 |
| | | Heat Rate (BTU/bhp-hr) | 7402 |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 30 | Height (ft): | 44 |
| Stack Number: | 1 | Diameter (ft): | 6 |
| Emission Percent: | 100.00% | Temperature ($^oF$): | 826 |
| Stack Angle ($^o$): | 0 | Flow (ACFM): | 114983 |
| Raincap: | No | Velocity (ft/s): | 67.8 |
| | | Exh Flow (lbm/hr): | 216169 |

**Control Model**

**Emission Controls:**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor | | Nominal Rating | Hrs of Operation | Estimated Emissions | | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| | EF | Units | (hp) | (hrs/yr) | (lb/hr) | (tpy) | |
| Nitrogen Oxides | 11.26 | lb/hr | 9990 | 8760 | 11.3 | 49.32 | Manufacturer Data |
| Carbon Monoxide | 9.02 | lb/hr | 9990 | 8760 | 9.02 | 39.51 | Manufacturer Data |
| VOC | 0.31 | lb/hr | 9990 | 8760 | 0.31 | 1.36 | Manufacturer Data |
| Formaldehyde | 0.00071 | lb/mmBtu | 9990 | 8760 | 0.05 | 0.23 | AP42 |
| Sulfur Dioxide | 0.0034 | lb/mmBtu | 9990 | 8760 | 0.25 | 1.10 | AP42 |
| PM10 | 0.0066 | lb/mmBtu | 9990 | 8760 | 0.49 | 2.14 | AP42 |

*DCP Operating Company, LP - Linam Ranch Gas Plant*

# Engine GHG Calculation

## 40 CFR 98 Subpart C TIER 1

Emission unit(s): 30
Source description: Turbine
Manufacturer: Solar
Maximum fuel usage: 689.85 MMscf/yr

### $CO_2$ Calculation[1] (Eq C-1)

Click here to view Table C-1 to Subpart C of Part 98.

$$CO_2 = 1 \times 10^{-3} \times \frac{689.85 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{53.02 \text{ kg CO2}}{\text{MMbtu}}$$

**$CO_2$ = 37600 tonnes $CO_2$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $CH_4$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$CH_4 = 1 \times 10^{-3} \times \frac{689.85 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-3} \text{ kg } CH_4}{\text{MMbtu}}$$

**$CH_4$ = 7.1E-01 tonnes $CH_4$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $N_2O$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$N_2O = 1 \times 10^{-3} \times \frac{689.85 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-4} \text{ kg } N_2O}{\text{MMbtu}}$$

**$N_2O$ = 7.1E-02 tonnes $N_2O$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

Notes:

1 $$CO_2 = 1 x 10^{-3} * Fuel * HHV * EF$$

2 $$CH_4 \text{ or } N_2O = 1 x 10^{-3} * Fuel * HHV * EF \quad \text{(Eq. C-8)}$$

Where:
$CH_4$ or $N_2O$ = Annual $CH_4$ or $N_2O$ emissions from the combustion of a particular type of fuel (metric tons).
Fuel = Mass or volume of the fuel combusted, either from company records or directly measured by a fuel flow meter, as applicable (mass or volume per year).
HHV = Default high heat value of the fuel from Table C–1 of this subpart (mmBtu per mass or volume).
EF = Fuel-specific default emission factor for $CH_4$ or $N_2O$, from Table C–2 of this subpart (kg $CH_4$ or $N_2O$ per mmBtu).
$1 \times 10^{-3}$ = Conversion factor from kilograms to metric tons.

## Emissions Calculation: TURBINE

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 31 | Model: | Solar Centaur T-4700 |
| Name 2: | Turbine 2 | Serial Number: | OHK06-C0131 |
| Name 3: | #2 Res | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Turbine HP (hp): | 3915 |
| Status: | Active | Fuel Heat Value (btu/scf): | 900 |
| Fuel Type: | Residue | Heat Rate (MMBtu/hr): | 36.8 |
| Service Type: | Residue | Oil Usage (gal/month): | 30 |
| Cycle Type: | Other | | |
| Oil Type: | Unknown | Potential fuel usage (MMscf/yr) | 358.2 |
| | | Potential fuel usage (Mscf/hr): | 40.9 |
| | | Heat Rate (BTU/bhp-hr) | 9400 |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 31 | Height (ft): | 44 |
| Stack Number: | 1 | Diameter (ft): | 4 |
| Emission Percent: | 100.00% | Temperature ($^oF$): | 817 |
| Stack Angle ($^o$): | 0 | Flow (ACFM): | 78000 |
| Raincap: | No | Velocity (ft/s): | 103.5 |

**Control Model**

**Emission Controls:**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor | | Nominal | Hrs of | Estimated Emissions | | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| | | | Rating | Operation | | | |
| | EF | Units | (hp) | (hrs/yr) | (lb/hr) | (tpy) | |
| Nitrogen Oxides | 26.0 | lb/hr | 3915 | 8760 | 26.030 | 114.011 | Manufacturer Data |
| Carbon Monoxide | 5.0 | lb/hr | 3915 | 8760 | 4.950 | 21.600 | Manufacturer Data |
| VOC | 0.4 | lb/hr | 3915 | 8760 | 0.350 | 1.533 | Manufacturer Data |
| Formaldehyde | 0.00071 | lb/mmBtu | 3915 | 8760 | 0.026 | 0.114 | AP42 |
| Sulfur Dioxide | 0.0034 | lb/mmBtu | 3915 | 8760 | 0.125 | 0.548 | AP42 |
| PM10 | 0.0066 | lb/mmBtu | 3915 | 8760 | 0.243 | 1.064 | AP42 |

# Engine GHG Calculation

## 40 CFR 98 Subpart C TIER 1

Emission unit(s): 31
Source description: Turbine
Manufacturer: Solar
Maximum fuel usage: 358.2 MMscf/yr

### $CO_2$ Calculation[1] (Eq C-1)

Click here to view Table C-1 to Subpart C of Part 98.

$$CO_2 = 1 \times 10^{-3} \times \frac{358.20 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{53.02 \text{ kg CO2}}{\text{MMbtu}}$$

**$CO_2$ = 19524 tonnes $CO_2$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $CH_4$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$CH_4 = 1 \times 10^{-3} \times \frac{358.20 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-3} \text{ kg } CH_4}{\text{MMbtu}}$$

**$CH_4$ = 3.7E-01 tonnes $CH_4$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $N_2O$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$N_2O = 1 \times 10^{-3} \times \frac{358.20 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-4} \text{ kg } N_2O}{\text{MMbtu}}$$

**$N_2O$ = 3.7E-02 tonnes $N_2O$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

Notes:

1 $CO_2 = 1 x 10^{-3} * Fuel * HHV * EF$

2 $CH_4 \ or \ N_2O = 1 x 10^{-3} * Fuel * HHV * EF$ (Eq. C-8)

Where:
$CH_4$ or $N_2O$ = Annual $CH_4$ or $N_2O$ emissions from the combustion of a particular type of fuel (metric tons).
Fuel = Mass or volume of the fuel combusted, either from company records or directly measured by a fuel flow meter, as applicable (mass or volume per year).
HHV = Default high heat value of the fuel from Table C–1 of this subpart (mmBtu per mass or volume).
EF = Fuel-specific default emission factor for $CH_4$ or $N_2O$, from Table C–2 of this subpart (kg $CH_4$ or $N_2O$ per mmBtu).
$1 \times 10^{-3}$ = Conversion factor from kilograms to metric tons.

## Emissions Calculation: TURBINE

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 32B | Model: | Solar Centaur T-4000 |
| Name 2: | Turbine 4 | Serial Number: | 4678C |
| Name 3: | Refrig | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Turbine HP (hp): | 3684 |
| Status: | Active | Fuel Heat Value (btu/scf): | 900 |
| Fuel Type: | Other | Heat Rate (MMBtu/hr): | 36.21 |
| Service Type: | Other | Oil Usage (gal/month): | 30 |
| Cycle Type: | Other | | |
| Oil Type: | Unknown | Potential fuel usage (MMscf/yr) | 352.44 |
| | | Potential fuel usage (Mscf/hr): | 40.23 |
| | | Heat Rate (BTU/bhp-hr) | 9829 |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | | Height (ft): | 32 |
| Stack Number: | | Diameter (ft): | 4 |
| Emission Percent: | | Temperature ($^oF$): | 817 |
| Stack Angle ($^o$): | | Flow (ACFM): | 78464 |
| Raincap: | | Velocity (ft/s): | 104.1 |
| | | Exh Flow (lbm/hr): | 116568 |

**Control Model**

**Emission Controls:**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor EF | Units | Nominal Rating (hp) | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| Nitrogen Oxides | 0.655 | lb/mmBtu | 3684 | 8760 | 23.718 | 103.883 | Manufacturer Data |
| Carbon Monoxide | 0.121 | lb/mmBtu | 3684 | 8760 | 4.381 | 19.191 | Manufacturer Data |
| VOC | 0.069 | lb/mmBtu | 3684 | 8760 | 2.498 | 10.943 | Manufacturer Data |
| Formaldehyde | 0.00071 | lb/mmBtu | 3684 | 8760 | 0.026 | 0.113 | AP42 |
| Sulfur Dioxide | 0.0034 | lb/mmBtu | 3684 | 8760 | 0.123 | 0.539 | AP42 |
| PM10 | 0.0066 | lb/mmBtu | 3684 | 8760 | 0.239 | 1.047 | AP42 |

# Engine GHG Calculation

## 40 CFR 98 Subpart C TIER 1

Emission unit(s): 32B
Source description: Turbine
Manufacturer: Solar
Maximum fuel usage: 352.44 MMscf/yr

### $CO_2$ Calculation[1] (Eq C-1)

Click here to view Table C-1 to Subpart C of Part 98.

$$CO_2 = 1 \times 10^{-3} \times \frac{352.44 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{53.02 \text{ kg CO2}}{\text{MMbtu}}$$

**$CO_2$ = 19210 tonnes $CO_2$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $CH_4$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$CH_4 = 1 \times 10^{-3} \times \frac{352.44 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-3} \text{ kg } CH_4}{\text{MMbtu}}$$

**$CH_4$ = 3.6E-01 tonnes $CH_4$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $N_2O$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$N_2O = 1 \times 10^{-3} \times \frac{352.44 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-4} \text{ kg } N_2O}{\text{MMbtu}}$$

**$N_2O$ = 3.6E-02 tonnes $N_2O$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

Notes:

1 $CO_2 = 1 x 10^{-3} * Fuel * HHV * EF$

2 $CH_4 \text{ or } N_2O = 1 x 10^{-3} * Fuel * HHV * EF$ (Eq. C-8)

Where:
$CH_4$ or $N_2O$ = Annual $CH_4$ or $N_2O$ emissions from the combustion of a particular type of fuel (metric tons).
Fuel = Mass or volume of the fuel combusted, either from company records or directly measured by a fuel flow meter, as applicable (mass or volume per year).
HHV = Default high heat value of the fuel from Table C–1 of this subpart (mmBtu per mass or volume).
EF = Fuel-specific default emission factor for $CH_4$ or $N_2O$, from Table C–2 of this subpart (kg $CH_4$ or $N_2O$ per mmBtu).
$1 \times 10^{-3}$ = Conversion factor from kilograms to metric tons.

## Emissions Calculation: HEATER/BOILER/REBOILER

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 34 | Model: | Other External Combustion Device |
| Name 2: | Furnace B | Serial Number: | 91-2348 |
| Name 3: | Regen | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Heat Input Fuel (mmbtu/hr): | 15 |
| Status: | Active | Fuel Heat Value (btu/scf): | 900.00 |
| Ext. Comb.Type: | Heaters | Heat Input Wste (mmbtu/hr): | |
| Fuel Type: | Residue | Waste heat Value (btu/scf): | |
| Equipment Usage: | | | |
| Configuration: | | | |
| | | Potential fuel usage (MMscf/yr): | 146.00 |
| | | Potential fuel usage (Mscf/hr): | 16.67 |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 34 | Height (ft): | 45 |
| Stack Number: | 1 | Diameter (ft): | 2 |
| Emission Percent: | 100.00% | Temperature ($^{o}$F): | 600 |
| Stack Angle ($^{o}$): | 0 | Flow (ACFM): | 6843 |
| Raincap: | No | Velocity (ft/s): | 36.3 |

**Control Model**

**Emission Controls:**

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor EF | Emission Factor Units | Nominal Rating (MMBtu/hr) | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | Estimated Emissions (tpy) | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| Nitrogen Oxides | 100 | lb/MMscf | 15 | 8760 | 1.667 | 7.300 | AP42 |
| Carbon Monoxide | 84 | lb/MMscf | 15 | 8760 | 1.400 | 6.132 | AP42 |
| VOC | 5.5 | lb/MMscf | 15 | 8760 | 0.092 | 0.402 | AP42 |
| PM10 | 7.6 | lb/MMscf | 15 | 8760 | 0.127 | 0.555 | AP42 |
| Sulfur Dioxide | 0.6 | lb/MMscf | 15 | 8760 | 0.010 | 0.044 | AP42 |

# Engine GHG Calculation

## 40 CFR 98 Subpart C TIER 1

Emission unit(s): 34
Source description: Turbine
Manufacturer: Solar
Maximum fuel usage: 146 MMscf/yr

### $CO_2$ Calculation[1] (Eq C-1)

Click here to view Table C-1 to Subpart C of Part 98.

$$CO_2 = 1 \times 10^{-3} \times \frac{146.00 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{53.02 \text{ kg CO2}}{\text{MMbtu}}$$

**$CO_2$ = 7958 tonnes $CO_2$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $CH_4$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$CH_4 = 1 \times 10^{-3} \times \frac{146.00 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-3} \text{ kg } CH_4}{\text{MMbtu}}$$

**$CH_4$ = 1.5E-01 tonnes $CH_4$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $N_2O$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98
Click here to view Table C-2 to Subpart C of Part 98

$$N_2O = 1 \times 10^{-3} \times \frac{146.00 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-4} \text{ kg } N_2O}{\text{MMbtu}}$$

**$N_2O$ = 1.5E-02 tonnes $N_2O$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

Notes:

1 $$CO_2 = 1 x 10^{-3} * Fuel * HHV * EF$$

2 $$CH_4 \text{ or } N_2O = 1 x 10^{-3} * Fuel * HHV * EF \qquad \text{(Eq. C-8)}$$

Where:
$CH_4$ or $N_2O$ = Annual $CH_4$ or $N_2O$ emissions from the combustion of a particular type of fuel (metric tons).
Fuel = Mass or volume of the fuel combusted, either from company records or directly measured by a fuel flow meter, as applicable (mass or volume per year).
HHV = Default high heat value of the fuel from Table C–1 of this subpart (mmBtu per mass or volume).
EF = Fuel-specific default emission factor for $CH_4$ or $N_2O$, from Table C–2 of this subpart (kg $CH_4$ or $N_2O$ per mmBtu).
$1 \times 10^{-3}$ = Conversion factor from kilograms to metric tons.

## Emissions Calculation: HEATER/BOILER/REBOILER

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 36 | Model: | Other External Combustion Device |
| Name 2: | Boiler 36 | Serial Number: | |
| Name 3: | Boiler | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Heat Input Fuel (mmbtu/hr): | 99.5 |
| Status: | Active | Fuel Heat Value (btu/scf): | 900.00 |
| Ext. Comb.Type: | Heaters | Heat Input Wste (mmbtu/hr): | |
| Fuel Type: | Residue | Waste heat Value (btu/scf): | |
| Equipment Usage: | | | |
| Configuration: | | | |
| | | Potential fuel usage (MMscf/yr): | 968.47 |
| | | Potential fuel usage (Mscf/hr): | 110.56 |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 36 | Height (ft): | 50 |
| Stack Number: | 36 | Diameter (ft): | 3.75 |
| Emission Percent: | 100.00% | Temperature (°F): | 300 |
| Stack Angle (°): | 0 | Velocity (ft/s): | 50 |
| Raincap: | No | Flow (ACFM): | 33134.0 |

**Emission Controls:** **Control Model**
Low-NOx Burners: Other Control

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor | | Nominal Rating | Hrs of Operation | Estimated Emissions | | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| | EF | Units | (MMBtu/hr) | (hrs/yr) | (lb/hr) | (tpy) | |
| Nitrogen Oxides | 50 | lb/MMscf | 99.5 | 8760 | 5.528 | 24.212 | AP42 |
| Carbon Monoxide | 84 | lb/MMscf | 99.5 | 8760 | 9.287 | 40.676 | AP42 |
| VOC | 5.5 | lb/MMscf | 99.5 | 8760 | 0.608 | 2.663 | AP42 |
| PM10 | 7.6 | lb/MMscf | 99.5 | 8760 | 0.840 | 3.680 | AP42 |
| Sulfur Dioxide | 0.6 | lb/MMscf | 99.5 | 8760 | 0.066 | 0.291 | AP42 |

## Emissions Calculation: HEATER/BOILER/REBOILER

**Facility ID:** 54 **Facility:** Linam Ranch Gas Plant

**Equipment Information**

| | | | |
|---|---|---|---|
| Source ID Number: | 37 | Model: | Other External Combustion Device |
| Name 2: | Boiler 37 | Serial Number: | |
| Name 3: | Boiler | Service Date: | |
| Coordinates: | Latitude/Longitude | Manufacture Date: | |
| Latitude: | | Permit Status: | |
| Longitude: | | SCC: | |

| | | | |
|---|---|---|---|
| Ownership: | DEFS owned | Heat Input Fuel (mmbtu/hr): | 99.5 |
| Status: | Active | Fuel Heat Value (btu/scf): | 900.00 |
| Ext. Comb.Type: | Heaters | Heat Input Wste (mmbtu/hr): | |
| Fuel Type: | Residue | Waste heat Value (btu/scf): | |
| Equipment Usage: | | | |
| Configuration: | | | |
| | | Potential fuel usage (MMscf/yr): | 968.47 |
| | | Potential fuel usage (Mscf/hr): | 110.56 |

**Stack Parameters**

| | | | |
|---|---|---|---|
| Stack Name: | 37 | Height (ft): | 50 |
| Stack Number: | 37 | Diameter (ft): | 3.75 |
| Emission Percent: | 100.00% | Temperature ($^oF$): | 300 |
| Stack Angle ($^o$): | 0 | Velocity (ft/s): | 50 |
| Raincap: | No | Flow (ACFM): | 33134.0 |

**Emission Controls:** **Control Model**
Low-NOx Burners: Other Control

**Potential operation:** 8760 hr/yr

**Potential Emissions**

| Pollutant | Emission Factor EF | Units | Nominal Rating (MMBtu/hr) | Hrs of Operation (hrs/yr) | Estimated Emissions (lb/hr) | (tpy) | Source of Emission Factor |
|---|---|---|---|---|---|---|---|
| Nitrogen Oxides | 50 | lb/MMscf | 99.5 | 8760 | 5.53 | 24.21 | AP42 |
| Carbon Monoxide | 84 | lb/MMscf | 99.5 | 8760 | 9.29 | 40.68 | AP42 |
| VOC | 5.5 | lb/MMscf | 99.5 | 8760 | 0.61 | 2.66 | AP42 |
| PM10 | 7.6 | lb/MMscf | 99.5 | 8760 | 0.84 | 3.68 | AP42 |
| Sulfur Dioxide | 0.6 | lb/MMscf | 99.5 | 8760 | 0.07 | 0.29 | AP42 |

*DCP Operating Company, LP - Linam Ranch Gas Plant*

# Engine GHG Calculation

## 40 CFR 98 Subpart C TIER 1

| | | |
|---|---|---|
| Emission unit(s): | 36 and 37 | |
| Source description: | Turbine | |
| Manufacturer: | Solar | |
| Maximum fuel usage: | 968.47 | MMscf/yr |

### $CO_2$ Calculation[1] (Eq C-1)

Click here to view Table C-1 to Subpart C of Part 98.

$$CO_2 = 1 \times 10^{-3} \times \frac{968.47 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{53.02 \text{ kg CO2}}{\text{MMbtu}}$$

**$CO_2$ = 52786 tonnes $CO_2$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $CH_4$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98

Click here to view Table C-2 to Subpart C of Part 98

$$CH_4 = 1 \times 10^{-3} \times \frac{968.47 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-3} \text{ kg } CH_4}{\text{MMbtu}}$$

**$CH_4$ = 1.0E+00 tonnes $CH_4$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

### $N_2O$ Calculation[2] (Eq C-8)

Click here to view Table C-1 to Subpart C of Part 98

Click here to view Table C-2 to Subpart C of Part 98

$$N_2O = 1 \times 10^{-3} \times \frac{968.47 \text{ MMscf}}{\text{yr}} \times \frac{1028 \text{ MMbtu}}{\text{MMscf}} \times \frac{1 \times 10^{-4} \text{ kg } N_2O}{\text{MMbtu}}$$

**$N_2O$ = 1.0E-01 tonnes $N_2O$ / yr**

Fuel usage carried forward from engine calculations in previous permit application.

Notes:

1 $CO_2 = 1 x 10^{-3} * Fuel * HHV * EF$

2 $CH_4 \text{ or } N_2O = 1 x 10^{-3} * Fuel * HHV * EF$ (Eq. C-8)

Where:

$CH_4$ or $N_2O$ = Annual $CH_4$ or $N_2O$ emissions from the combustion of a particular type of fuel (metric tons).

Fuel = Mass or volume of the fuel combusted, either from company records or directly measured by a fuel flow meter, as applicable (mass or volume per year).

HHV = Default high heat value of the fuel from Table C–1 of this subpart (mmBtu per mass or volume).

EF = Fuel-specific default emission factor for $CH_4$ or $N_2O$, from Table C–2 of this subpart (kg $CH_4$ or $N_2O$ per mmBtu).

$1 \times 10^{-3}$ = Conversion factor from kilograms to metric tons.

## Linam Ranch Gas Plant: Engine and Turbine HAP Calculations

| Emission Unit ID No. | Emission Unit Description | Horsepower Site Rating hp | Heat Input mmBtu/hr | Benzene EF lb/MMBtu | Benzene Emiss Rate TPY | Toluene EF lb/MMBtu | Toluene Emiss Rate TPY | Ethylbenzene EF lb/MMBtu | Ethylbenzene Emiss Rate TPY | Xylenes EF lb/MMBtu | Xylenes Emiss Rate TPY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | Clark TLA-6 | 2000 | 17.73 | 1.94E-03 | 0.151 | 9.63E-04 | 0.075 | 1.08E-04 | 0.008 | 2.68E-04 | 0.021 |
| 7 | Clark TLA-6 | 2000 | 17.73 | 1.94E-03 | 0.151 | 9.63E-04 | 0.075 | 1.08E-04 | 0.008 | 2.68E-04 | 0.021 |
| 10 or 11 | Clark HBA-6 | 1267 | 11.86 | 1.94E-03 | 0.101 | 9.63E-04 | 0.050 | 1.08E-04 | 0.006 | 2.68E-04 | 0.014 |
| 28 | Solar Taurus T-60-7800S | 7340 | 63.43 | 1.20E-05 | 0.003 | 1.30E-04 | 0.036 | 3.20E-05 | 0.009 | 6.40E-05 | 0.018 |
| 29 | Solar Taurus 70-10302S | 10702 | 77.63 | 1.20E-05 | 0.004 | 1.30E-04 | 0.044 | 3.20E-05 | 0.011 | 6.40E-05 | 0.022 |
| 30 | Solar Taurus 70-9702S | 9990 | 73.95 | 1.20E-05 | 0.004 | 1.30E-04 | 0.042 | 3.20E-05 | 0.010 | 6.40E-05 | 0.021 |
| 31 | Solar Centaur T-4700 | 3915 | 36.80 | 1.20E-05 | 0.002 | 1.30E-04 | 0.021 | 3.20E-05 | 0.005 | 6.40E-05 | 0.010 |
| 32B | Solar Centaur T-4000 | 3684 | 36.21 | 1.20E-05 | 0.002 | 1.30E-04 | 0.021 | 3.20E-05 | 0.005 | 6.40E-05 | 0.010 |
| **Total HAP** | | | | | **0.42** | | **0.36** | | **0.06** | | **0.14** |

| Emission Unit ID No. | Description | Formaldehyde EF lb/MMBtu | Formaldehyde Emiss Rate TPY | Acetaldehyde EF lb/MMBtu | Acetaldehyde Emiss Rate TPY | n-Hexane EF lb/MMBtu | n-Hexane Emiss Rate TPY | Acrolein EF lb/MMBtu | Acrolein Emiss Rate TPY | Methanol EF lb/MMBtu | Methanol Emiss Rate TPY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | Clark TLA-6 | 0.05520 | 4.286 | 7.76E-03 | 0.603 | 4.45E-04 | 0.035 | 7.78E-03 | 0.604 | 2.48E-03 | 0.193 |
| 7 | Clark TLA-6 | 0.05520 | 4.286 | 7.76E-03 | 0.603 | 4.45E-04 | 0.035 | 7.78E-03 | 0.604 | 2.48E-03 | 0.193 |
| 10 or 11 | Clark HBA-6 | 0.05520 | 2.866 | 7.76E-03 | 0.403 | 4.45E-04 | 0.023 | 7.78E-03 | 0.404 | 2.48E-03 | 0.129 |
| 28 | Solar Taurus T-60-7800S | 0.00241 | 0.670 | 4.00E-05 | 0.011 | 0 | 0.000 | 6.40E-06 | 0.002 | 0 | 0.000 |
| 29 | Solar Taurus 70-10302S | 0.00071 | 0.241 | 4.00E-05 | 0.014 | 0 | 0.000 | 6.40E-06 | 0.002 | 0 | 0.000 |
| 30 | Solar Taurus 70-9702S | 0.00071 | 0.230 | 4.00E-05 | 0.013 | 0 | 0.000 | 6.40E-06 | 0.002 | 0 | 0.000 |
| 31 | Solar Centaur T-4700 | 0.00071 | 0.114 | 4.00E-05 | 0.006 | 0 | 0.000 | 6.40E-06 | 0.001 | 0 | 0.000 |
| 32B | Solar Centaur T-4000 | 0.00071 | 0.113 | 4.00E-05 | 0.006 | 0 | 0.000 | 6.40E-06 | 0.001 | 0 | 0.000 |
| **Total HAP** | | | **12.81** | | **1.66** | | **0.09** | | **1.62** | | **0.51** |

*EPA-AP42 Tables 3.2-1 (7/00) & 3.1-3 (4/00) emission factors were used for HAP calculations for all units except Unit 28 formaldehyde.*
*Manufacturer's emission factor (HHV basis) was used for Unit 28 formaldehyde. Unit 28 HAP emissions are based in HHV.*

# Linam Ranch Gas Plant: External Combustion Source HAP Calculations

| Emission Unit ID No. | Emission Unit Description | Fuel Use MMscf/yr | Benzene EF lb/MMscf | Benzene Emiss Rate TPY | Toluene EF lb/MMscf | Toluene Emiss Rate TPY | Formaldehyde EF lb/MMscf | Formaldehyde Emiss Rate TPY | Hexane EF lb/MMscf | Hexane Emiss Rate TPY |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 ** | Amine Plant Flare | 14.2 | 0.00E+00 | 0.000 | 0.00E+00 | 0.000 | 0.00E+00 | 0.000 | 0 | 0.000 |
| 4A ** | ESD (Plant) Flare | 14.2 | 0.00E+00 | 0.000 | 0.00E+00 | 0.000 | 0.00E+00 | 0.000 | 0 | 0.000 |
| 34 | Furnace B | 146.0 | 2.10E-03 | 0.000 | 3.40E-03 | 0.000 | 7.50E-02 | 0.005 | 1.8 | 0.131 |
| 36 | Boiler 36 | 968.5 | 2.10E-03 | 0.001 | 3.40E-03 | 0.002 | 7.50E-02 | 0.036 | 1.8 | 0.872 |
| 37 | Boiler 37 | 968.5 | 2.10E-03 | 0.001 | 3.40E-03 | 0.002 | 7.50E-02 | 0.036 | 1.8 | 0.872 |
| **Total HAPs** | | | | **0.002** | | **0.003** | | **0.073** | | **1.743** |

EPA-AP42 Table 1.4-3 emission factors (7/98) were used for HAP calculations.
** Pilot only during normal operation

# TEG Dehydrator

| | |
|---|---|
| Emission unit number: | DH-10 |
| Source description: | TEG Dehydrator |
| Manufacturer: | Unknown |
| Capacity: | 27 MMscfd |

**Emission Rates**

*Condensor Controlled Regenerator and Uncontrolled Flash Tank Emissions* [1]

| VOC[1] | Total HAPs[1] | | |
|---|---|---|---|
| 1.6 | 0.0012 | lb/hr | Condensor Controlled Regenerator Emissions from GlyCalc |
| 3.5 | 0.0010 | lb/hr | Flash Tank Off Gas Emissions from GRI-GLYCalc |
| **5.1** | **0.0022** | **lb/hr** | |
| **22.2** | **0.010** | **tons/yr** | |

| $CO_2$ | $CH_4$ | $CO_2e$ [2] | | |
|---|---|---|---|---|
| 0.00 | 1.6 | 41.16 | lb/hr | Condensor Controlled Regenerator Emissions from GlyCalc |
| 0.00 | 24.6 | 615.46 | lb/hr | Flash Tank Off Gas Emissions from GRI-GLYCalc |
| **0.00** | **26.26** | **656.62** | **lb/hr** | |
| **0.00** | **115.04** | **2876.01** | **tons/yr** | |

*Condensor Controlled Regenerator and Uncontrolled Flash Tank Emissions sent to Flare 4a* [3]

| VOC[1] | Total HAPs[1] | |
|---|---|---|
| **-** | **-** | **lb/hr** |
| **-** | **-** | **tpy** |

| $CO_2$ | $CH_4$ | $CO_2e$ [2] | |
|---|---|---|---|
| **-** | **-** | **-** | **lb/hr** |
| **-** | **-** | **-** | **tons/yr** |

[1] *Emissions are from GLYCalc 4.0; Total HAPs are estimated based on N-Pentane+*

[2] *Warming potential of CH4 is 25 times greater than CO2*

[3] *The glycol dehydrator is a controlled system. Emissions are controlled by the flare, unit 4A. Controlled emissions for these units are included in unit 4a emissions.*

# Gasoline Tank

Emission units: TK-2
Source Description: 500 gallon horizontal gasoline tank

**General Tank Information**

| | | | |
|---|---|---|---|
| Volume | 500 | gallon | |
| Length (shell) | 5.25 | ft | |
| Diameter | 4 | ft | |
| Throughput | 250 | gal/mo | |
| Throughput | 3000 | gal/yr | bbl/mo * 12 mo/yr |
| Turnovers | 5.0 | turnovers/yr | bbl/yr / Volume |
| Turnovers | 6.0 | maximum turnovers/yr | Turnovers x 1.2 (per 40 CFR 63.760 (subpart HH) |
| Throughput | 8.2 | maximum gal/day | Maximum turnovers * Volume / 365 days/year |

**VOC Emissions**

| | VOCs | | |
|---|---|---|---|
| | 1399.0 | lb/yr | TANKS 4.09 d |
| | 0.70 | tpy | tpy = lb/hr x [(8760hr/yr) / (2000lb/ton)]) |
| | N/A | tpy | No flashing losses from this tank at atmospheric conditions |
| **Total VOCs** | 0.70 | tpy | Working and Breathing + Flash |
| | 0.16 | lb/hr | tpy * 2000 lb/ton / 8760 hrs/yr |

## TK-VRU Emissions

Source: TK-VRU: (RVP 10) Seven (7) condensate tanks routed to a common VRU.

**VOC Emissions for Condensate Tanks**

| VOCs | | |
|---|---|---|
| 106,656 | lb/yr | VOC Working & Breathing Emissions: TANKS 4.09 d* |
| 134,575 | lb/yr | Flashing emissions; Promax and max. flow meter data |
| 5% | % | VRU downtime |
| 100% | % | VRU recovery (emissions are routed to process, only uncontrolled emissions are during VRU downtime) |
| 12,062 | lb/yr | |
| **27.54** | **lb/hr** | |
| **6.03** | **tpy** | |

*Maximum throughput for all five 750-bbl tanks combined is 1,800 bbl/day. Since each bbl of throughput will be routed through only one tank, working losses are counted only once. However, since each tank may contain condensate, the breathing losses from the TANKS 4.09 output are multiplied by five. Total working losses for the 400-bbl and 210-bbl condensate tanks are also included here.

*DCP Operating Company, LP - Linam Ranch Gas Plant*

# TK-VRU -Tanks Flashing Emissions

Source: TK-VRU: (RVP 10) Five (5) fixed-roof vertical tanks routed to VRU.

**ProMax Condensate Vapor Analysis**

| **Component** | **MW** | **Mol %** | **MW * Mol %** | **Mass Fraction** | **Specific Volume scf/lb** | **Specific Volume Vapor scf/lb** |
|---|---|---|---|---|---|---|
| Nitrogen | 28.01 | 0.00% | 0.0000 | 0.00% | 13.547 | 0.0000 |
| Oxygen | 32.00 | 0.00% | 0.0000 | 0.00% | 13.5 | 0.0000 |
| $CO_2$ | 44.01 | 0.01% | 0.0023 | 0.00% | 8.623 | 0.0003 |
| $H_2S$ | 34.08 | 0.02% | 0.0081 | 0.01% | 11.136 | 0.0013 |
| Methane | 16.04 | 0.01% | 0.0023 | 0.00% | 23.65 | 0.0008 |
| Ethane | 30.07 | 0.57% | 0.1716 | 0.25% | 12.62 | 0.0310 |
| Propane | 44.10 | 7.38% | 3.2550 | 4.66% | 8.606 | 0.4008 |
| I-Butane | 58.12 | 5.86% | 3.4046 | 4.87% | 6.529 | 0.3181 |
| N-Butane | 58.12 | 24.46% | 14.2169 | 20.34% | 6.529 | 1.3281 |
| I-Pentane | 72.15 | 13.94% | 10.0588 | 14.39% | 5.26 | 0.7570 |
| N-Pentane | 72.15 | 16.94% | 12.2207 | 17.49% | 5.26 | 0.9197 |
| n-Hexane | 86.18 | 30.81% | 26.5496 | 37.99% | 4.404 | 1.6730 |
| Heptanes | 100.21 | 0.00% | 0.0000 | 0.00% | 3.787 | 0.0000 |
| Benzene | 78.11 | 0.00% | 0.0000 | 0.00% | 4.858 | 0.0000 |
| Toluene | 92.14 | 0.00% | 0.0000 | 0.00% | 4.119 | 0.0000 |
| Ethylbenzene | 106.17 | 0.00% | 0.0000 | 0.00% | 3.574 | 0.0000 |
| Xylenes | 106.17 | 0.00% | 0.0000 | 0.00% | 3.574 | 0.0000 |
| C8+ | 114.23 | 0.00% | 0.0000 | 0.00% | 3.322 | 0.0000 |
| Total | | 100% | | 100% | | |
| Wtd. Average | | | 69.89 | | | 5.430 |
| NMEHC (VOC) | | 99.39% | | 99.74% | | |
| GHG Component | | 0.02% | | 0.01% | | |

**Flow Rate Summary: September - October, 2010**

Raw Data

| | E G-Tank | W G-Tank | Total Tanks | |
|---|---|---|---|---|
| Average | 0.331 | 0.485 | 0.816 | Mcfd |
| Max | 0.995 | 0.992 | 1.987 | Mcfd |

Corrected to STP

| | E G-Tank | W G-Tank | Total Tanks | |
|---|---|---|---|---|
| Average | 0.335 | 0.490 | 0.825 | Mscfd |
| Max | 1.005 | 1.002 | 2.007 | Mscfd |

$V_{corrected} = V_{raw} * (T_{STP}/T_{site})*(P_{site}/P_{STP})$

| | | |
|---|---|---|
| Site Pressure | 29.9 in. Hg | Sept-Oct. 2010 Climate Data, NWS Midland International. |
| Site Temperature | 71.2 ºF | |

**Emission Calculations**

Total Tanks Flow Rate

| | Average | Maximum | | |
|---|---|---|---|---|
| Flashing losses | 151.5 | 368.7 | VOC, lb/day | mass flow = corrected flow * mass % NMNEHC / specific vol. vapor |
| | 55,280.0 | 134,575.5 | VOC, lb/yr. | |
| GHG Emissions | 0.01 | 0.02 | (methane + CO2) lb/day | mass flow = corrected flow * mass % GHG / specific vol. vapor |
| | 4 | 9 | (methane + CO2) lb/yr' | |

## TK-VRUTMP Emissions

Source: TK-TMP: (RVP 10) Two (2) horizontal bullet tanks routed to a common VRU.

**General Information for Each Tank**

| | | |
|---|---|---|
| Volume | 1,500 | bbl |
| Diameter | 12 | ft |
| Throughput | 1800 | bpd |
| Throughput | 27,594,000 | gallons/yr |
| Turnovers | 438 | turnovers/yr |

**VOC Emissions for Condensate Tanks**

| VOCs | | |
|---|---|---|
| 80,594 | lb/yr | VOC Working & Breathing Emissions: TANKS 4.09 d* |
| 134,575 | lb/yr | Flashing emissions; Promax and max. flow meter data |
| 5% | % | VRU downtime |
| 100% | % | VRU recovery (emissions are routed to process, only uncontrolled emissions are during VRU downtime) |
| 10,758 | lb/yr | |
| | | |
| **24.56** | **lb/hr** | |
| **5.38** | **tpy** | |

*Maximum throughput for these two tanks combined is 1,800 bbl/day. Since each bbl of throughput will be routed through only one tank, working losses are counted only once. However, since each tank may contain condensate, the breathing losses from the TANKS 4.09 output are multiplied by two.

*DCP Operating Company, LP - Linam Ranch Gas Plant*

# TK-VRUTMP -Tanks Flashing Emissions

Source: TK-TMP: (RVP 10) Two (2) horizontal bullet tanks routed to a common VRU.

**ProMax Condensate Vapor Analysis**

| Component | MW | Mol % | MW * Mol % | Mass Fraction | Specific Volume scf/lb | Specific Volume Vapor scf/lb |
|---|---|---|---|---|---|---|
| Nitrogen | 28.01 | 0.00% | 0.0000 | 0.00% | 13.547 | 0.0000 |
| Oxygen | 32.00 | 0.00% | 0.0000 | 0.00% | 13.5 | 0.0000 |
| $CO_2$ | 44.01 | 0.01% | 0.0023 | 0.00% | 8.623 | 0.0003 |
| $H_2S$ | 34.08 | 0.02% | 0.0081 | 0.01% | 11.136 | 0.0013 |
| Methane | 16.04 | 0.01% | 0.0023 | 0.00% | 23.65 | 0.0008 |
| Ethane | 30.07 | 0.57% | 0.1716 | 0.25% | 12.62 | 0.0310 |
| Propane | 44.10 | 7.38% | 3.2550 | 4.66% | 8.606 | 0.4008 |
| I-Butane | 58.12 | 5.86% | 3.4046 | 4.87% | 6.529 | 0.3181 |
| N-Butane | 58.12 | 24.46% | 14.2169 | 20.34% | 6.529 | 1.3281 |
| I-Pentane | 72.15 | 13.94% | 10.0588 | 14.39% | 5.26 | 0.7570 |
| N-Pentane | 72.15 | 16.94% | 12.2207 | 17.49% | 5.26 | 0.9197 |
| n-Hexane | 86.18 | 30.81% | 26.5496 | 37.99% | 4.404 | 1.6730 |
| Heptanes | 100.21 | 0.00% | 0.0000 | 0.00% | 3.787 | 0.0000 |
| Benzene | 78.11 | 0.00% | 0.0000 | 0.00% | 4.858 | 0.0000 |
| Toluene | 92.14 | 0.00% | 0.0000 | 0.00% | 4.119 | 0.0000 |
| Ethylbenzene | 106.17 | 0.00% | 0.0000 | 0.00% | 3.574 | 0.0000 |
| Xylenes | 106.17 | 0.00% | 0.0000 | 0.00% | 3.574 | 0.0000 |
| C8+ | 114.23 | 0.00% | 0.0000 | 0.00% | 3.322 | 0.0000 |
| Total | | 100% | | 100% | | |
| Wtd. Average | | | 69.89 | | | 5.430 |
| NMEHC (VOC) | | 99.39% | | 99.74% | | |
| GHG Component | | 0.02% | | 0.01% | | |

**Flow Rate Summary: September - October, 2010**

| | Raw Data | | | |
|---|---|---|---|---|
| | E G-Tank | W G-Tank | Total Tanks | |
| Average | 0.331 | 0.485 | 0.816 | Mcfd |
| Max | 0.995 | 0.992 | 1.987 | Mcfd |

| | Corrected to STP | | | | |
|---|---|---|---|---|---|
| | E G-Tank | W G-Tank | Total Tanks | | |
| Average | 0.335 | 0.490 | 0.825 | Mscfd | $V_{corrected} = V_{raw}$ * |
| Max | 1.005 | 1.002 | 2.007 | Mscfd | $(T_{STP}/T_{site})$*$(P_{site}/P_{STP})$ |

| | | | |
|---|---|---|---|
| Site Pressure | 29.9 | in. Hg | Sept-Oct. 2010 Climate Data, NWS Midland International. |
| Site Temperature | 71.2 | ºF | |

**Emission Calculations**

| | Total Tanks Flow Rate | | | |
|---|---|---|---|---|
| | Average | Maximum | | |
| Flashing losses | 151.5 | 368.7 | VOC, lb/day | mass flow = corrected flow * mass |
| | 55,280.0 | 134,575.5 | VOC, lb/yr. | % NMNEHC / specific vol. vapor |
| GHG Emissions | 0.01 | 0.02 | (methane + CO2) lb/day | mass flow = corrected flow * mass |
| | 4 | 9 | (methane + CO2) lb/yr' | % GHG / specific vol. vapor |

# Methanol Tanks

Emission units: TK-20, TK-21, TK-27, TK-77, TK-1370
Source Description: 500 - 7050 gallon horizontal or vertical methanol tanks

**General Tank Information**

| **Tank** | **TK-20** | **TK-21** | **TK-27** | **TK-77** | **TK-1370** | | |
|---|---|---|---|---|---|---|---|
| Volume | 1,130 | 660 | 7,050 | 500 | 500 | gallon | |
| Length (shell) | 6.5 | 5.5 | 12 | 5.25 | 5.25 | ft | |
| Diameter | 5.5 | 4.5 | 10 | 4 | 4 | ft | |
| Throughput | 13,560 | 7,920 | 29,375 | 6,000 | 6,000 | gal/mo | |
| Throughput | 162,720 | 95,040 | 352,500 | 72,000 | 72,000 | gal/yr | bbl/mo * 12 mo/yr |
| Turnovers | 144.0 | 144.0 | 50.0 | 144.0 | 144.0 | turnovers/yr | bbl/yr / Volume |
| Turnovers | 172.8 | 172.8 | 60.0 | 172.8 | 172.8 | maximum turnovers/yr | Turnovers x 1.2 (per 40 CFR 63.760 (subpart HH) |
| Throughput | 535.0 | 312.5 | 1158.9 | 236.7 | 236.7 | maximum gal/day | Maximum turnovers * Volume / 365 days/year |

**VOC Emissions**

| | **VOC** | **VOC** | **VOC** | **VOC** | **VOC** | | |
|---|---|---|---|---|---|---|---|
| | 234.1 | 138.0 | 968.6 | 105.7 | 105.7 | lb/yr | TANKS 4.09 d |
| | 0.12 | 0.069 | 0.48 | 0.053 | 0.053 | tpy | tpy = lb/hr x [(8760hr/yr) / (2000lb/ton)] |
| | N/A | N/A | N/A | N/A | N/A | tpy | No flashing losses from this tank at atmospheric conditions |
| **Total VOCs** | 0.12 | 0.069 | 0.48 | 0.053 | 0.053 | tpy | Working and Breathing + Flash |
| | 0.027 | 0.016 | 0.11 | 0.012 | 0.012 | lb/hr | tpy * 2000 lb/ton / 8760 hrs/yr |

# North Cooling Tower Emissions

| | Cooling Water Recirculation Rate (gpm) | Drift Rate fraction of Circulating Flow % | Total Drift Mass lb/min | Circulating Water Total Dissolved Solids (mg/l) | Circulating Water Total Dissolved Solids ($ppm_w$) |
|---|---|---|---|---|---|
| Note | 1 | 2 | 3 | 4 | |
| Cooling Tower | 4,090 | 0.02% | 6.8 | 3,000 | 3,000 |

| | Hourly Uncontrolled Particulate Emissions (lb/hr) | Annual Uncontrolled Particulate Emissions (tpy) | Hourly Uncontrolled TSP Emissions (lb/hr) | Annual Uncontrolled TSP Emissions (tpy) | Hourly Uncontrolled $PM_{10}$ Emissions (lb/hr) | Annual Uncontrolled $PM_{10}$ Emissions (tpy) | Hourly Uncontrolled $PM_{2.5}$ Emissions (lb/hr) | Annual Uncontrolled $PM_{2.5}$ Emissions (tpy) |
|---|---|---|---|---|---|---|---|---|
| Note | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 |
| Cooling Tower | 1.23 | 5.38 | 1.16 | 5.09 | 0.61 | 2.69 | 0.00250 | 0.0110 |

***Notes***

1 Cooling Tower Water Recirc rate based on site data: 2045 gpm* 2 pumps = 4,090 gpm
2 Uncontrolled circulating water flow percent drift estimated based on AP-42 factors for induced draft cooling towers (Table 13.4-1)
3 Total Drift Mass = Recirculation rate * Drift Rate Fraction * Drift Density (8.34 lb/gal)
4 TDS measured at 5000 mg/l as a conservative measure.
5 Total particulate emission calculated using procedure described in Section 13.4 of AP-42 (01/95), Wet Cooling Towers.
PM = Water Circulation Rate * Drift Rate* Percent drift mass escape * TDS
Particulate Hourly Emissions:

$$\frac{4{,}090\text{ gal}}{\text{min}} \cdot \frac{60\text{ min}}{\text{hr}} \cdot \frac{0.0002\text{ gal drift}}{\text{gal recirculation}} \cdot 31.30\% \cdot \frac{8.34\text{ lb drift}}{\text{gal drift}} \cdot \frac{3000\text{ lb PM}}{10^6\text{ lb drift}} = \frac{1.23\text{ lb}}{\text{hr}}$$

Particulate annual emissions = Hourly emissions (lb/hr) * 8760 (hrs/yr) / 2000 (lb/ton)
6 Particle size distribution based on the following distribution (from Frisbie data)

***Particle Distribution***

| Particle | Mass % of Total Particulates | |
|---|---|---|
| TSP (PM 30) | 94.7 | Frisbie data |
| PM10 | 50.0 | Frisbie data |
| PM2.5 | 0.20 | Frisbie data |

*DCP Operating Company, LP - Linam Ranch Gas Plant*

# North Cooling Tower Frisbee Table

Facility TDS 5000

| EPRI Droplet Diameter (µm) | Droplet Volume (µm3 ) | Droplet Mass (µg) | Particle Mass (Solids) (µg) | Solid Particle Volume (µm3 ) | Solid Particle Diameter (µm) | EPRI % Mass Smaller | Interpolated Particulate Fraction based on facility TDS 3000 |
|---|---|---|---|---|---|---|---|
| 10 | 524 | 5.24E-04 | 4.03E-06 | 1.83 | 1.52 | 0.00 | 1.11 |
| 20 | 4189 | 4.19E-03 | 3.23E-05 | 14.66 | 3.04 | 0.20 | 2.22 |
| 30 | 14137 | 1.41E-02 | 1.09E-04 | 49.48 | 4.56 | 0.23 | 3.33 |
| 40 | 33510 | 3.35E-02 | 2.58E-04 | 117.29 | 6.07 | 0.51 | 4.44 |
| 50 | 65450 | 6.54E-02 | 5.04E-04 | 229.07 | 7.59 | 1.82 | 5.54 |
| 60 | 113097 | 1.13E-01 | 8.71E-04 | 395.84 | 9.11 | 5.70 | 6.65 |
| 70 | 179594 | 1.80E-01 | 1.38E-03 | 628.58 | 10.63 | 21.35 | 7.76 |
| 90 | 381704 | 3.82E-01 | 2.94E-03 | 1335.96 | 13.67 | 49.81 | 9.98 |
| 110 | 696910 | 6.97E-01 | 5.37E-03 | 2439.18 | 16.70 | 70.51 | 12.20 |
| 130 | 1150347 | 1.15E+00 | 8.86E-03 | 4026.21 | 19.74 | 82.02 | 14.42 |
| 150 | 1767146 | 1.77E+00 | 1.36E-02 | 6185.01 | 22.77 | 88.01 | 16.63 |
| 180 | 3053628 | 3.05E+00 | 2.35E-02 | 10687.7 | 27.33 | 91.03 | 19.96 |
| 210 | 4849048 | 4.85E+00 | 3.73E-02 | 16971.67 | 31.88 | 92.47 | 23.29 |
| 240 | 7238229 | 7.24E+00 | 5.57E-02 | 25333.8 | 36.44 | 94.09 | 26.61 |
| 270 | 10305995 | 1.03E+01 | 7.94E-02 | 36070.98 | 40.99 | 94.69 | 29.94 |
| 300 | 14137167 | 1.41E+01 | 1.09E-01 | 49480.08 | 45.55 | 96.29 | 33.27 |
| 350 | 22449298 | 2.24E+01 | 1.73E-01 | 78572.54 | 53.14 | 97.01 | 38.81 |
| 400 | 33510322 | 3.35E+01 | 2.58E-01 | 117286.13 | 60.73 | 98.34 | 44.36 |
| 450 | 47712938 | 4.77E+01 | 3.67E-01 | 166995.28 | 68.32 | 99.07 | 49.90 |
| 500 | 65449847 | 6.54E+01 | 5.04E-01 | 229074.46 | 75.92 | 99.07 | 55.45 |
| 600 | 113097336 | 1.13E+02 | 8.71E-01 | 395840.67 | 91.10 | 100.00 | 66.54 |
| | | | | | PM2.5/Total | 2.5 | 0.204 |
| | | | | | PM10/Total | 10 | 49.996 |
| | | | | | TSP/Total | 30 | 94.717 |

# *South Cooling Tower Emissions*

| | Cooling Water Recirculation Rate (gpm) | Drift Rate fraction of Circulating Flow % | Total Drift Mass lb/min | Circulating Water Total Dissolved Solids (mg/l) | Circulating Water Total Dissolved Solids ($ppm_w$) |
|---|---|---|---|---|---|
| Note | 1 | 2 | 3 | 4 | |
| Cooling Tower | 12,800 | 0.02% | 21.4 | 3,000 | 3,000 |

| | Hourly Uncontrolled Particulate Emissions (lb/hr) | Annual Uncontrolled Particulate Emissions (tpy) | Hourly Uncontrolled TSP Emissions (lb/hr) | Annual Uncontrolled TSP Emissions (tpy) | Hourly Uncontrolled $PM_{10}$ Emissions (lb/hr) | Annual Uncontrolled $PM_{10}$ Emissions (tpy) | Hourly Uncontrolled $PM_{2.5}$ Emissions (lb/hr) | Annual Uncontrolled $PM_{2.5}$ Emissions (tpy) |
|---|---|---|---|---|---|---|---|---|
| Note | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 |
| Cooling Tower | 3.84 | 16.83 | 3.64 | 15.94 | 1.92 | 8.42 | 0.00783 | 0.0343 |

***Notes***

1 Cooling Tower Water Recirc rate based on site data: 3200 gpm* 4 pumps = 12,800 gpm
2 Uncontrolled circulating water flow percent drift estimated based on AP-42 factors for induced draft cooling towers (Table 13.4-1)
3 Total Drift Mass = Recirculation rate * Drift Rate Fraction * Drift Density (8.34 lb/gal)
4 TDS measured at 5,000 ppm as a conservative measure. Actual snapshot of concentration indicates TDS level of ~2,500 ppm.
5 Total particulate emission calculated using procedure described in Section 13.4 of AP-42 (01/95), Wet Cooling Towers.
PM = Water Circulation Rate * Drift Rate* Percent drift mass escape * TDS
Particulate Hourly Emissions:

$$\frac{12{,}800\text{ gal}}{\text{min}} \times \frac{60\text{ min}}{\text{hr}} \times \frac{0.0002\text{ gal drift}}{\text{gal recirculation}} \times 31.30\% \times \frac{8.34\text{ lb drift}}{\text{gal drift}} \times \frac{3000\text{ lb PM}}{10^6\text{ lb drift}} = \frac{3.84\text{ lb}}{\text{hr}}$$

Particulate annual emissions = Hourly emissions (lb/hr) * 8760 (hrs/yr) / 2000 (lb/ton)
6 Particle size distribution based on the following distribution (from Frisbie data)

***Particle Distribution***

| Particle | Mass % of Total Particulates | |
|---|---|---|
| TSP (PM 30) | 94.7 | Frisbie data |
| PM10 | 50.0 | Frisbie data |
| PM2.5 | 0.20 | Frisbie data |

*DCP Operating Company, LP - Linam Ranch Gas Plant*

# South Cooling Tower Frisbee Table

Facility TDS 5000

| EPRI Droplet Diameter (µm) | Droplet Volume (µm3 ) | Droplet Mass (µg) | Particle Mass (Solids) (µg) | Solid Particle Volume (µm3 ) | Solid Particle Diameter (µm) | EPRI % Mass Smaller | Interpolated Particulate Fraction based on facility TDS 3000 |
|---|---|---|---|---|---|---|---|
| 10 | 524 | 5.24E-04 | 4.03E-06 | 1.83 | 1.52 | 0.00 | 1.11 |
| 20 | 4189 | 4.19E-03 | 3.23E-05 | 14.66 | 3.04 | 0.20 | 2.22 |
| 30 | 14137 | 1.41E-02 | 1.09E-04 | 49.48 | 4.56 | 0.23 | 3.33 |
| 40 | 33510 | 3.35E-02 | 2.58E-04 | 117.29 | 6.07 | 0.51 | 4.44 |
| 50 | 65450 | 6.54E-02 | 5.04E-04 | 229.07 | 7.59 | 1.82 | 5.54 |
| 60 | 113097 | 1.13E-01 | 8.71E-04 | 395.84 | 9.11 | 5.70 | 6.65 |
| 70 | 179594 | 1.80E-01 | 1.38E-03 | 628.58 | 10.63 | 21.35 | 7.76 |
| 90 | 381704 | 3.82E-01 | 2.94E-03 | 1335.96 | 13.67 | 49.81 | 9.98 |
| 110 | 696910 | 6.97E-01 | 5.37E-03 | 2439.18 | 16.70 | 70.51 | 12.20 |
| 130 | 1150347 | 1.15E+00 | 8.86E-03 | 4026.21 | 19.74 | 82.02 | 14.42 |
| 150 | 1767146 | 1.77E+00 | 1.36E-02 | 6185.01 | 22.77 | 88.01 | 16.63 |
| 180 | 3053628 | 3.05E+00 | 2.35E-02 | 10687.7 | 27.33 | 91.03 | 19.96 |
| 210 | 4849048 | 4.85E+00 | 3.73E-02 | 16971.67 | 31.88 | 92.47 | 23.29 |
| 240 | 7238229 | 7.24E+00 | 5.57E-02 | 25333.8 | 36.44 | 94.09 | 26.61 |
| 270 | 10305995 | 1.03E+01 | 7.94E-02 | 36070.98 | 40.99 | 94.69 | 29.94 |
| 300 | 14137167 | 1.41E+01 | 1.09E-01 | 49480.08 | 45.55 | 96.29 | 33.27 |
| 350 | 22449298 | 2.24E+01 | 1.73E-01 | 78572.54 | 53.14 | 97.01 | 38.81 |
| 400 | 33510322 | 3.35E+01 | 2.58E-01 | 117286.13 | 60.73 | 98.34 | 44.36 |
| 450 | 47712938 | 4.77E+01 | 3.67E-01 | 166995.28 | 68.32 | 99.07 | 49.90 |
| 500 | 65449847 | 6.54E+01 | 5.04E-01 | 229074.46 | 75.92 | 99.07 | 55.45 |
| 600 | 113097336 | 1.13E+02 | 8.71E-01 | 395840.67 | 91.10 | 100.00 | 66.54 |

| | | |
|---|---|---|
| PM2.5/Total | 2.5 | 0.204 |
| PM10/Total | 10 | 49.996 |
| TSP/Total | 30 | 94.717 |

*DCP Operating Company, LP - Linam Ranch Gas Plant*

# Fugitive Emissions - Summary

Emission units: FUG

| Stream | VOC Fugitive Emissions (lb/hr) | VOC Fugitive Emissions (tpy) |
|---|---|---|
| Inlet Gas | 1.9 | 8.5 |
| Fuel Gas | 0.019 | 0.084 |
| Sweet Gas | 0.45 | 1.3 |
| Dry Gas | 0.39 | 1.7 |
| Residue Gas | 0.010 | 0.044 |
| Y-Grade Liquids | 0.31 | 1.3 |
| Natural Gas Liquids | 2.6 | 11 |
| Condensate | 3.8 | 17 |
| Refrigerant | 3.9 | 17 |
| Rich Amine | 0 | 0 |
| Project | 4.3 | 19 |
| **TOTALS** | **18** | **77** |

# Fugitive Emissions - Summary

Emission units: FUG

| Short-Term VOC Fugitive HAPs | | | | | | |
|---|---|---|---|---|---|---|
| **Stream** | **Hexane (lb/hr)** | **Benzene (lb/hr)** | **Toluene (lb/hr)** | **Ethylbenzene (lb/hr)** | **Xylenes (lb/hr)** | **Total VOC Fugitive HAPs (lb/hr)** |
| Inlet Gas | 0.019 | 0.0087 | 2.1E-03 | 4.3E-05 | 8.6E-05 | 0.030 |
| Fuel Gas | - | - | - | - | - | - |
| Sweet Gas | 0.040 | 0.00042 | 7.1E-04 | 3.7E-05 | 1.8E-04 | 0.042 |
| Dry Gas | 0.034 | 0.00036 | 6.1E-04 | 3.1E-05 | 1.6E-04 | 0.035 |
| Residue Gas | - | - | - | - | - | - |
| Y-Grade Liquids | 0.027 | 0.00015 | 2.5E-04 | 1.3E-05 | 6.4E-05 | 0.027 |
| Natural Gas Liquids | 1.1 | 0.00060 | 1.0E-03 | 5.2E-05 | 2.6E-04 | 1.1 |
| Condensate | 2.7 | 0.00089 | 1.5E-03 | 7.7E-05 | 3.8E-04 | 2.7 |
| Refrigerant | - | - | - | - | - | - |
| Rich Amine | - | - | - | - | - | - |
| Project | 1.3 | 0.0013 | 2.0E-04 | 1.1E-05 | 5.0E-05 | 1.3 |
| **TOTALS** | **5.1** | **0.012** | **0.006** | **0.000** | **0.001** | **5.2** |

| Long-term VOC Fugitive HAPs | | | | | | |
|---|---|---|---|---|---|---|
| **Stream** | **Hexane (tpy)** | **Benzene (tpy)** | **Toluene (tpy)** | **Ethylbenzene (tpy)** | **Xylenes (tpy)** | **Total VOC Fugitive HAPs (tpy)** |
| Inlet Gas | 0.083 | 0.038 | 0.0092 | 0.00019 | 0.00038 | 0.13 |
| Fuel Gas | - | - | - | - | - | - |
| Sweet Gas | 0.18 | 0.0018 | 0.0031 | 0.00016 | 0.00080 | 0.182 |
| Dry Gas | 0.15 | 0.0016 | 0.0027 | 0.00014 | 0.00068 | 0.155 |
| Residue Gas | - | - | - | - | - | - |
| Y-Grade Liquids | 0.12 | 0.00064 | 0.0011 | 0.00006 | 0.00028 | 0.119 |
| Natural Gas Liquids | 4.6 | 0.0026 | 0.0044 | 0.00023 | 0.0011 | 4.6 |
| Condensate | 12 | 0.0039 | 0.0066 | 0.00034 | 0.0017 | 12 |
| Refrigerant | - | - | - | - | - | - |
| Rich Amine | - | - | - | - | - | - |
| Project | 5.5 | 0.0057 | 0.00088 | 0.000047 | 0.00022 | 5.5 |
| **TOTALS** | **23** | **0.054** | **0.028** | **0.0012** | **0.0052** | **23** |

# Fugitive Emissions - Inlet Gas

| Inlet Gas Fugitives | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 680 | 0.0045 | 6.732 | 29.486 |
| Flanges/Connectors | 1771 | 0.00039 | 1.520 | 6.655 |
| Relief Valves | 31 | 0.0088 | 0.600 | 2.629 |
| Sample Points | 2 | 0.002 | 0.009 | 0.039 |
| Pump Seals | 1 | 0.0024 | 0.005 | 0.023 |
| Compressor Seals | 8 | 0.0088 | 0.155 | 0.678 |
| **TOTALS** | **2493** | | **9.021** | **39.510** |

| Inlet Gas Fugitives - Speciated | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Methane | 0.735375 | 16 | 12 | 53 | 4.8 | 20.88 |
| Ethane | 0.125872 | 30 | 3.8 | 17 | 1.5 | 6.7 |
| Propane | 0.061477 | 44 | 2.7 | 12 | 1.1 | 4.8 |
| Butanes | 0.023154 | 58 | 1.3 | 6.0 | 0.54 | 2.4 |
| Pentanes | 0.006754 | 72 | 0.49 | 2.2 | 0.20 | 0.87 |
| Hexanes+ | 0.0029 | 86 | 0.25 | 1.1 | 0.10 | 0.44 |
| Hydrogen Sulfide | 0.003803 | 34 | 0.13 | 0.58 | 0.053 | 0.23 |
| Other (Non-HC) | 0.040693 | 44 | 1.8 | 8.0 | 0.73 | 3.2 |
| **TOTALS** | **1.0000** | **385** | **22** | **100** | **9.0** | **40** |

VOC Emissions = Total Emissions-(Methane+Ethane+Hydrogen Sulfide+Other)

Hourly Emission Rate = **1.942 lb/hr**

Annual Emission Rate = **8.506 tpy**

Note: Based on DCP's recent 11/11/13 Linam Ranch inlet gas analysis from 11/6/13 sample

| Inlet Gas Fugitive HAPs | | | | | | |
|---|---|---|---|---|---|---|
| **HAP Component** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Wt. % of Stream** | **HAP Fugitive Emissions (lb/hr)** | **HAP Fugitive Emissions (tpy)** |
| Hexane | 0.000541 | 86.178 | 0.047 | 0.21 | 0.019 | 0.083 |
| Benzene | 0.000276 | 78.11 | 0.022 | 0.10 | 0.0087 | 0.038 |
| Toluene | 0.000056 | 92.14 | 0.0052 | 0.023 | 0.0021 | 0.0092 |
| Ethyl Benzene | 0.000001 | 106.17 | 0.00011 | 0.00048 | 0.000043 | 0.00019 |
| Xylenes | 0.000002 | 106.17 | 0.00021 | 0.0010 | 0.000086 | 0.00038 |
| **TOTALS** | 0.000876 | 469 | 0.074 | 0.33 | 0.030 | 0.13 |

Note: Based on DCP's recent 11/11/13 Linam Ranch inlet gas analysis from 11/6/13 sample

# Fugitive Emissions - Fuel Gas

| Fuel Gas Fugitives | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 377 | 0.0045 | 3.732 | 16.347 |
| Flanges/Connectors | 1256 | 0.00039 | 1.078 | 4.720 |
| Relief Valves | 38 | 0.0088 | 0.736 | 3.222 |
| Sample Points | 2 | 0.002 | 0.009 | 0.039 |
| Pump Seals | 0 | 0.0024 | 0.000 | 0.000 |
| Compressor Seals | 10 | 0.0088 | 0.194 | 0.848 |
| **TOTALS** | **1683** | | **5.748** | **25.176** |

| Fuel Gas Fugitives - Speciated | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Methane | 0.912431 | 16 | 14.599 | 82.53 | 4.744 | 20.777 |
| Ethane | 0.054849 | 30.1 | 1.651 | 9.33 | 0.536 | 2.350 |
| Propane | 0.00131 | 44.1 | 0.058 | 0.33 | 0.019 | 0.082 |
| Butanes | 0.000021 | 58.1 | 0.001 | 0.01 | 0.000 | 0.002 |
| Pentanes | - | 72.2 | - | - | - | - |
| Hexanes+ | - | 86.2 | - | - | - | - |
| Hydrogen Sulfide | - | 34.1 | - | - | - | - |
| Other (Non-HC) | 0.031389 | 44 | 1.381 | 7.81 | 0.449 | 1.966 |
| **TOTALS** | **1.00** | **384.80** | **17.69** | **100** | **5.748** | **25.176** |

VOC Emissions = Total Emissions-(Methane+Ethane+Hydrogen Sulfide+Other)

Hourly Emission Rate = **0.019 lb/hr**

Annual Emission Rate = **0.084 tpy**

Note: Based on DCP's recent 10/21/13 Linam Ranch fuel/residue gas analysis from 10/14/13 sample

| Fuel Gas Fugitive HAPs | | | |
|---|---|---|---|
| **HAP Component** | **Mole % of Stream** | **HAP Fugitive Emissions (lb/hr)** | **HAP Fugitive Emissions (tpy)** |
| Hexane | - | - | - |
| Benzene | - | - | - |
| Toluene | - | - | - |
| Ethyl Benzene | - | - | - |
| Xylenes | - | - | - |
| **TOTALS** | - | - | - |

Note: Based on DCP's recent 10/21/13 Linam Ranch fuel/residue gas analysis from 10/14/13 sample

# Fugitive Emissions - Sweet Gas

| **Sweet Gas Fugitives** | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 156 | 0.0045 | 1.544 | 6.764 |
| Flanges/Connectors | 318 | 0.00039 | 0.273 | 1.195 |
| Relief Valves | 0 | 0.0088 | 0.000 | 0.000 |
| Sample Points | 2 | 0.002 | 0.009 | 0.039 |
| Pump Seals | 0 | 0.0024 | 0.000 | 0.000 |
| Compressor Seals | 0 | 0.0088 | 0.000 | 0.000 |
| **TOTALS** | **476** | | **1.826** | **7.998** |

| **Sweet Gas Fugitives - Speciated** | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Methane | 0.7 | 16 | 11.200 | 47.73 | 0.871 | 3.817 |
| Ethane | 0.12 | 30.1 | 3.612 | 15.39 | 0.281 | 1.231 |
| Propane | 0.067 | 44.1 | 2.955 | 12.59 | 0.230 | 1.007 |
| Butanes | 0.028 | 58.1 | 1.627 | 6.93 | 0.127 | 0.554 |
| Pentanes | 0.01 | 72.2 | 0.722 | 3.08 | 0.056 | 0.246 |
| Hexanes+ | 0.006 | 86.2 | 0.517 | 2.20 | 0.040 | 0.176 |
| Hydrogen Sulfide | 0.007 | 34.1 | 0.239 | 1.02 | 0.019 | 0.081 |
| Other (Non-HC) | 0.059 | 44 | 2.596 | 11.06 | 0.202 | 0.885 |
| **TOTALS** | **1.00** | **384.80** | **23.47** | **100** | **1.826** | **7.998** |

VOC Emissions = Total Emissions-(Methane+Ethane+Hydrogen Sulfide+Other)
Hourly Emission Rate =1.826-(0.871+0.281+0.019+0.202) = **0.453 lb/hr**
Annual Emission Rate = 7.998-(3.817+1.231+0.081+0.885) = **1.255 tpy**

| **Sweet Gas Fugitive HAPs** | | | |
|---|---|---|---|
| **HAP Component** | **Wt. % of Stream** | **HAP Fugitive Emissions (lb/hr)** | **HAP Fugitive Emissions (tpy)** |
| Hexane | 2.2 | 0.040 | 0.176 |
| Benzene | 0.023 | 0.000 | 0.002 |
| Toluene | 0.039 | 0.001 | 0.003 |
| Ethyl Benzene | 0.002 | 0.000 | 0.000 |
| Xylenes | 0.01 | 0.000 | 0.001 |
| **TOTALS** | **2.274** | **0.042** | **0.182** |

Note 1: Hexane content estimated from fugitive speciation in previous spreadsheet
Note 2: BTEX Content of inlet gas stream from Table 4-6 GRI-HAP Calc Manual for NG. Speciation based on API/GRI bag study

# Fugitive Emissions - Dry Gas

| Dry Gas Fugitives | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 135 | 0.0045 | 1.337 | 5.854 |
| Flanges/Connectors | 261 | 0.00039 | 0.224 | 0.981 |
| Relief Valves | 0 | 0.0088 | 0.000 | 0.000 |
| Sample Points | 0 | 0.002 | 0.000 | 0.000 |
| Pump Seals | 0 | 0.0024 | 0.000 | 0.000 |
| Compressor Seals | 0 | 0.0088 | 0.000 | 0.000 |
| **TOTALS** | **396** | | **1.560** | **6.835** |

| Dry Gas Fugitives - Speciated | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Methane | 0.71 | 16 | 11.360 | 48.48 | 0.756 | 3.313 |
| Ethane | 0.12 | 30.1 | 3.612 | 15.41 | 0.241 | 1.054 |
| Propane | 0.068 | 44.1 | 2.999 | 12.80 | 0.200 | 0.875 |
| Butanes | 0.028 | 58.1 | 1.627 | 6.94 | 0.108 | 0.474 |
| Pentanes | 0.01 | 72.2 | 0.722 | 3.08 | 0.048 | 0.211 |
| Hexanes+ | 0.006 | 86.2 | 0.517 | 2.21 | 0.034 | 0.151 |
| Hydrogen Sulfide | 0 | 34.1 | 0.000 | 0.00 | 0.000 | 0.000 |
| Other (Non-HC) | 0.059 | 44 | 2.596 | 11.08 | 0.173 | 0.757 |
| **TOTALS** | **1.00** | **384.80** | **23.43** | **100** | **1.560** | **6.835** |

VOC Emissions = Total Emissions-(Methane+Ethane+Hydrogen Sulfide+Other)
Hourly Emission Rate =1.56-(0.756+0.241+0+0.173) = **0.39 lb/hr**
Annual Emission Rate = 6.835-(3.313+1.054+0+0.757) = **1.711 tpy**

| Dry Gas Fugitive HAPs | | | |
|---|---|---|---|
| **HAP Component** | **Wt. % of Stream** | **HAP Fugitive Emissions (lb/hr)** | **HAP Fugitive Emissions (tpy)** |
| Hexane | 2.2 | 0.034 | 0.150 |
| Benzene | 0.023 | 0.000 | 0.002 |
| Toluene | 0.039 | 0.001 | 0.003 |
| Ethyl Benzene | 0.002 | 0.000 | 0.000 |
| Xylenes | 0.01 | 0.000 | 0.001 |
| **TOTALS** | **2.274** | **0.035** | **0.155** |

Note 1: Hexane content estimated from fugitive speciation in previous spreadsheet
Note 2: BTEX Content of inlet gas stream from Table 4-6 GRI-HAP Calc Manual for NG. Speciation based on API/GRI bag study

# Fugitive Emissions - Residue Gas

| Residue Gas Fugitives | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 200 | 0.0045 | 1.980 | 8.672 |
| Flanges/Connectors | 694 | 0.00039 | 0.595 | 2.608 |
| Relief Valves | 18 | 0.0088 | 0.348 | 1.526 |
| Sample Points | 5 | 0.002 | 0.022 | 0.096 |
| Pump Seals | 0 | 0.0024 | 0.000 | 0.000 |
| Compressor Seals | 3 | 0.0088 | 0.058 | 0.254 |
| **TOTALS** | **920** | | **3.004** | **13.158** |

| Residue Gas Fugitives - Speciated | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Methane | 0.912431 | 16 | 14.599 | 82.53 | 2.479 | 10.858 |
| Ethane | 0.054849 | 30.1 | 1.651 | 9.33 | 0.280 | 1.228 |
| Propane | 0.00131 | 44.1 | 0.058 | 0.33 | 0.010 | 0.043 |
| Butanes | 0.000021 | 58.1 | 0.001 | 0.01 | 0.000 | 0.001 |
| Pentanes | - | 72.2 | - | - | - | - |
| Hexanes+ | - | 86.2 | - | - | - | - |
| Hydrogen Sulfide | - | 34.1 | - | - | - | - |
| Other (Non-HC) | 0.031389 | 44 | 1.381 | 7.81 | 0.235 | 1.027 |
| **TOTALS** | **1.00** | **384.80** | **17.69** | **100** | **3.004** | **13.158** |

VOC Emissions = Total Emissions-(Methane+Ethane+Hydrogen Sulfide+Other)

Hourly Emission Rate = **0.010 lb/hr**

Annual Emission Rate = **0.044 tpy**

Note: Based on DCP's recent 10/21/13 Linam Ranch fuel/residue gas analysis from 10/14/13 sample

| Residue Gas Fugitive HAPs | | | |
|---|---|---|---|
| **HAP Component** | **Mole % of Stream** | **HAP Fugitive Emissions (lb/hr)** | **HAP Fugitive Emissions (tpy)** |
| Hexane | - | - | - |
| Benzene | - | - | - |
| Toluene | - | - | - |
| Ethyl Benzene | - | - | - |
| Xylenes | - | - | - |
| **TOTALS** | - | - | - |

Note: Based on DCP's recent 10/21/13 Linam Ranch fuel/residue gas analysis from 10/14/13 sample

# Fugitive Emissions - Y-Grade

| **Y-Grade Fugitives** | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 95 | 0.0025 | 0.523 | 2.289 |
| Flanges/Connectors | 135 | 0.00021 | 0.062 | 0.273 |
| Relief Valves | 3 | 0.0075 | 0.050 | 0.217 |
| Sample Points | 6 | 0.00014 | 0.002 | 0.008 |
| Pump Seals | 0 | 0.013 | 0.000 | 0.000 |
| Compressor Seals | 0 | 0.0075 | 0.000 | 0.000 |
| **TOTALS** | **239** | | **0.636** | **2.787** |

| **Y-Grade Fugitives - Speciated** | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Methane | 0 | 16 | 0.000 | 0.00 | 0.000 | 0.000 |
| Ethane | 0.41 | 30.1 | 12.341 | 29.89 | 0.190 | 0.833 |
| Propane | 0.23 | 44.1 | 10.143 | 24.56 | 0.156 | 0.685 |
| Butanes | 0.095 | 58.1 | 5.520 | 13.37 | 0.085 | 0.372 |
| Pentanes | 0.034 | 72.2 | 2.455 | 5.94 | 0.038 | 0.166 |
| Hexanes+ | 0.02 | 86.2 | 1.724 | 4.18 | 0.027 | 0.116 |
| Hydrogen Sulfide | 0.022 | 34.1 | 0.750 | 1.82 | 0.012 | 0.051 |
| Other (Non-HC) | 0.19 | 44 | 8.360 | 20.25 | 0.129 | 0.564 |
| **TOTALS** | **1.00** | **384.80** | **41.29** | **100** | **0.636** | **2.787** |

VOC Emissions = Total Emissions-(Methane+Ethane+Hydrogen Sulfide+Other)

Hourly Emission Rate =0.636-(0+0.190+0.012+0.129) = **0.305 lb/hr**

Annual Emission Rate = 2.787-(0+0.833+0.051+0.564) = **1.339 tpy**

| **Y-Grade Fugitive HAPs** | | | |
|---|---|---|---|
| **HAP Component** | **Wt. % of Stream** | **HAP Fugitive Emissions (lb/hr)** | **HAP Fugitive Emissions (tpy)** |
| Hexane | 4.18 | 0.027 | 0.116 |
| Benzene | 0.023 | 0.000 | 0.001 |
| Toluene | 0.039 | 0.000 | 0.001 |
| Ethyl Benzene | 0.002 | 0.000 | 0.000 |
| Xylenes | 0.01 | 0.000 | 0.000 |
| **TOTALS** | **4.254** | **0.027** | **0.119** |

Note 1: Hexane content estimated from fugitive speciation in previous spreadsheet

Note 2: BTEX Content of inlet gas stream from Table 4-6 GRI-HAP Calc Manual for NG. Speciation based on API/GRI bag study

# Fugitive Emissions - Natural Gas Liquids

| Natural Gas Liquids Fugitives | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 340 | 0.0025 | 1.870 | 8.191 |
| Flanges/Connectors | 767 | 0.00021 | 0.354 | 1.552 |
| Relief Valves | 9 | 0.0075 | 0.149 | 0.650 |
| Sample Points | 4 | 0.00014 | 0.001 | 0.005 |
| Pump Seals | 8 | 0.013 | 0.229 | 1.002 |
| Compressor Seals | 0 | 0.0075 | 0.000 | 0.000 |
| **TOTALS** | **1128** | | **2.603** | **11.401** |

| Natural Gas Liquids Fugitives - Speciated | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Methane | 0 | 16 | 0.000 | 0.00 | 0.000 | 0.000 |
| Ethane | 0.01 | 30.1 | 0.301 | 0.49 | 0.013 | 0.056 |
| Propane | 0.4 | 44.1 | 17.640 | 28.55 | 0.743 | 3.255 |
| Butanes | 0.2 | 58.1 | 11.620 | 18.81 | 0.490 | 2.144 |
| Pentanes | 0.1 | 72.2 | 7.220 | 11.69 | 0.304 | 1.332 |
| Hexanes+ | 0.29 | 86.2 | 24.998 | 40.46 | 1.053 | 4.613 |
| Hydrogen Sulfide | 0 | 34.1 | 0.000 | 0.00 | 0.000 | 0.000 |
| Other (Non-HC) | 0 | 44 | 0.000 | 0.00 | 0.000 | 0.000 |
| **TOTALS** | **1.00** | **384.80** | **61.78** | **100** | **2.603** | **11.401** |

VOC Emissions = Total Emissions-(Methane+Ethane+Hydrogen Sulfide+Other)
Hourly Emission Rate = 2.603-(0+0.013+0+0) = **2.59 lb/hr**
Annual Emission Rate = 11.401-(0+0.056+0+0) = **11.345 tpy**

| Natural Gas Liquids Fugitive HAPs | | | |
|---|---|---|---|
| **HAP Component** | **Wt. % of Stream** | **HAP Fugitive Emissions (lb/hr)** | **HAP Fugitive Emissions (tpy)** |
| Hexane | 40.5 | 1.054 | 4.617 |
| Benzene | 0.023 | 0.001 | 0.003 |
| Toluene | 0.039 | 0.001 | 0.004 |
| Ethyl Benzene | 0.002 | 0.000 | 0.000 |
| Xylenes | 0.01 | 0.000 | 0.001 |
| **TOTALS** | **40.574** | **1.056** | **4.626** |

Note 1: Hexane content estimated from fugitive speciation in previous spreadsheet
Note 2: BTEX Content of inlet gas stream from Table 4-6 GRI-HAP Calc Manual for NG. Speciation based on API/GRI bag study

## Fugitive Emissions - Condensate

| Condensate Fugitives | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 419 | 0.0025 | 2.305 | 10.094 |
| Flanges/Connectors | 1172 | 0.00021 | 0.541 | 2.372 |
| Relief Valves | 12 | 0.0075 | 0.198 | 0.867 |
| Sample Points | 10 | 0.00014 | 0.003 | 0.013 |
| Pump Seals | 28 | 0.013 | 0.801 | 3.508 |
| Compressor Seals | | 0.0075 | 0.000 | 0.000 |
| **TOTALS** | **1641** | | **3.848** | **16.854** |

| Condensate Fugitives - Speciated | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Methane | 0 | 16 | 0.000 | 0.00 | 0.000 | 0.000 |
| Ethane | 0.007 | 30.1 | 0.211 | 0.27 | 0.010 | 0.045 |
| Propane | 0.031 | 44.1 | 1.367 | 1.75 | 0.067 | 0.294 |
| Butanes | 0.11 | 58.1 | 6.391 | 8.16 | 0.314 | 1.376 |
| Pentanes | 0.21 | 72.2 | 15.162 | 19.36 | 0.745 | 3.264 |
| Hexanes+ | 0.64 | 86.2 | 55.168 | 70.46 | 2.711 | 11.875 |
| Hydrogen Sulfide | 0 | 34.1 | 0.000 | 0.00 | 0.000 | 0.000 |
| Other (Non-HC) | 0 | 44 | 0.000 | 0.00 | 0.000 | 0.000 |
| **TOTALS** | **1.00** | **384.80** | **78.30** | **100** | **3.848** | **16.854** |

VOC Emissions = Total Emissions-(Methane+Ethane+Hydrogen Sulfide+Other)
Hourly Emission Rate = 3.848-(0+0.010+0+0) = **3.838 lb/hr**
Annual Emission Rate = 16.854-(0+0.045+0+0) = **16.809 tpy**

| Condensate Fugitive HAPs | | | |
|---|---|---|---|
| **HAP Component** | **Wt. % of Stream** | **HAP Fugitive Emissions (lb/hr)** | **HAP Fugitive Emissions (tpy)** |
| Hexane | 70.3 | 2.705 | 11.848 |
| Benzene | 0.023 | 0.001 | 0.004 |
| Toluene | 0.039 | 0.002 | 0.007 |
| Ethyl Benzene | 0.002 | 0.000 | 0.000 |
| Xylenes | 0.01 | 0.000 | 0.002 |
| **TOTALS** | **70.374** | **2.708** | **11.861** |

Note 1: Hexane content estimated from fugitive speciation in previous spreadsheet
Note 2: BTEX Content of inlet gas stream from Table 4-6 GRI-HAP Calc Manual for NG. Speciation based on API/GRI bag study

# Fugitive Emissions - Amine

| Amine Fugitives | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 419 | 0.0025 | 2.305 | 10.094 |
| Flanges/Connectors | 1172 | 0.00021 | 0.541 | 2.372 |
| Relief Valves | 12 | 0.0075 | 0.198 | 0.867 |
| Sample Points | 10 | 0.0014 | 0.031 | 0.135 |
| Pump Seals | 28 | 0.013 | 0.801 | 3.508 |
| Compressor Seals | | 0.0075 | 0.000 | 0.000 |
| **TOTALS** | **1641** | | **3.876** | **16.975** |

| Amine Fugitives - Speciated | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Propane | 1 | 44.1 | 44.100 | 100.00 | 3.876 | 16.975 |
| **TOTALS** | **1.00** | **44.10** | **44.10** | **100** | **3.876** | **16.975** |

VOC Emissions = Total Emissions

Hourly Emission Rate = **3.876 lb/hr**

Annual Emission Rate = **16.975 tpy**

# Fugitive Emissions - Rich Amine

| **Rich Amine Fugitives** | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 72 | 0.0025 | 0.396 | 1.734 |
| Flanges/Connectors | 2 | 0.00021 | 0.001 | 0.004 |
| Relief Valves | 0 | 0.0075 | 0.000 | 0.000 |
| Open Ends | 0 | 0.0014 | 0.000 | 0.000 |
| Pump Seals | 0 | 0.013 | 0.000 | 0.000 |
| Compressor Seals | 0 | 0.0075 | 0.000 | 0.000 |
| **TOTALS** | **74** | | **0.397** | **1.739** |

| **Rich Amine Fugitives - Speciated** | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Monoethanolamine | 0.213 | 105.1 | 22.386 | 58.85 | 0.234 | 1.023 |
| Hydrogen Sulfide | 0.018 | 34.1 | 0.614 | 1.61 | 0.006 | 0.028 |
| Carbon Dioxide | 0.046 | 44.1 | 2.029 | 5.33 | 0.021 | 0.093 |
| Water | 0.723 | 18 | 13.014 | 34.21 | 0.136 | 0.595 |
| **TOTALS** | **1.00** | **201.30** | **38.04** | **100** | **0.397** | **1.739** |

Note 1: MEA is not a HAP; therefore, there are no HAP fugitives associated with the Rich Amine System.
Note 2: MEA is not significant (VP<10 mm Hg). Fugitives were calculated for rich amine only top obtain H2S
H2S is significant (VP>10 mm Hg).

# Fugitive Emissions - Acid Gas

| Acid Gas Fugitives | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 548 | 0.0045 | 5.425 | 23.762 |
| Flanges/Connectors | 2083 | 0.00039 | 1.787 | 7.828 |
| Relief Valves | 18 | 0.0088 | 0.348 | 1.526 |
| Sample Points | 9 | 0.002 | 0.040 | 0.173 |
| Pump Seals | 0.0E+00 | 0.0024 | 0.0E+00 | 0.0E+00 |
| Compressor Seals | 10 | 0.0088 | 0.194 | 0.848 |
| **TOTALS** | **2668** | | **7.794** | **34.138** |

| ***ACID GAS*** | ***TOTAL*** |
|---|---|
| VALVES | 548 |
| FLANGES | 788 |
| SCREWED CONNECTIONS | 1228 |
| PRV'S | 18 |
| UNIONS | 67 |
| COMPRESSOR SEALS | 10 |
| SAMPLE POINTS | 9 |

| Acid Gas Fugitives - Speciated | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Methane | 0.0036 | 16 | 0.058 | 0.14 | 0.011 | 0.047 |
| Ethane | 0.0008 | 30.1 | 0.024 | 0.06 | 0.004 | 0.020 |
| Hydrogen Sulfide | 0.1871 | 34.1 | 6.380 | 15.14 | 1.18 | 5.17 |
| Carbon Dioxide | 0.8065 | 44.1 | 35.567 | 84.40 | 6.58 | 28.81 |
| Propane | 0.0003 | 44.1 | 0.013 | 0.03 | 0.002 | 0.011 |
| Butanes | 0.0008 | 58.1 | 0.046 | 0.11 | 0.009 | 0.038 |
| Pentanes | 0.00014 | 72.2 | 0.010 | 0.02 | 0.002 | 0.008 |
| Hexanes+ | 0.0005 | 86.2 | 0.043 | 0.10 | 0.008 | 0.035 |
| **TOTALS** | **1.00** | **124.30** | **42.03** | **100.00** | **7.79** | **34.14** |

VOC Emissions = (Propane+Butanes+Pentanes+Hexanes)
Hourly Emission Rate = 0.021
Annual Emission Rate = 0.091

Based on DCP's recent 11/1/13 Linam Ranch Acid Gas Analysis

## Fugitive Emissions - Sour Water

| Sour Water Fugitives | | | | |
|---|---|---|---|---|
| **Component** | **No. of Components** | **EPA Component Emission Factor (kg/hr/source)** | **THC Fugitive Emissions (lb/hr)** | **THC Fugitive Emissions (tpy)** |
| Valves | 45 | 0.0025 | 0.25 | 1.084 |
| Flanges/Connectors | 135 | 0.00021 | 0.062 | 0.273 |
| Relief Valves | 3 | 0.0075 | 0.050 | 0.217 |
| Sample Points | 2 | 0.0014 | 0.0062 | 0.027 |
| Pump Seals | 0.0E+00 | 0.013 | 0.0E+00 | 0.0E+00 |
| Compressor Seals | 0.0E+00 | 0.0075 | 0.0E+00 | 0.0E+00 |
| **TOTALS** | **185** | | **0.366** | **1.601** |

| ***SOUR WATER*** | ***TOTAL*** |
|---|---|
| VALVES | 45 |
| FLANGES | 31 |
| SCREWED CONNECTIONS | 82 |
| PRV'S | 3 |
| UNIONS | 22 |
| COMPRESSOR SEALS | 0 |
| SAMPLE POINTS | 2 |

| Sour Water Fugitives - Speciated | | | | | | |
|---|---|---|---|---|---|---|
| **Compound** | **Mole Fraction** | **Molecular Weight** | **Weight Per Mole** | **Weight %** | **Fugitive Emissions (lb/hr)** | **Fugitive Emissions (tpy)** |
| Methane | 0.0036 | 16 | 0.058 | 0.14 | 5.0E-04 | 0.002 |
| Ethane | 0.0008 | 30 | 0.024 | 0.057 | 2.1E-04 | 0.001 |
| Hydrogen Sulfide | 0.1871 | 34 | 6.4 | 15 | 5.5E-02 | 0.242 |
| Carbon Dioxide | 0.8065 | 44 | 36 | 84 | 3.1E-01 | 1.351 |
| Propane | 0.0003 | 44 | 0.013 | 0.031 | 1.1E-04 | 0.001 |
| Butanes | 0.0008 | 58 | 0.046 | 0.11 | 4.0E-04 | 0.002 |
| Pentanes | 0.00014 | 72 | 0.010 | 0.023 | 8.5E-05 | 0.000 |
| Hexanes+ | 0.0005 | 86 | 0.043 | 0.10 | 3.7E-04 | 0.002 |
| **TOTALS** | **1.00** | **124.30** | **42.03** | **100.00** | **0.366** | **1.601** |

VOC Emissions = (Propane+Butanes+Pentanes+Hexanes)
Hourly Emission Rate = 0.001
Annual Emission Rate = 0.004

Based on DCP's recent 11/1/13 Linam Ranch Acid Gas Analysis

**COMPONENTS AND NET VOC and GHG FUGITIVE EMISSIONS BY UNIT / SERVICE / COMPONENT**
**DCP Operating, Linam Ranch Gas Plant**

*Number of Components*

| | **Gas** | | | | | **Light Oil** | | | | | **Water / Oil** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | Valves | Pumps | Others | Connectors | Flanges | Valves | Pumps | Others | Connectors | Flanges | Valves | Pumps | Others | Connectors | Flanges |
| Inlet System | 29 | 0 | 34 | 0 | 95 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dual Service | 16 | 0 | 24 | 0 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turbine | 30 | 0 | 40 | 0 | 110 | 12 | 6 | 18 | 0 | 30 | 0 | 0 | 0 | 0 | 0 |
| Amine System | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 4 | 28 | 0 | 42 |
| VRU | 22 | 1 | 29 | 0 | 70 | 47 | 2 | 30 | 0 | 130 | 0 | 0 | 0 | 0 | 0 |
| Turboexpander | 12 | 0 | 20 | 0 | 40 | 16 | 2 | 20 | 0 | 40 | 0 | 0 | 0 | 0 | 0 |
| **Totals** | 109 | 1 | 147 | 0 | 355 | 75 | 10 | 68 | 0 | 200 | 17 | 4 | 28 | 0 | 42 |
| Emission Factor (lb/hr/component) | 9.99E-03 | 5.29E-03 | 1.94E-02 | 4.41E-04 | 8.60E-04 | 5.51E-03 | 2.87E-02 | 1.65E-02 | 4.63E-04 | 2.43E-04 | 2.16E-04 | 5.29E-05 | 3.09E-02 | 2.43E-04 | 6.39E-06 |

*Emission by Unit / Service / Component, lbs/hr*

| | **Gas** | | | | | **Light Oil** | | | | | **Water / Oil** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | Valves | Pumps | Others | Connectors | Flanges | Valves | Pumps | Others | Connectors | Flanges | Valves | Pumps | Others | Connectors | Flanges |
| Inlet System | 0.2896 | | 0.6596 | | 0.0817 | | | | | | | | | | |
| Dual Service | 0.1598 | | 0.4656 | | 0.0344 | | | | | | | | | | |
| Turbine | 0.2996 | | 0.7760 | | 0.0946 | 0.0661 | 0.1720 | 0.2976 | | 0.0073 | | | | | |
| Amine System | | | | | | | | | | | 0.0037 | 0.0002 | 0.8642 | | 0.0003 |
| VRU | 0.2197 | 0.0053 | 0.5626 | | 0.0602 | 0.2590 | 0.0573 | 0.4960 | | 0.0315 | | | | | |
| Turboexpander | 0.1198 | | 0.3880 | | 0.0344 | 0.0882 | 0.0573 | 0.3307 | | 0.0097 | | | | | |
| **Total Service / Component (lb/hr)** | 1.0886 | 0.0053 | 2.8519 | 0.0000 | 0.3052 | 0.4134 | 0.2866 | 1.1243 | 0 | 0.0485 | 0.0037 | 0.0002 | 0.8642 | 0.0000 | 0.0003 |

[1] Based on information provided by DCP personnel February 2011 ("Components" spreadsheet, REV-07)

| | **VOC** | | **GHG** | | **Hexane** | | **Benzene** | | **Toluene** | | **Ethylbenzene** | | **Xylenes** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | **fraction** | **lb/hr** | **fraction** | **lb/hr** | **fraction** | **lb/hr** | **fraction** | **lb/hr** | **fraction** | **lb/hr** | **fraction** | **lb/hr** | **fraction** | **lb/hr** |
| Inlet System | 0.25 | **0.26** | 0.75 | **0.78** | 0.022 | **0.023** | 0.00023 | **2.37E-04** | 0.00039 | **4.02E-04** | 0.00002 | **2.06E-05** | 0.00010 | **1.03E-04** |
| Dual Service | 0.25 | **0.16** | 0.75 | **0.50** | 0.022 | **0.015** | 0.00023 | **1.52E-04** | 0.00039 | **2.57E-04** | 0.00002 | **1.32E-05** | 0.00010 | **6.60E-05** |
| Turbine | 0.25 | **0.29** | 0.75 | **0.88** | 0.022 | **0.038** | 0.00023 | **3.94E-04** | 0.00039 | **6.68E-04** | 0.00002 | **3.43E-05** | 0.00010 | **1.71E-04** |
| Turbine - Lube Oil | 1.00 | **0.54** | | | | | | | | | | | | |
| Amine System | 1.00 | **0.87** | | | | | | | | | | | | |
| VRU | 1.00 | **1.69** | | | 0.703 | **1.189** | 0.00023 | **3.89E-04** | 0.00039 | **6.60E-04** | 0.00002 | **3.38E-05** | 0.00010 | **1.69E-04** |
| Turboexpander - Lube Oil | 1.00 | **0.49** | | | | | | | | | | | | |
| Turboexpander | 0.05 | **0.03** | 0.95 | **0.52** | | | 0.00023 | **1.25E-04** | 0.00039 | **2.11E-04** | 0.00002 | **1.08E-05** | 0.00010 | **5.42E-05** |
| **Total Service / Component (lb/hr)** | | **4.32** | | **2.66** | | **1.26** | | **1.30E-03** | | **2.20E-03** | | **1.13E-04** | | **5.64E-04** |

| | **VOC** | **GHG** | |
|---|---|---|---|
| **Total Net Change** | **4.32** | **2.66** | **lb/hr** |
| | **18.94** | **11.67** | **tpy** |

**$H_2S$ FUGITIVE EMISSIONS using PETROLEUM INDUSTRY LEAK RATE/SCREENING VALUE CORRELATIONS**
**DCP Operating, Linam Ranch Gas Plant**

Number of Components

| | Gas | | | | | Water / Oil | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Unit | Valves | Pumps | Others | Connectors | Flanges | Valves | Pumps | Others | Connectors | Flanges |
| Acid Gas | 548 | 0 | 37 | 1295 | 788 | 0 | 0 | 0 | 0 | 0 |
| Sour Water | 0 | 0 | 0 | 0 | 0 | 45 | 0 | 5 | 104 | 31 |
| Totals | 593 | 0 | 42 | 1399 | 819 | | | | | |

SV (Screening Value)= 35 ppmv[1]
Components in simultaneous service. 50%

| Component | Number of Components | Correlation Factor (kg/hr) | Exponent | EPA Component Emission Factor[2] (kg/hr/source) | $H_2S$ Fugitive Emissions (lb/hr) | $H_2S$ Fugitive Emissions (tpy) |
|---|---|---|---|---|---|---|
| Valves/all | 593 | 2.29E-06 | 0.746 | 3.25E-05 | 0.021 | 0.093 |
| Pump seals/a | 0 | 5.03E-05 | 0.610 | 4.40E-04 | 0.000 | 0.000 |
| Others | 42 | 1.36E-05 | 0.589 | 1.10E-04 | 0.005 | 0.022 |
| Connectors/a | 1399 | 1.53E-06 | 0.735 | 2.09E-05 | 0.032 | 0.141 |
| Flanges/all | 819 | 4.61E-06 | 0.703 | 5.61E-05 | 0.051 | 0.222 |
| Open-ended l | 0 | 2.20E-06 | 0.704 | 2.69E-05 | 0.000 | 0.000 |
| Totals | | | | | 0.109 | 0.478 |

1 In-plant monitors are set at 10 ppm. Therefore, DCP is conservatively estimating emissions by assuming a screening value (correlated to leakage rate) for each component is 35 ppmv. Some components may leak at higher rates, but most will leak at lower rates. concentration and represents a further conservative assumption.

2

EPA Protocol for Equipment Leak Emission Estimates (November, 1995, Publication No. EPA-453 /R-95-017), Table 2-10.

3 Allocation of emissions to volume sources used in modeling.

| | Frac. Total | Emission rate |
|---|---|---|
| AGI Compression | 0.4 | 0.044 |
| AGI well or AGI Flare | 0.1 | 0.011 |
| Plant Compression | 0.4 | 0.044 |
| Plant pipe | 0.1 | 0.011 |

# SSM Calculations

**DCP Operating Company, LP**
**Linam Ranch Gas Plant**
**SSM & M ACTIVITY EMISSIONS SUMMARY**

| Activity/Unit | | NOx | | CO | | VOCs | | SOx | | PM10 | | PM2.5 | | $H_2S$ | | Total HAPs | | $CO_2e$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| SSM Venting | Plant turnaround | - | - | - | - | 3,029.49 | 14.50 | - | - | - | - | - | - | 0.19 | 9.5E-05 | 0.11 | 5.4E-05 | - | 21.63 |
| SSM Venting | Plant Startup (post turnaround) | - | - | - | - | 1,990.00 | 6.96 | - | - | - | - | - | - | 53.77 | 0.19 | 30.56 | 0.11 | - | 429.23 |
| SSM Venting | Condensate Tank Degassing (5% VRU Downtime) | - | - | - | - | 27.54 | 6.03 | - | - | - | - | - | - | - | - | 10.49 | 2.30 | - | - |
| SSM Venting | Condensate Tank Degassing (5% VRUTMP Downtime) | - | - | - | - | 24.56 | 5.38 | - | - | - | - | - | - | - | - | 9.36 | 2.05 | - | - |
| SSM Venting | Gas Piping Degassing (meter proving and line isolation) | - | - | - | - | 7.59 | 0.14 | - | - | - | - | - | - | 0.20 | 0.0037 | 0.12 | 0.0021 | - | 8.42 |
| SSM Venting | Pigging | - | - | - | - | 4.47 | 0.12 | - | - | - | - | - | - | 0.12 | 0.0031 | 0.069 | 0.0018 | - | 7.16 |
| SSM Venting | Vacuum Trucks (All Tank Cleanout) | - | - | - | - | 72.00 | 0.093 | - | - | - | - | - | - | 1.95 | 0.0025 | 1.11 | 0.0014 | - | 5.71 |
| SSM Venting | Engine Startup[1] | - | - | - | - | 0.034 | 0.0030 | - | - | - | - | - | - | - | - | - | - | - | 18.77 |
| SSM Venting | Turbine Blowdown[1] | - | - | - | - | 203.79 | 1.14 | - | - | - | - | - | - | 5.51 | 0.066 | 3.13 | 0.020 | - | 67.88 |
| SSM Venting | Compressor Blowdown[1] | - | - | - | - | 31.64 | 1.90 | - | - | - | - | - | - | 0.85 | 0.051 | 0.49 | 0.029 | - | 117.01 |
| SSM Venting | **SSM Venting Total** | - | - | - | - | 5,391.12 | 36.26 | - | - | - | - | - | - | 62.59 | 0.31 | 55.41 | 4.51 | - | 675.81 |
| Unit 2- E. Amine Acid Gas Flare | | 14.80 | 0.88 | 80.51 | 4.77 | 1.56 | 0.0090 | 7,751.21 | 45.59 | - | - | - | - | 84.02 | 0.48 | 0.62 | 0.0036 | - | 136.78 |
| AGI Flare | | 17.75 | 0.71 | 96.59 | 44.39 | 1.87 | 8.0E-04 | 9,301.45 | 4.13 | - | - | - | - | 100.83 | 0.043 | 0.75 | 0.75 | - | 0.20 |
| Unit 4A - ESD Flare | | 287.65 | 4.33 | 1,565.15 | 23.57 | 862.27 | 7.35 | 2,148.40 | 18.91 | - | - | - | - | 23.29 | 0.20 | 14.55 | 0.12 | - | 4,500.20 |
| **SSM Emission Totals** | | **320.20** | **5.92** | **1,742.25** | **72.73** | **6,021.35** | **43.63** | **19,201.06** | **68.64** | **-** | **-** | **-** | **-** | **270.73** | **1.04** | **71.33** | **5.38** | **-** | **5,312.98** |

[1] Hourly emission rate shown for informational purposes only and not included in hourly total limit; emissions were calculated assuming each activity lasts 1 hour.

| Unit | NOx | | CO | | VOCs | | SOx | | PM10 | | PM2.5 | | $H_2S$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| Malfunction | 287.65 | 10.00 | 1,565.15 | 10.00 | 3,029.49 | 10.00 | 9,301.45 | 10.00 | - | - | - | - | 100.83 | 10.00 |
| **Malfunction Total** | **287.65** | **10.00** | **1,565.15** | **10.00** | **3,029.49** | **10.00** | **9,301.45** | **10.00** | **-** | **-** | **-** | **-** | **100.83** | **10.00** |

The highest hourly emission rates above are used for malfunction activities.

| Unit | NOx | | CO | | VOCs | | SOx | | PM10 | | PM2.5 | | $H_2S$ | | Total HAPs | | $CO_2e$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| **SSM & Malfunction Emisson Totals** | **320.20** | **15.92** | **1,742.25** | **82.73** | **6,021.35** | **53.63** | **19,201.06** | **78.64** | **-** | **-** | **-** | **-** | **270.73** | **11.04** | **71.33** | **5.38** | **-** | **5,312.98** |

Total annual SSM & Malfunction emissions includes annual SSM plus annual malfunction emissions. Hourly SSM & malfunction emissions are the highest of hourly SSM or malfunction emission rates.

**DCP Operating Company, LP - Linam Ranch Gas Plant**

## Inlet Gas Analysis

Inlet: M0500#

| Component | MW | Mol% | MW * vol % | Mass Fraction |
|---|---|---|---|---|
| Water | 18.02 | 0.00% | 0.0000 | 0.00% |
| Nitrogen | 28.01 | 2.46% | 0.6894 | 3.15% |
| Argon/Oxygen | 31.99 | 0.00% | 0.0000 | 0.00% |
| Carbon Dioxide | 44.01 | 1.61% | 0.7079 | 3.23% |
| Hydrogen Sulfide | 34.08 | 0.38% | 0.1296 | 0.59% |
| Methane | 16.04 | 73.54% | 11.7976 | 53.85% |
| Ethane | 30.07 | 12.59% | 3.7850 | 17.28% |
| Propane | 44.10 | 6.15% | 2.7110 | 12.37% |
| i-Butane | 58.12 | 0.70% | 0.4046 | 1.85% |
| n-Butane | 58.12 | 1.62% | 0.9412 | 4.30% |
| i- & n-Pentane | 72.15 | 0.65% | 0.4670 | 2.13% |
| Cyclopentane | 70.14 | 0.028% | 0.0197 | 0.0900% |
| C6 HCs | 86.18 | 0.15% | 0.1281 | 0.58% |
| C7 HCs | 100.21 | 0.04% | 0.0445 | 0.20% |
| C8 HCs | 114.23 | 0.01% | 0.0059 | 0.03% |
| C9 HCs | 128.26 | 0.001% | 0.0017 | 0.01% |
| n-Hexane | 86.18 | 0.05% | 0.0466 | 0.21% |
| Benzene | 78.11 | 0.028% | 0.0216 | 0.10% |
| Toluene | 92.14 | 0.006% | 0.0052 | 0.02% |
| Ethyl Benzene | 106.17 | 0.0001% | 0.0001 | 0.0005% |
| Xylenes | 106.17 | 0.0002% | 0.0002 | 0.001% |
| Total | | 100% | 21.91 | 100% |

[1] *Compostion is based on Linam M0500# inlet gas analysis dated 11/11/13*

MW of Gas = 21.9068

Weight % VOCs = 22%

Universal Gas Content = 379.4 scf/lb-mol @ 60 F and 14.696 psia

**Atmospheric Pressure**

| | | | |
|---|---|---|---|
| Site Elevation | 3710 | ft MSL | |
| Site Air Pressure | 26.10 | in Hg | Calculated based on elevation |
| Site Air Pressure | 12.82 | psia | Conversion factor |

**DCP Operating Company, LP - Linam Ranch Gas Plant**

## Fuel Gas Analysis

Inlet: Residue/Fuel Gas Analysis

| Component | MW | Mol% | MW * wet vol % | Mass Fraction (wet) |
|---|---|---|---|---|
| Water | 18.02 | 0.0000% | 0.0000 | 0.00% |
| Nitrogen | 28.01 | 3.1359% | 0.8785 | 5.10% |
| Argon/Oxygen | 31.99 | 0.0000% | 0.0000 | 0.00% |
| Carbon Dioxide | 44.01 | 0.0030% | 0.0013 | 0.01% |
| Hydrogen Sulfide | 34.08 | 0.0000% | 0.0000 | 0.00% |
| Methane | 16.04 | 91.2431% | 14.6381 | 84.98% |
| Ethane | 30.07 | 5.4849% | 1.6493 | 9.57% |
| Propane | 44.10 | 0.1310% | 0.0578 | 0.34% |
| i-Butane | 58.12 | 0.0012% | 0.0007 | 0.00% |
| n-Butane | 58.12 | 0.0009% | 0.0005 | 0.00% |
| i-Pentane | 72.15 | 0.0000% | 0.0000 | 0.00% |
| n-Pentane | 72.15 | 0.0000% | 0.0000 | 0.00% |
| Hexanes + | 86.18 | 0.0000% | 0.0000 | 0.00% |
| Total | | 100% | 17.23 | 100% |

[1] *Composition is based on the 10/21/13 Linam Ranch Fuel Gas extended analysis*

## DCP Operating Company, LP - Linam Ranch Gas Plant
## SAMPLE EMISSIONS CALCULATIONS -TURNAROUND EMISSIONS

**Calculation Basis:**

Multiple steps comprise a plant turnaround. Step 1 - For the natural gas system, emissions to the atmosphere after opening pipelines are calculated using the Ideal Gas Law and are based on the entire pipe volume venting to the atmosphere at pipeline pressure. Step 2 - For systems in liquid service clingage emissions degassing emissions occur after the system is de-inventoried. Degassing emissions are calculated using the Ideal Gas Law. Step 3 - After systems are degassed and opened, residual materials (clingage) may be emitted to the atmosphere. Clingage emissions are estiamted using system volumes and an assumed clingage amount.

Total lb/hr emissions from each liquid system turnaround step (degassing, clingage) assume that any liquid system may undergo turnaround at any time. Maximum lb/hr emissions from all turnaround steps is calculated as the maximum lb/hr emission rate from any step.

**Constants and Variables:**

| | System/Service Name | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N.G. (gas) | Glycol | Lube oil | Amine | NGL Product | Propane (liq) | Methanol | Condensate | | |
| fluid type (@ atm): | Gas | Liquid | Liquid | Liquid | Gas | Gas | Liquid | Liquid | | |
| Volume: | 3,549,116 | 3,997 | 220,925 | 14,150 | 107,397 | 6,280 | 4,807 | 2,203 | scf (for N.G.), gal (for liquids) | |
| Process Temperature : | 95.00 | | | | | | | | ° F | |
| Ideal Gas Constant : | 10.73 | | | | | | | | ($ft^3$)(psi)/(lbmol)(°R) | |
| Density: | 0.0578 | 9.28 | 7.50 | 8.66 | 0.23 | 0.20 | 6.66 | 6.00 | lb/scf (for gas), lb/gal (for liquid) - from DCP turnaround quantity calculations | |
| Vapor Pressure: | N/A | 0.001 | 0.010 | 0.002 | 24.7 | 24.7 | 3.868 | 5.52 | psi | MSDS, or Tanks 4.0d for condensate |
| Molecular Weight: | 21.91 | 62.07 | 170 | 119.16 | 51 | 44 | 32 | 92 | lb/lbmol | MSDS, or Tanks 4.0d for condensate |
| VOC Content : | 21.9% | 100 | 100 | 100 | 100 | 100 | 100 | 99.74 | Wt. % | For N.G., from Residue Gas Analysis for Condensate from ProMax Gas Composition |
| Total HAPs Content: | 0.3% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | Wt. % | For N.G., from Gas Composition Sheet. Assumes all Hexanes+ are HAPs |
| H2S Content: | 0.6% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | Wt. % | For N.G., from Gas Composition Sheet |
| CO2 Content: | 3.23% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | Wt. % | from Gas Composition Sheet |
| CH4 Content: | 53.85% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | Wt. % | from Gas Composition Sheet |

**VOC Emissions, N.G. System Blowdown**

Volume of system = 3,549,116 $ft^3$

Amount HC vented to atmosphere (lb) = (Volume x density)

= 3,549,116 $ft^3$ | 0.058 lb / $ft^3$

| | | | |
|---|---|---|---|
| = | 25,643 | lbs N.G. (lb/hr) | 8 hours for plant blowdown |
| = | 56 | lbs VOC (lb/hr) | |
| Maximum number of turnarounds = | 1.00 | activity/yr | from site data sheet |
| = | 0.22 | tpy VOC | |
| = | 0.11 | lb/hr Total HAPs | |
| = | 5.39E-05 | tpy Total HAPs | |
| = | 0.19 | lb/hr H2S | |
| = | 9.48E-05 | tpy H2S | |
| = | 103.6 | lb/hr CO2 | |
| = | 5.18E-02 | tpy CO2 | |
| = | 1726.2 | lb/hr CH4 | |
| = | 8.63E-01 | tpy CH4 | |
| = | 21.63 | tpy CO2e | |

**Liquid system opening loss (vapor space, atm liquid systems only)**

Amount emitted (lbs) = P*V*MW / (R * T)

***Glycol system:***

Amount VOC vented to atmosphere (lb) = (Volume x molecular weight x vapor pressure) / (Gas Constant x Temperature [°R]) * MW

= 3,997 gal / 10.73 $ft^3$ * psi / °R * lb-mol | 1 / 555 ° R | 0.13368 ft3 / gal | 62.07 lb / lb-mol | 0.001 psi | 100 % VOC

= 7.33E-03 lbs VOC/hr — assume degassing occurs in one hour

= 3.66E-06 tpy VOC

***Lube Oil system:***

Amount VOC vented to atmosphere (lb) = (Volume x molecular weight x vapor pressure) / (Gas Constant x Temperature [°R]) * MW

= 220,925 gal / 10.73 $ft^3$ * psi / °R * lb-mol | 1 / 555 ° R | 0.13368 ft3 / gal | 170.00 lb / lb-mol | 0.010 psi | 100 % VOC

= 8.43 lbs VOC/hr — assume degassing occurs in one hour

= 4.21E-03 tpy VOC

***Amine system:***

Amount VOC vented to atmosphere (lb) = (Volume x molecular weight x vapor pressure) / (Gas Constant x Temperature [°R]) * MW

= 14,150 gal / 10.73 $ft^3$ * psi / °R * lb-mol | 1 / 555 ° R | 0.13368 ft3 / gal | 119.16 lb / lb-mol | 0.0025 psi | 100 % VOC

= 0.094 lbs VOC/hr — assume degassing occurs in one hour

= 4.68E-05 tpy VOC

## DCP Operating Company, LP - Linam Ranch Gas Plant
## SAMPLE EMISSIONS CALCULATIONS -TURNAROUND EMISSIONS

***Methanol system:***

Amount VOC vented to atmosphere (lb) = (Volume x molecular weight x vapor pressure) / (Gas Constant x Temperature [°R]) * MW

| | | | | | | |
|---|---|---|---|---|---|---|
| = | 4,807 gal | 1 | 0.13368 ft3 | 32.00 lb | 3.87 psi | 100 % VOC |
| | 10.73 $ft^3$ * psi / °R * lb-mol | 555 ° R | gal | lb-mol | | |

= 13.35 lbs VOC/hr — assume degassing occurs in one hour
= 6.68E-03 tpy VOC

***Condensate system:***

Amount VOC vented to atmosphere (lb) = (Volume x molecular weight x vapor pressure) / (Gas Constant x Temperature [°R]) * MW

| | | | | | | |
|---|---|---|---|---|---|---|
| = | 2,203 gal | 1 | 0.13368 ft3 | 92.00 lb | 5.52 psi | 99.7 % VOC |
| | 10.73 $ft^3$ * psi / °R * lb-mol | 555 ° R | gal | lb-mol | | |

= 25.06 lbs VOC/hr — assume degassing occurs in one hour
= 1.25E-02 tpy VOC

***NGL Product system:***

Amount VOC vented to atmosphere (lb) = (Volume x molecular weight x vapor pressure) / (Gas Constant x Temperature [°R]) * MW

| | | | | | |
|---|---|---|---|---|---|
| = | 107,397 scf | 1 | 51.00 lb | 24.70 psi | 100.0 % VOC |
| | 10.73 $ft^3$ * psi / °R * lb-mol | 555 ° R | lb-mol | | |

= 2839.31 lbs VOC/hr — assume degassing occurs in 8 hours
= 11.36 tpy VOC

***Propane (liq) system:***

Amount VOC vented to atmosphere (lb) = (Volume x molecular weight x vapor pressure) / (Gas Constant x Temperature [°R]) * MW

| | | | | | |
|---|---|---|---|---|---|
| = | 6,280 scf | 1 | 44.00 lb | 24.70 psi | 100.0 % VOC |
| | 10.73 $ft^3$ * psi / °R * lb-mol | 555 ° R | lb-mol | | |

= 143.24 lbs VOC/hr — assume degassing occurs in 8 hours
= 0.57 tpy VOC

Total degassing (all systems): 3029.5 lbs VOC/hr
11.95 tpy VOC

**System clingage loss (vapor space)**

Assume: 0.25 % of liquid volume remains as clingage and is emitted to atm.
Assume: 0.05 % of NGL and Propane liquid system volume remains as clingage and is emitted to atm.
Duration of clingage losses: 24 hrs

| System: | Glycol | Lube oil | Amine | Methanol | Condensate | | |
|---|---|---|---|---|---|---|---|
| fluid type (@ atm): | Liquid | Liquid | Liquid | Liquid | Liquid | | |
| Clingage volume: | 9.99 | 552 | 35.38 | 12.02 | 5.51 | gal | |
| Density: | 9.28 | 7.50 | 8.66 | 6.66 | 6.00 | lb/gal - from DCP turnaround quantity calculations | |
| % VOC: | 100 | 100 | 100 | 100 | 99.74 | wt % | |
| | 92.68 | 4,140.68 | 306.47 | 80.1 | 32.96 | lb/activity | |
| VOC Emissions: | 4 | 173 | 13 | 3.34 | 1.37 | lb/hr | assumed that clingage losses occur over a 24 hour period |
| | 0.046 | 2.07 | 0.153 | 0.040 | 0.016 | tpy | |

Total clingage (all systems): 193.9 lbs VOC/hr
2.33 tpy VOC

*Example calculation: Glycol system*

Amount VOC vented to atmosphere (lb) = (System volume x % clingage x density x % VOC)

| | | | | |
|---|---|---|---|---|
| = | 3,997 gal | 0.25 % clingage | 9.28 lb | 100 % VOC |
| | | | gal | |

**Total Turnaround Activity Emissions:**

| | | |
|---|---|---|
| **lb/hr VOC:** | **3,029** | Maximum hourly emissions from blowdown, liquid system venting or clingage steps. |
| **tpy VOC:** | **14.50** | Sum of emissions from all turnaround steps. |
| **lb/hr H2S:** | **0.19** | |
| **tpy H2S:** | **9.48E-05** | |
| **lb/hr Total HAPs:** | **0.11** | |
| **tpy Total HAPs:** | **5.39E-05** | |
| **tpy CO2e** | **21.630** | |

These example calculations are not intended to be representations under 116.116(a), but are an example of the emission calculation approach for a sub-category of SSM emissions activities. The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific plant or activity condition under 116.116(a). Individual activities in this MSS sub-category are performed which may have slight variations in procedure or equipment configuration.

## DCP Operating Company, LP - Linam Ranch Gas Plant
## Engine Startup/Warmup Calculations

**Example Calculations:**

Per Activity Propane Emissions Calculation:

ER (lb propane/startup) = Gas released (scf/release) x mol % / 379 scf/mol * MW

$$= \frac{324\ \text{scf}}{\text{release}} \times \frac{0.13\ \text{mol \%}}{100} \times \frac{44.097\ \text{lb}}{\text{lb mol}} \times \frac{\text{lb-mol}}{379\ \text{scf}} = 0.05\ \text{lb propane/startup}$$

Annual VOC Emissions Calculation:

Annual ER (tpy) = Gas Released per activity (lb/startup) x No. of activities per year / 2000 lb

$$= \frac{\text{lb}}{\text{activity}} \times \frac{\text{\# of startups}}{\text{yr}} \times \frac{\text{ton}}{2000\ \text{lb}}$$

**Startup Emissions Calculations:**

Calculation of gas released for each unit:

| Activity | Gas Released (scf/release) | Gas Released in lb mol/release |
|---|---|---|
| Engine Startup | 324 | 0.85 |

Note: Gas Release based on input from Site Data sheet.

Calculation of gas emissions from engine startup events:

| 0/21/13 Residue Gas Analy Component | Molecular Weight | Mole % | Gas Weight per engine startup (lb/activity) |
|---|---|---|---|
| Carbon Dioxide | 44 | 0.003 | 0.00 |
| Hydrogen Sulfide | 34 | 0.000 | 0.00 |
| Nitrogen | 28 | 3.136 | 0.75 |
| Methane | 16 | 91.243 | 12.51 |
| ethane | 30 | 5.485 | 1.41 |
| propane | 44 | 0.131 | 0.0494 |
| i-butane | 58 | 0.001 | 0.0006 |
| N-butane | 58 | 0.001 | 0.0004 |
| i-Pentane | 72 | 0.000 | 0.00 |
| n-Pentane | 72 | 0.000 | 0.00 |
| Hexanes + | 86 | 0.000 | 0.00 |
| Total Gas Released | | 100.00 | 14.73 |
| Total VOC Released | | 0.133 | 0.05 |

Engine startup summary of VOC, $H_2S$ and Total HAP emissions:

| Pollutant | Activity E.R (lb/activity) | Number of Annual Activities | ER (lb/year) | Annual ER (tpy) | Hourly ER* (lb/hr) |
|---|---|---|---|---|---|
| VOC | 0.0504 | 120 | 6.05 | **0.003** | 0.034 |
| Hydrogen Sulfide | 0.0000 | | 0.00 | **0.000** | 0.00 |
| Total HAPs | 0.0000 | | 0.00 | **0.000** | 0.00 |

*Hourly emission rate shown for informational purposes only; emissions were calculated assuming each activity lasts 1 hour.

| GHG Pollutant | Hourly ER (lb/activity) | Number of Annual Activities | Annual ER (tpy) |
|---|---|---|---|
| $CO_2$ | 0.0011 | 120 | 0.0001 |
| $CH_4$ | 12.51 | | 0.7508 |
| $CO_2e$ | | | 18.77 |

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## DCP Operating Company, LP - Linam Ranch Gas Plant
### SAMPLE EMISSIONS CALCULATIONS -STARTUP EMISSIONS, POST TURNAROUND

**Calculation Basis:**

For the natural gas system, emissions to the atmosphere occur from a three step pressure test and purge prior to plant startup. These emissions are calculated using the Ideal Gas Law and are based on the entire pipe volume venting to the atmosphere at each purge step pressure.

**Constants and Variables:**

| | N.G. (gas) System | | |
|---|---|---|---|
| Plant startup duration: | 7 | hrs | From site data sheet |
| Annual startup frequency: | 1 | activity/yr (equivalent to turnaround frequency) | From site data sheet |
| Gas System Equipment Volume: | 91,796 | cu. Ft., from DCP turnaround quantity calculations | From site data sheet |
| Process Temperature : | 95.0 | ° F | |
| Density: | 0.0455 | lb/scf (for gas)- from DCP turnaround quantity calculations | |
| VOC Content : | 22% | Wt. % | From Gas Composition Sheet |
| Total HAP Content: | 0.34% | Wt. % | From Gas Composition Sheet. Assumes all Hexanes+ are HAPs |
| H2S Content: | 0.59% | Wt. % | From Gas Composition Sheet |
| CO2 Content: | 3.23% | Wt. % | |
| CH4 Content: | 53.85% | Wt. % | |

**VOC Emissions, N.G. System Blowdown:**

Amount of gas vented to atmosphere (scf) = [Equipment volume x (system purge step pressure (psi) + 14.7)] / [554 deg R* 14.7 psi] * 520 deg R

| System Purge Step #: | 1 | 2 | 3 | |
|---|---|---|---|---|
| System pressure prior to Purge: | 30 | 50 | 100 | psi |
| Amount of gas vented to atm: | 279,136 | 404,029 | 716,261 | scf @ 95 deg F [1] |
| | 279.14 | 404.03 | 716.26 | Mscf @ 95 deg F [1] |
| Total gas vented to atm (all steps): | 1399.43 | | | Mscf |
| | 63.61 | | | Mlbs |
| Hourly gas emission rate: | 9087.18 | | | lb/hr |
| Hourly VOC emission rate: | 1990.00 | | | lb/hr |
| Hourly Total HAP emission rate: | 30.56 | | | lb/hr |
| Hourly H2S emission rate: | 53.77 | | | lb/hr |
| Annual VOC Emission rate: | 6.96 | | | tpy |
| Annual Total HAP emission rate: | 0.11 | | | tpy |
| Annual H2S emission rate: | 0.19 | | | tpy |

Note: [1] TCEQ guidance of final temperature for depressurizing to atmosphere, from chemical sector MSS permitting.

| GHG Emissions | lb/hr | tpy |
|---|---|---|
| CO2 | 293.6 | 1.03 |
| CH4 | 4893.8 | 17.1 |
| Total CO2e | | 429.2 |

These example calculations are not intended to be representations under 116.116(a), but are an example of the emission calculation approach for a sub-category of MSS emissions activities. The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific plant or activity condition under 116.116(a). Individual activities in this MSS sub-category are performed which may have slight variations in procedure or equipment configuration.

**DCP Operating Company, LP - Linam Ranch Gas Plant**
**Compressor Blowdown Emission Calculations**

**Calculation Basis:**

Emissions to the atmosphere from the blowdown of the compressors, attached to either engines or turbines. During a compressor blowdown gas will be released to the atmosphere.
Emissions are calculated using a mass balance and are based on the volume vented to the atmosphere.

**Example Calculations:**

Compressor Blowdown, Propane Emissions Calculation:

ER (lb propane/blowdown) = Gas released (scf/release) x mol % / 379 scf/mol * MW

$$= \frac{2500\ \text{scf}}{\text{release}} \times \frac{6.15\ \text{mol}\ \%}{100} \times \frac{44.097\ \text{lb}}{\text{lb mol}} \times \frac{\text{lb-mol}}{379\ \text{scf}} = 17.88\ \text{lb propane/Compressor blowdown}$$

Annual VOC Emissions Calculation:

Annual ER (tpy) = Gas Released per activity (lb/blowdown) x No. of activities per year / 2000 lb

$$= \frac{\text{lb}}{\text{activity}} \times \frac{\#\ \text{of blowdowns}}{\text{yr}} \times \frac{\text{ton}}{2000\ \text{lb}}$$

**Blowdown Emissions Calculations:**

Calculation of gas released for each compressor unit during a blowdown event:

| Activity | Gas Released (scf/activity) | Gas Released in lb mol/activity |
|---|---|---|
| Blowdown Volume[1] | 2,500 | 6.60 |

Notes:
[1] Blowdown based on site-specific blowdown volume (From site data sheet).

Calculation of gas emissions from compressor blowdown events:

| Residue Gas Analysis Component | Molecular Weight | Mole % | Gas Weight per compressor (lb/activity) |
|---|---|---|---|
| Water | 18.02 | 0.00 | 0.00 |
| Nitrogen | 28.01 | 2.46 | 4.55 |
| Argon/Oxygen | 31.99 | 0.00 | 0.00 |
| Carbon Dioxide | 44.01 | 1.61 | 4.67 |
| Hydrogen Sulfide | 34.08 | 0.38 | 0.85 |
| Methane | 16.04 | 73.54 | 77.82 |
| Ethane | 30.07 | 12.59 | 24.97 |
| Propane | 44.10 | 6.15 | 17.88 |
| i-Butane | 58.12 | 0.70 | 2.67 |
| n-Butane | 58.12 | 1.62 | 6.21 |
| i- & n-Pentane | 72.15 | 0.65 | 3.08 |
| Cyclopentane | 70.14 | 0.0281 | 0.13 |
| C6 HCs | 86.18 | 0.1487 | 0.85 |
| C7 HCs | 100.21 | 0.0444 | 0.293 |
| C8 HCs | 114.23 | 0.0052 | 0.0392 |
| C9 HCs | 128.26 | 0.0013 | 0.0110 |
| n-Hexane | 86.18 | 0.0541 | 0.3075 |
| Benzene | 78.11 | 0.0276 | 0.1422 |
| Toluene | 92.14 | 0.0056 | 0.0340 |
| Ethyl Benzene | 106.17 | 0.000100 | 0.00070 |
| Xylenes | 106.17 | 0.000200 | 0.00140 |
| Total Gas Released | | 100 | 144.50 |
| Total VOC Released | | 9.43 | **31.64** |

| | | |
|---|---|---|
| Number of Compressors = | 6 | |
| Frequency of Blowdowns = | 20 | releases/yr/compressor |
| Total Number of Blowdowns = | 120 | releases/year |
| **Total Annual VOC Emissions =** | **1.90** | **tpy** |
| **Total Annual $H_2S$ Emissions =** | **0.051** | **tpy** |
| **Total Annual HAP emissions =** | **0.0292** | **tpy** |

Conservatively assumes all Hexanes+ are HAPs

| | | |
|---|---|---|
| **Hourly VOC Emissions =** | **31.6** | **lb/hr** |
| **Hourly H2S Emissions =** | **0.855** | **lb/hr** |
| **Hourly HAP Emissions =** | **0.486** | **lb/hr** |

*Hourly emission rate shown for informational purposes only; emissions were calculated assuming each activity lasts 1 hour.

| GHG Pollutant | Hourly ER (lb/activity) | Number of Annual Activities | Annual ER (tpy) |
|---|---|---|---|
| $CO_2$ | 4.6692 | 120.0 | 0.280 |
| $CH_4$ | 77.8207 | | 4.67 |
| $CO_2e$ | | | 117.01 |

## DCP Operating Company, LP - Linam Ranch Gas Plant
## Turbine Blowdown Emission Calculations

**Calculation Basis:**

Emissions to the atmosphere from two types of turbine blowdowns: maintenance and washing related blowdowns. During a turbine wash blowdown occurs in three steps: a pre-wash blowdown to take the turbine out of service, a starter run (used to move turbine during washing) and finally a blowdown associated with turbine startup at completion of the wash. During a maintenance event blowdown occurs from an initial blowdown and starter blowdown. Emissions are calculated using a mass balance and are based on the volume vented to the atmosphere.

**Example Calculations:**

Turbine wash Blowdown, Propane Emissions Calculation:

ER (lb propane/blowdown) = Gas released (scf/release) x mol % / 379 scf/mol * MW

$$= \frac{16100\text{ scf}}{\text{activity}} \times \frac{6.15\text{ mol \%}}{100} \times \frac{44.096\text{ lb}}{\text{lb mol}} \times \frac{\text{lb-mol}}{379\text{ scf}} = 115.16 \text{ lb propane/ turbine wash blowdown}$$

Annual VOC Emissions Calculation:

Annual ER (tpy) = Gas Released per activity (lb/blowdown) x No. of activities per year / 2000 lb

$$= \frac{\text{lb}}{\text{activity}} \times \frac{\text{\# of blowdowns}}{\text{yr}} \times \frac{\text{ton}}{2000\text{ lb}}$$

**Blowdown Emissions Calculations:**

Calculation of gas released for each unit during a turbine wash:

| Activity | Gas Released (scf/activity) | Gas Released in lb mol/activity |
|---|---|---|
| Pre-wash blowdown [1] | 700 | 1.85 |
| Blowdown during wash [2] | 14,000 | 36.94 |
| Starter blowdown [3] | 1,400 | 3.69 |
| Total (all steps) [4] | 16,100 | 42.48 |

Notes:
[1] Pre-wash blowdown based on site-specific turbine blowdown volume (From site data sheet).
[2] Wash blowdown based on running 2 starters per turbine, with 1,400 scf/min, run for 5 minutes each
[3] Post-wash startup blowdown emissions from 3, 10-sec startups @ 1,400 scf/min for two starters.
[4] Maximum of one turbine wash per hour.

Calculation of gas released for each unit during a maintenance blowdown:

| Activity | Gas Released (scf/activity) | Gas Released in lb mol/activity |
|---|---|---|
| Initial blowdown | 700 | 1.85 |
| Starter blowdown [3] | 1,400 | 3.69 |
| Total (both steps) | 2,100 | 5.54 |

Calculation of gas emissions from turbine washing and non-wash blowdown events, using Residue Gas Analysis:

| Residue Gas Analysis Component | Molecular Weight | Mole % | Gas Weight per turbine wash (lb/activity) [1] | Gas Weight per maintenance blowdown (lb/activity) [1] |
|---|---|---|---|---|
| Carbon Dioxide | 44.01 | 1.608 | 30.07 | 0.72 |
| Hydrogen Sulfide | 34.08 | 0.38 | 5.51 | 3.82 |
| Nitrogen | 28.00 | 2.46 | 29.27 | 65.19 |
| methane | 16.00 | 73.54 | 499.82 | 20.97 |
| ethane | 30.07 | 12.59 | 160.79 | 15.02 |
| propane | 44.10 | 6.15 | 115.16 | 2.24 |
| i-butane | 58.12 | 0.70 | 17.19 | 5.21 |
| N-butane | 58.12 | 1.62 | 39.98 | 2.59 |
| i- & n-Pentane | 72.15 | 0.65 | 19.84 | 0.11 |
| Cyclopentane | 70.14 | 0.03 | 0.84 | 0.11 |
| C6 HCs | 86.18 | 0.15 | 5.44 | 0.71 |
| C7 HCs | 100.21 | 0.04 | 1.89 | 0.25 |
| C8 HCs | 114.23 | 0.01 | 0.25 | 0.03 |
| C9 HCs | 128.26 | 0.001 | 0.07 | 0.01 |
| n-Hexane | 86.18 | 0.05 | 1.98 | 0.26 |
| Benzene | 78.11 | 0.03 | 0.92 | 0.12 |
| Toluene | 92.14 | 0.01 | 0.22 | 0.03 |
| Ethyl Benzene | 106.17 | 0.00 | 0.00 | 0.00 |
| Xylenes | 106.17 | 0.00 | 0.01 | 0.00 |
| Total Gas Released | | 100 | 929.24 | 117.39 |
| Total VOC Released | | 9.43 | **203.79** | **11.67** |

Note: [1] The highest hourly emission rate is the maximum of either blowdown scenario: turbine washing or maintenance blowdown.

| | | | |
|---|---|---|---|
| Frequency of Turbine Washing = | 2 | times/yr/turbine | |
| Frequency of Maintenance blowdowns= | 4 | times/yr/turbine | |
| Number of Turbines = | 5 | from site data sheet | |
| Annual VOC from Turbine Washing = | 1.02 | tpy | |
| Annual VOC from Maintenance Blowdowns = | 0.1167 | tpy | |
| Total Annual VOC Emissions = | 1.14 | tpy | |
| Total annual H2S from Turbine Washing = | 0.028 | tpy | |
| Total annual H2S from Maint blowdown = | 0.038 | tpy | |
| Total annual HAPs from Turbine Washing = | 0.016 | tpy | Calculated assuming all Hexane thru Xylenes are HAPs |
| Total annual HAPs from Maint blowdown = | 0.004 | tpy | Calculated assuming all Hexane thru Xylenes are HAPs |
| Total annual CO2 from Turbine Washing = | 0.150 | tpy | |
| Total annual CO2 from Maint blowdown = | 0.007 | tpy | |
| Total annual CH4 from Turbine Washing = | 2.499 | tpy | |
| Total annual CH4 from Maint blowdown = | 0.210 | tpy | |
| Total annual CO2e = | 67.9 | tpy | |

Hours per activity each year, assuming each activity takes 1 hour:

| | | |
|---|---|---|
| Hours of Turbine Washing per year = | 10 | Five turbines are washed twice per year each |
| Hours of Maintenance Blowdowns per year = | 20 | Five turbines are blown down four times per year each. |

| | | |
|---|---|---|
| Hourly VOC from Turbine Washing = | 203.79 | lb/hr |
| Hourly VOC from Maintenance Blowdowns = | 11.67 | lb/hr |
| Hourly H2S from Turbine Washing = | 5.51 | lb/hr |
| Hourly H2S from Maintenance Blowdowns = | 3.82 | lb/hr |
| Hourly HAPs from Turbine Washing = | 3.13 | lb/hr |
| Hourly HAPs from Maintenance Blowdowns = | 0.41 | lb/hr |

Note: [1] The highest hourly emission rate is the maximum of either blowdown scenario: turbine washing or maintenance blowdown.
[2] Hourly emission rate shown for informational purposes only; emissions were calculated assuming each activity lasts 1 hour.

These example calculations are not intended to be representations under 116.116(a), but are an example of the emission calculation approach for a sub-category of MSS emission activities. The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific plant or activity condition under 116.116(a). Individual activities in this MSS sub-category are performed which may have slight variations in procedure or equipment configuration.

# DCP Operating Company, LP - Linam Ranch Gas Plant
# SAMPLE EMISSIONS CALCULATIONS - PIPING OPENED TO ATMOSPHERE

**Calculation Basis:**

Emissions to the atmosphere after opening pipelines are calculated using the Ideal Gas Law and are based on the entire pipe volume venting to the atmosphere at pipeline pressure.

**Constants and Variables:**

| | | | |
|---|---|---|---|
| Venting Pressure : | 1200 | psia | Default |
| Piping Volume : | 7.85 | $ft^3$ | Represents a 10ft. length of 12 in. diameter line |
| Process Temperature : | 95.00 | ° F | |
| Ideal Gas Constant : | 10.73 | $(ft^3)$(psi)/(lbmol)(°R) | |
| Molecular Weight: | 21.91 | lb/lb mol | From Gas Composition Sheet |
| Activities per year : | 36 | count/year | Monthly meter proving and twice monthly line repair |
| VOC Content : | 21.90 | Wt. % | From Gas Composition Sheet |
| HAPs Content: | 0.34 | Wt. % | |
| H2S Content: | 0.38 | mol % | |
| $CO_2$ Concentration: | 1.61 | mol % | |
| $CH_4$ Concentration: | 73.54 | mol % | |

**Example Calculation - VOC Emissions**

Volume of system = 7.85 $ft^3$

Amount HC vented to atmosphere (lb) = (Pressure x Volume) / (Gas Constant x Temperature [°R]) * MW

$$= \frac{1200.00 \text{ psia}}{10.73 \text{ ft}^3 * \text{psi} / °\text{R} * \text{lb-mol}} \cdot \frac{8 \text{ ft}^3}{555\ °\text{R}} \cdot \frac{21.91 \text{ lb}}{\text{lb-mol}}$$

= 34.65 lbs HC/activity (lb/hr)
= 7.59 lbs VOC/activity (lb/hr)
= 0.14 tpy VOC
= 0.12 lbs HAPs
= 2.10E-03 tpy HAPs

**Example Calculation - H2S Emissions**

Volume of system = 7.85 $ft^3$

Amount vented to atmosphere (lb) = (Pressure x Volume) / (Gas Constant x Temperature [°R]) * MW

$$= \frac{1200.00 \text{ psia}}{10.73 \text{ ft}^3 * \text{psi} / °\text{R} * \text{lb-mol}} \cdot \frac{8 \text{ ft}^3}{555\ °\text{R}} \cdot \frac{0.38 \text{ lb-mol H2S}}{100 \text{ lb-mol Gas}} \cdot \frac{34.08 \text{ lb H2S}}{1 \text{ lb-mol H2S}}$$

= 2.05E-01 lbs H2S/activity (lb/hr)
= 3.69E-03 tpy H2S

**Example Calculation - CO2 Emissions**

Volume of system = 7.85 $ft^3$

Amount vented to atmosphere (lb) = (Pressure x Volume) / (Gas Constant x Temperature [°R]) * MW

$$= \frac{1200.00 \text{ psia}}{10.73 \text{ ft}^3 * \text{psi} / °\text{R} * \text{lb-mol}} \cdot \frac{8 \text{ ft}^3}{555\ °\text{R}} \cdot \frac{1.61 \text{ lb-mol CO2}}{100 \text{ lb-mol Gas}} \cdot \frac{44.01 \text{ lb CO2}}{1 \text{ lb-mol CO2}}$$

= 1.12E+00 lbs CO2/activity (lb/hr)
= 2.02E-02 tpy CO2

**Example Calculation - CH4 Emissions**

Volume of system = 7.85 $ft^3$

Amount vented to atmosphere (lb) = (Pressure x Volume) / (Gas Constant x Temperature [°R]) * MW

$$= \frac{1200.00 \text{ psia}}{10.73 \text{ ft}^3 * \text{psi} / °\text{R} * \text{lb-mol}} \cdot \frac{8 \text{ ft}^3}{555\ °\text{R}} \cdot \frac{73.54 \text{ lb-mol CH4}}{100 \text{ lb-mol Gas}} \cdot \frac{16.04 \text{ lb CH4}}{1 \text{ lb-mol CH4}}$$

= 1.87E+01 lbs CH4/activity (lb/hr)
= 0.3 tpy CH4

**Total $CO_2$e** 8.4 tpy $CO_2$e

# DCP Operating Company, LP - Linam Ranch Gas Plant
# SAMPLE EMISSIONS CALCULATIONS - PIGGING

**Calculation Basis:**

Emissions to the atmosphere after opening pipelines are calculated using the Ideal Gas Law and are based on the entire pipe volume venting to the atmosphere at pipeline pressure.

**Constants and Variables:**

| | | | |
|---|---|---|---|
| Venting Pressure : | 400 | psia | Default discharge pressure |
| Piping Volume : | 13.9 | $ft^3$ | |
| Process Temperature : | 95 | ° F | |
| Ideal Gas Constant : | 10.73 | $(ft^3)$(psi)/(lbmol)(°R) | |
| Molecular Weight: | 21.91 | lb/lb mol | From Gas Composition Sheet |
| Activities per year : | 52 | count/year | From MSS Activity Summary Sheet |
| VOC Content : | 21.90 | Wt. % | From Gas Composition Sheet |
| HAPs Content: | 0.34 | Wt. % | |
| H2S Content: | 0.38 | mol % | |
| $CO_2$ Concentration: | 1.61 | mol % | |
| $CH_4$ Concentration: | 73.54 | mol % | |

**Example Calculation - VOC Emissions**

Amount HC vented to atmosphere (lb) = (Pressure x Volume) / (Gas Constant x Temperature [°R]) * MW

| | | | |
|---|---|---|---|
| = 400.00 psia | 14 $ft^3$ | 21.91 lb | |
| 10.73 $ft^3$ * psi / °R * lb-mol | 555 ° R | lb-mol | |

= 20.41 lbs HC/activity ( lb/hr)
= 4.47 lbs VOC/activity (lb/hr)
= 0.12 tpy VOC
= 6.86E-02 lbs HAPs/activity (lb/hr)
= 1.78E-03 tpy HAPs

**Example Calculation - H2S Emissions**

Amount vented to atmosphere (lb) = (Pressure x Volume) / (Gas Constant x Temperature [°R]) * MW

| | | | |
|---|---|---|---|
| = 400.00 psia | 14 $ft^3$ | 0.380 lb-mol H2S | 34.08 lb H2S |
| 10.73 $ft^3$ * psi / °R * lb-mol | 555 ° R | 100 lb-mol Gas | 1 lb-mol H2S |

= 1.21E-01 lbs H2S
= 3.14E-03 tpy H2S

**Example Calculation - CO2 Emissions**

Amount vented to atmosphere (lb) = (Pressure x Volume) / (Gas Constant x Temperature [°R]) * MW

| | | | |
|---|---|---|---|
| = 400.00 psia | 14 $ft^3$ | 1.608 lb-mol CO2 | 44.01 lb CO2 |
| 10.73 $ft^3$ * psi / °R * lb-mol | 555 ° R | 100 lb-mol Gas | 1 lb-mol CO2 |

= 0.66 lbs $CO_2$
= 1.71E-02 tpy $CO_2$

**Example Calculation - CH4 Emissions**

Amount vented to atmosphere (lb) = (Pressure x Volume) / (Gas Constant x Temperature [°R]) * MW

| | | | |
|---|---|---|---|
| = 400.00 psia | 14 $ft^3$ | 73.538 lb-mol CH4 | 16.04 lb CH4 |
| 10.73 $ft^3$ * psi / °R * lb-mol | 555 ° R | 100 lb-mol Gas | 1 lb-mol CH4 |

= 11.0 lbs $CH_4$
= 0.29 tpy $CH_4$

**Total $CO_2$e** 7.2 tpy $CO_2$e

## DCP Operating Company, LP - Linam Ranch Gas Plant
## EMISSION CALCULATIONS - VACUUM TRUCKS (TANK CLEANING)

**Calculation Basis:**

Emissions from vacuum trucks are estimated using the loading loss method of AP-42, Chapter 5.2: Transportation and Marketing of Petroleum Liquids, 1995. Calculations are performed based on the concentrations of the individual organic species since the wastes contain significant non-volatile content (i.e. water, solids). A truck can be loaded in one hour, therefore the emissions per loading activity reflect the lb/hr emission rate.

$L_L$ = 12.46 SPM/T *(SF)

where:

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

S = a saturation factor

P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia)

M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole)

T = temperature of bulk liquid loaded, ºR (ºF+460)

SF = safety factor due to vacuum loading

**Example Calculation :**

Volume of Constituent Loaded (gal) = 6300 gal

Loading Loss (lb/1000 gal) = $L_L$ = 12.46 SPM/T * (SF) = (12.46) * (0.6) * (5.5219) * (92) / (95 + 460) * 2 = 13.6862 lb/1000 gal

VOC Emissions per Condensate Offload Cleanout (lb/hr) = (6300 gal) / (1000) * (13.686 lb/1000 gal) * (0.22 VOC wt. Fraction) = 18.88 lb/hr

| Material Collected by Vacuum Truck | Organic Constituent | Tank Volume (gal) | Constituent Concentration (% volume) | Liquid Heel (% volume of tank) | Amount Loaded (gal) | S, Saturation Loss Factor | P, Vapor Pressure (psia) | M, Molecular Weight (lb/lb-mole) | T, Bulk Loading Temp (ºF) | VOC Wt. Fraction | SF, Safety Factor | $L_L$ (lb/1000 gal) | Loss (lbs/activity) (lb/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Product Tanks VRU1 - VRU5 | Condensate | 31500 | 100 | 20 | 6300 | 0.60 | 5.52 | 92.00 | 95 | 0.22 | 2 | 13.69 | 18.88 |
| Gunbarrel Tank VRU6 | Condensate | 16800 | 100 | 20 | 3360 | 0.60 | 5.52 | 92.00 | 95 | 0.22 | 2 | 13.69 | 10.07 |
| Oil Tank VRU7 | Condensate | 8820 | 100 | 20 | 1764 | 0.60 | 5.52 | 92.00 | 95 | 0.22 | 2 | 13.69 | 5.29 |
| Tanks VRUTMP1 VRUTMP2 | Condensate | 63000 | 100 | 20 | 12600 | 0.60 | 5.52 | 92.00 | 95 | 0.22 | 2 | 13.69 | 37.76 |

Number of Vacuum Trucks per year, per tank: 1 From Site Data Sheet

| | Product Tanks VRU1 - VRU5 | Gunbarrel Tank VRU6 | Oil Tank VRU7 | Tanks VRUTMP1 VRUTMP2 | Total | |
|---|---|---|---|---|---|---|
| Number of Tanks: | 5 | 1 | 1 | 2 | 9 | From Site Data Sheet |
| H2S Concentration (wt frac): | 0.0059 | 0.0059 | 0.0059 | 0.0059 | - | From Tank & Flash Calculations tab |
| Total Haps (wt frac): | 0.0034 | 0.0034 | 0.0034 | 0.0034 | - | From Tank & Flash Calculations tab |
| CO2 Concentration (wt frac): | 0.0323 | 0.0323 | 0.0323 | 0.0323 | - | |
| CH4 Concentration (wt frac): | 0.5385 | 0.5385 | 0.5385 | 0.5385 | - | |
| VOC Emissions per Cleanout (lb/hr) = | 18.88 | 10.07 | 5.29 | 37.76 | 72.00 | |
| H2S Emissions per Cleanout (lb/hr) = | 0.51 | 0.27 | 0.14 | 1.02 | 1.95 | |
| Total HAPs Emissions per Cleanout (lb/hr) = | 0.29 | 0.15 | 0.08 | 0.58 | 1.11 | |
| CO2 Emissions per Cleanout (lb/hr) = | 2.79 | 1.49 | 0.78 | 5.57 | 10.62 | |
| CH4 Emissions per Cleanout (lb/hr) = | 46.43 | 24.76 | 13.00 | 92.87 | 177.07 | |
| Cleanout VOC Annual Emissions (tpy) = | 4.72E-02 | 5.04E-03 | 2.64E-03 | 3.78E-02 | 0.09 | |
| Cleanout H2S Annual Emissions (tpy) = | 1.28E-03 | 1.36E-04 | 7.14E-05 | 1.02E-03 | 0.003 | |
| Cleanout Total HAPS Annual Emissions (tpy) = | 7.25E-04 | 7.73E-05 | 4.06E-05 | 5.80E-04 | 0.001 | |
| Cleanout CO2 Annual Emissions (tpy) = | 6.97E-03 | 7.43E-04 | 3.90E-04 | 5.57E-03 | 0.014 | |
| Cleanout CH4 Annual Emissions (tpy) = | 1.16E-01 | 1.24E-02 | 6.50E-03 | 9.29E-02 | 0.228 | |
| Cleanout CO2e Annual Emissions (tpy) = | 2.91E+00 | 3.10E-01 | 1.63E-01 | 2.33E+00 | 5.710 | |

These example calculations are not intended to be representations under 116.116(a), but are an example of the emission calculation approach for a sub-category of MSS emissions activities. The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific plant or activity condition under 116.116(a). Individual activities in this MSS category are performed which may have slight variations in procedure or equipment configuration.

*DCP Operating Company, LP - Linam Ranch Gas Plant*

## Acid Gas Flare- Measured Gas Analysis (per 11/4/13 DCP email)

Emission Unit: Acid Gas Flare

| Meter # | Name | Date | arbon Dioxi | Nitrogen | Methane | Ethane | Propane | iso-Butane | n-Butane | iso-Pentane | n-Pentane | Hexane | Heptane | Octane | Nonane | Decane | Water | drogen Sulfide |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M0489-00 | Linam Acid Gas | 11/1/2013 0:00 | 80.65% | 0.01% | 0.36% | 0.08% | 0.03% | 0.06% | 0.02% | 5.2E-05 | 8.3E-05 | 0.055% | - | - | - | - | 1.1% | 18.71% |
| | **Average** | | **80.653%** | **0.011%** | **0.360%** | **0.081%** | **0.034%** | **0.056%** | **0.024%** | **5.2E-05** | **8.3E-05** | **0.055%** | **-** | **-** | **-** | **-** | **1.1%** | **18.714%** |

## E. Amine Unit Acid Gas Flare- Acid Gas Analysis (per 11/4/13 DCP Email)

Emission Unit: Acid Gas Flare

**Estimated Flared Gas Composition Used for Calculations**

| Component | MW | Flared Gas[1] Mol% | MW * wet vol % | HHV Btu/scf[2] | Btu/scf * wet vol % | Mass Fraction (wet) | Spec. Volume[2] $ft^3$/lb | Spec. Volume VOC $ft^3$/lb |
|---|---|---|---|---|---|---|---|---|
| Water | 18.02 | 1.13% | 0.20 | 0.0 | 0.0 | 0.00 | 21.06 | |
| Hydrogen Sulfide | 34.08 | 18.71% | 6.38 | 637.02 | 119.2 | 0.15 | 11.136 | |
| Carbon Dioxide | 44.01 | 80.65% | 35.50 | 0.0 | 0.0 | 0.84 | 8.623 | |
| Nitrogen | 28.01 | 0.01% | 0.00 | 0.0 | 0.0 | 0.00 | 13.547 | |
| Oxygen | 32.00 | 0.00% | 0.00 | 0.0 | 0.0 | 0.00 | 11.859 | |
| Methane | 16.04 | 0.36% | 0.06 | 1009.7 | 3.6 | 0.00 | 23.65 | |
| Ethane | 30.07 | 0.08% | 0.02 | 1768.7 | 1.4 | 0.00 | 12.62 | |
| Propane | 44.10 | 0.03% | 0.02 | 2517.2 | 0.9 | 0.00 | 8.606 | 1.094 |
| i-Butane | 58.12 | 0.06% | 0.03 | 3252.6 | 1.8 | 0.00 | 6.529 | 1.790 |
| n-Butane | 58.12 | 0.02% | 0.01 | 3262 | 0.8 | 0.00 | 6.529 | 0.764 |
| i-Pentane | 72.15 | 0.01% | 0.00 | 3999.7 | 0.2 | 0.00 | 5.26 | 0.167 |
| n-Pentane | 72.15 | 0.01% | 0.01 | 4008.7 | 0.3 | 0.00 | 5.26 | 0.266 |
| Hexanes | 86.18 | 0.05% | 0.05 | 4756.1 | 2.6 | 0.00 | 4.404 | 1.759 |
| | | 101% | 42.28 | | 130.9 | 1.00 | | 5.840 |
| NMNEHC (VOC) | | 0.2% | | | | 0.3% | | |

[1] *Based on DCP's recent 11/1/13 Linam Ranch Acid Gas Flare Gas Analysis to provide conservative estimates for sulfur dioxide and heat release estimate.*

[2] *Component HHVs and specific volumes obtained from Physical Properties of Hydrocarbons, API Research Project 44, Fig. 16-1, Rev. 1981.*

**Fuel Data**

| | | | |
|---|---|---|---|
| *Flare Pilot* | 500 | scf/hr | Engineering judgement |
| | 0.00050 | MMscf/hr | |
| | 1000 | Btu/scf | Pipeline Gas, HHV, nominal |
| | 0.50 | MMBtu/hr | MMscf/hr * Btu/scf |
| *Purge Gas* | 16 | Mscf/day | per DCP Midstream (Jennifer Corser 10/29/13 email) |
| | 0.67 | Mscf/hr | Mscf/d / 24 hr/day |
| | 0.001 | MMscf/hr | Mscf/hr / 1000 |
| | 1000 | Btu/scf | Pipeline Gas, HHV, nominal from Linam T5 app. |
| | 0.67 | MMBtu/hr | MMscf/hr * Btu/scf |
| Assist Gas | | | |
| | 135 | Btu/scf | Heating value of Pilot + Purge gas + Flared gas |
| | 500 | Btu/scf | target heat content |
| | 1000 | Btu/scf | Assist gas-assumed sweet |
| | 0.18 | MMscf/hr | Assist gas volume |
| | 182.5 | MMBtu/hr | Assist gas heat input |
| Assist gas - Annual* | 5.0 | MMscf/yr | Estimated Maximum annual SSM flow rate. Not a requested limit; for calculation only. |

Note: Flared gas annual/ ratio of assist gas: flared gas hourly usage) ex: 10.5 MMscf/yr / (1-.8054)

| | | | |
|---|---|---|---|
| *Flared Gas - Short Term* | 0.25 | MMscf/hr | High end representative SSM hourly flowrate taken from 2010 - 2013 Blowdown Data for Unit 2 |
| | 131 | Btu/scf | Heating value calculated from gas compostion above. |
| | 33 | MMBtu/hr | Hourly heat rate = Heating value * Effective hourly flow rate. |
| *Flared Gas - Annual* | 2.9 | MMscf/yr | Estimated Maximum annual SSM flow rate. Taken from avg of 2010 - 2013 SSM blowdown data for Linam Ranch GP. Not a requested limit; for calculation only. |
| *Total* | 216 | MMBtu/hr | **Pilot + Purge gas + Flared gas** |

**Stack Parameters**

| | | |
|---|---|---|
| 1,832 | ˚F | Exhaust temperature |
| 65.6 | ft/sec | Exhaust velocity |
| 222.0 | ft | Flare height |

*Pilot+ Purge Gas only*

| | | | |
|---|---|---|---|
| 16.04 | g/mol | Pilot & Purge gas molecular weight | Mol. wt. of methane, the dominant species |
| 81,667 | cal/sec | Heat release (q) | MMBtu/hr * $10^6$ * 252 cal/Btu ÷ 3600 sec/hr |
| 65,967 | | $q_n$ | $q_n = q(1-0.048(MW)^{1/2})$ |
| 0.26 | m | Effective stack diameter (D) | $D = (10^{-6} q_n)^{1/2}$ |

*Pilot + Purge Gas+ Flared Gas + Assist Gas*

| | | | |
|---|---|---|---|
| 42.16 | g/mol | Flared gas molecular weight | Volume weighted mol. wt. of all components |
| 1.52E+07 | cal/sec | Heat release (q) | MMBtu/hr * $10^6$ * 252 cal/Btu ÷ 3600 sec/hr |
| 1.04E+07 | | $q_n$ | $q_n = q(1-0.048(MW)^{1/2})$ |
| 3.23 | m | Effective stack diameter (D) | $D = (10^{-6} q_n)^{1/2}$ |

# E. Amine Unit Acid Gas Flare- Acid Gas Analysis (per 11/4/13 DCP Email)

Emission Unit: Acid Gas Flare

**Emission Rates**

*Pilot+ Purge Gas*

| NOx | CO | VOC | $H_2S$ | $SO_2$ | Units | |
|---|---|---|---|---|---|---|
| 0.068 | 0.370 | | | | lb/MMBtu | AP-42 Table 13.5-1 (9/91) (Reformatted 1/95) |
| | | | 3.6E-04 | | lb $H_2S$/Mscf | Purchased sweet natural gas fuel, 0.25 gr $H_2S$/100scf |
| | | | 4.2E-04 | | lb $H_2S$/hr | $H_2S$ rate * fuel usage |
| | | | | 7.1E-03 | lb S/Mscf | Sweet natural gas fuel, 5 gr S/100scf |
| | | | | 8.3E-03 | lb $SO_2$/hr | $SO_2$ rate * fuel usage |
| | | 0.00% | | | mol% | Assume no VOC content in purchased fuel (methane) |
| | | 23.7 | | | $ft^3$/lb | Specific volume (methane) |
| | | 0.00 | | | lb/hr | vol. Gas * mole fraction / specific volume |
| 100% | 100% | 100% | 100% | 100% | % | Safety Factor |
| 0.14 | 0.74 | | | | lb/MMBtu | Unit emission rate with Safety Factor |
| **0.16** | **0.86** | | | | lb/hr | lb/MMBtu * MMBtu/hr |
| | | **-** | **1.7E-05** | **1.7E-02** | lb/hr | 98% combustion $H_2S$; 100% conversion to $SO_2$ |
| **0.69** | **3.8** | **-** | **7.3E-05** | **7.3E-02** | tpy | 8760 hrs/yr |

*Assist gas*

| NOx | CO | VOC | $H_2S$ | $SO_2$ | Units | |
|---|---|---|---|---|---|---|
| 0.0680 | 0.3700 | | | | lb/MMBtu | AP-42 Table 13.5-1 (9/91) (Reformatted 1/95) |
| | | | 4E-04 | | lb $H_2S$/Mscf | Purchased sweet natural gas fuel, 0.25 gr $H_2S$/100scf |
| | | | 6.52E-02 | | lb $H_2S$/hr | $H_2S$ rate * fuel usage |
| | | | | 7.1E-03 | lb S/Mscf | Purchased sweet natural gas fuel, 5 gr S/100scf |
| | | | | 1.3 | lb $SO_2$/hr | $SO_2$ rate * fuel usage |
| | | 0.00% | | | mol% | Assume no VOC content in purchased fuel (methane) |
| | | 23.7 | | | $ft^3$/lb | Specific volume (methane) |
| | | 0.000 | | | lb/hr | vol. Gas * mole fraction / specific volume |
| **12.4** | **67.5** | | | | lb/hr | lb/MMBtu * MMBtu/hr |
| | | **-** | **1.3E-03** | **1.3** | lb/hr | 98% combustion $H_2S$; 100% conversion to $SO_2$ |
| **0.17** | **0.92** | **-** | **1.8E-05** | **0.018** | tpy | |

*Flared Gas*

| NOx | CO | VOC | $H_2S$ | $SO_2$ | Total HAPs | Units | |
|---|---|---|---|---|---|---|---|
| 0.068 | 0.370 | | | | | lb/MMBtu | AP-42 Table 13.5-1 (9/91) (Reformatted 1/95) |
| | | 0.18% | 0.187 | | 0.05% | mol% | Flare Gas |
| | | 5.8 | 11.1 | | 4.4 | $ft^3$/lb | Specific volume |
| | | 77.9 | 4201 | | 31.1 | lb/hr | vol. Gas * mole fraction / specific volume |
| 2.2 | 12.1 | | | | | lb/hr | lb/MMBtu * MMBtu/hr |
| **2.2** | **12** | **78** | **4201** | **7750** | **31** | **lb/hr** | Uncontrolled emissions at maximum rate |
| **0.013** | **0.070** | **0.45** | **24** | **46** | **0.18** | **tpy** | |

| **Controlled #2 Acid Gas Flare** | **NOx** | **CO** | **VOC** | **$H_2S$** | **$SO_2$** | **HAPs** | **Units** |
|---|---|---|---|---|---|---|---|
| **Pilot + Purge Gas+ Flared Gas** | **1.5E+01** | **8.1E+01** | **1.6** | **8.4E+01** | **7.8E+03** | **0.62** | lb/hr |
| | **0.88** | **4.8** | **0.0090** | **0.48** | **45.6** | **0.0036** | tpy |

Total HAPs conservatively assumed to be Hexanes+

**GHG Emissions**

| | $CO_2e$ Short Tons/yr | | |
|---|---|---|---|
| $CO_2$ | 137 | Eq 4-15 | API Compendium |
| $CH_4$ | 1.1E-03 | Eq 4-16 | API Compendium |
| $N_2O$ | 4.8E-06 | Eq 4-17 | API Compendium |
| **Total CO2e** | **137** | | |

*DCP Operating Company, LP - Linam Ranch Gas Plant*

## AGI Flare- Measured Acid Gas Analysis (per 11/4/13 DCP email)

Emission Unit: AGI Flare

| Meter # | Name | Date | Carbon Dioxide | Nitrogen | Methane | Ethane | Propane | iso-Butane | n-Butane | iso-Pentane | n-Pentane | Hexane | Heptane | Octane | Nonane | Decane | Water | Hydrogen Sulfide |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M0489-00 | Linam Acid Gas | 11/1/2013 0:00 | 80.65% | 0.01% | 0.36% | 0.08% | 0.03% | 0.056% | 0.024% | 5.2E-05 | 8.3E-05 | 0.055% | - | - | - | - | 1.1% | 18.71% |
| | **Average** | | **80.653%** | **0.011%** | **0.360%** | **0.081%** | **0.034%** | **0.056%** | **0.024%** | **5.2E-05** | **8.3E-05** | **0.055%** | **-** | **-** | **-** | **-** | **1.1%** | **18.714%** |

## AGI Flare- Acid Gas Analysis (per 11/4/13 DCP Email)

Emission Unit: AGI Flare

**Estimated Flared Gas Composition Used for Calculations**

| Component | MW | Flared Gas[1] Mol% | MW * wet vol % | HHV Btu/scf[2] | Btu/scf * wet vol % | Mass Fraction (wet) | Spec. Volume[2] $ft^3/lb$ | Spec. Volume VOC $ft^3/lb$ |
|---|---|---|---|---|---|---|---|---|
| Water | 18.02 | 1.13% | 0.20 | 0.0 | 0.0 | 0.00 | 21.06 | |
| Hydrogen Sulfide | 34.08 | 18.71% | 6.38 | 637.02 | 119.2 | 0.15 | 11.136 | |
| Carbon Dioxide | 44.01 | 80.65% | 35.50 | 0.0 | 0.0 | 0.84 | 8.623 | |
| Nitrogen | 28.01 | 0.01% | 0.00 | 0.0 | 0.0 | 0.00 | 13.547 | |
| Oxygen | 32.00 | 0.00% | 0.00 | 0.0 | 0.0 | 0.00 | 11.859 | |
| Methane | 16.04 | 0.36% | 0.06 | 1009.7 | 3.6 | 0.00 | 23.65 | |
| Ethane | 30.07 | 0.08% | 0.02 | 1768.7 | 1.4 | 0.00 | 12.62 | |
| Propane | 44.10 | 0.03% | 0.02 | 2517.2 | 0.9 | 0.00 | 8.606 | 1.094 |
| i-Butane | 58.12 | 0.06% | 0.03 | 3252.6 | 1.8 | 0.00 | 6.529 | 1.790 |
| n-Butane | 58.12 | 0.02% | 0.01 | 3262 | 0.8 | 0.00 | 6.529 | 0.764 |
| i-Pentane | 72.15 | 0.01% | 0.00 | 3999.7 | 0.2 | 0.00 | 5.26 | 0.167 |
| n-Pentane | 72.15 | 0.01% | 0.01 | 4008.7 | 0.3 | 0.00 | 5.26 | 0.266 |
| Hexane | 86.18 | 0.05% | 0.05 | 4756.1 | 2.6 | 0.00 | 4.404 | 1.759 |
| | | 101% | 42.28 | | 130.9 | 1.00 | | 5.840 |
| NMNEHC (VOC) | | 0.2% | | | | 0.3% | | |

[1] *Based on DCP's recent 11/1/13 Linam Ranch Acid Gas Flare Gas Analysis to provide conservative estimates for sulfur dioxide and heat release estimate.*

[2] *Component HHVs and specific volumes obtained from Physical Properties of Hydrocarbons, API Research Project 44, Fig. 16-1, Rev. 1981.*

**Fuel Data**

| | | | |
|---|---|---|---|
| *Flare Pilot* | 500 | scf/hr | Engineering judgement |
| | 0.0005 | MMscf/hr | |
| | 1000 | Btu/scf | Pipeline Gas, HHV, nominal from Linam T5 app. |
| | 0.50 | MMBtu/hr | MMscf/hr * Btu/scf |
| *Purge Gas* | 16 | Mscf/day | per DCP Midstream (Jennifer Corser 10/29/13 email) |
| | 0.67 | Mscf/hr | Mscf/d / 24 hr/day |
| | 0.001 | MMscf/hr | Mscf/hr / 1000 |
| | 1000 | Btu/scf | Pipeline Gas, HHV, nominal from Linam T5 app. |
| | 0.67 | MMBtu/hr | MMscf/hr * Btu/scf |
| Assist Gas | | | |
| | 134 | Btu/scf | Heating value of Pilot + Purge gas + Flared gas |
| | 500 | Btu/scf | target heat content |
| | 1000 | Btu/scf | Assist gas-assumed sweet |
| | 0.22 | MMscf/hr | Assist gas volume |
| | 219 | MMBtu/hr | Assist gas heat input |
| Assist gas - Annual* | 0.44 | MMscf/yr | Estimated Maximum annual SSM flow rate. Not a requested limit; for calculation only. |

Note: Flared gas annual/ ratio of assist gas: flared gas hourly usage) ex: 10.5 MMscf/yr / (1-.8054)

| | | | |
|---|---|---|---|
| *Flared Gas - Short Term* | 0.30 | MMscf/hr | Maximum Effective hourly flowrate taken from 2010 - 2013 Blowdown Data for AGI Flare |
| | 131 | Btu/scf | Heating value calculated from gas compostion above. |
| | 39 | MMBtu/hr | Hourly heat rate = Heating value * Effective hourly flow rate. |
| *Flared Gas - Annual* | 0.26 | MMscf/yr | Estimated Maximum annual SSM flow rate. Taken from avg of 2010 - 2013 SSM blowdown data for Linam Ranch GP. Not a requested limit; for calculation only. |
| *Total* | 260 | MMBtu/hr | **Pilot + Purge gas + Flared gas** |

**Stack Parameters**

| | | | | |
|---|---|---|---|---|
| | 1,832 | ˚F | Exhaust temperature | Per Linam 2-H sheet |
| | 65.6 | ft/sec | Exhaust velocity | Per Linam 2-H sheet |
| | 210.0 | ft | Flare height | |
| *Pilot+ Purge Gas only* | | | | |
| | 16.04 | g/mol | Pilot & Purge gas molecular weight | Mol. wt. of methane, the dominant species |

# AGI Flare- Acid Gas Analysis (per 11/4/13 DCP Email)

Emission Unit: AGI Flare

| | | | |
|---|---|---|---|
| 81,667 | cal/sec | Heat release (q) | MMBtu/hr * $10^6$ * 252 cal/Btu ÷ 3600 sec/hr |
| 65,967 | | $q_n$ | $q_n = q(1\text{-}0.048(MW)^{1/2})$ |
| 0.26 | m | Effective stack diameter (D) | $D = (10^{-6}q_n)^{1/2}$ |

*Pilot + Purge Gas+ Flared Gas + Assist Gas*

| | | | |
|---|---|---|---|
| 42.18 | g/mol | Flared gas molecular weight | Volume weighted mol. wt. of all components |
| 1.82E+07 | cal/sec | Heat release (q) | MMBtu/hr * $10^6$ * 252 cal/Btu ÷ 3600 sec/hr |
| 1.25E+07 | | $q_n$ | $q_n = q(1\text{-}0.048(MW)^{1/2})$ |
| 3.5 | m | Effective stack diameter (D) | $D = (10^{-6}q_n)^{1/2}$ |

**Emission Rates**

*Pilot+ Purge Gas*

| NOx | CO | VOC | $H_2S$ | $SO_2$ | Units | |
|---|---|---|---|---|---|---|
| 0.068 | 0.37 | | | | lb/MMBtu | AP-42 Table 13.5-1 (9/91) (Reformatted 1/95) |
| | | | 3.6E-04 | | lb $H_2S$/Mscf | Purchased sweet natural gas fuel, 0.25 gr $H_2S$/100scf |
| | | | 4.17E-04 | | lb $H_2S$/hr | $H_2S$ rate * fuel usage |
| | | | | 7.1E-03 | lb S/Mscf | Sweet natural gas fuel, 5 gr S/100scf |
| | | | | 8.3E-03 | lb $SO_2$/hr* | $SO_2$ rate * fuel usage |
| | | 0.00% | | | mol% | Assume no VOC content in purchased fuel (methane) |
| | | 13 | | | $ft^3$/lb | Specific volume (methane) |
| | | 0.00 | | | lb/hr | vol. Gas * mole fraction / specific volume |
| 100% | 100% | 100% | 100% | 100% | % | Safety Factor |
| 0.14 | 0.74 | | | | lb/MMBtu | Unit emission rate with Safety Factor |
| **0.16** | **0.86** | | | | lb/hr | lb/MMBtu * MMBtu/hr |
| | | **-** | **1.7E-05** | **1.7E-02** | lb/hr | 98% combustion $H_2S$; 100% conversion to $SO_2$ |
| **0.69** | **3.8** | **-** | **7.3E-05** | **7.3E-02** | tpy | 8760 hrs/yr |

*Assist gas*

| NOx | CO | VOC | $H_2S$ | $SO_2$ | Units | |
|---|---|---|---|---|---|---|
| 0.068 | 0.370 | | | | lb/MMBtu | AP-42 Table 13.5-1 (9/91) (Reformatted 1/95) |
| | | | 3.6E-04 | | lb $H_2S$/Mscf | Purchased sweet natural gas fuel, 0.25 gr $H_2S$/100scf |
| | | | 7.84E-02 | | lb $H_2S$/hr | $H_2S$ rate * fuel usage |
| | | | | 7.1E-03 | lb S/Mscf | Purchased sweet natural gas fuel, 5 gr S/100scf |
| | | | | 1.6E+00 | lb $SO_2$/hr | $SO_2$ rate * fuel usage |
| | | 0.00% | | | mol% | Assume no VOC content in purchased fuel (methane) |
| | | 12.6 | | | $ft^3$/lb | Specific volume (methane) |
| | | 0.000 | | | lb/hr | vol. Gas * mole fraction / specific volume |
| **14.9** | **81.2** | | | | lb/hr | lb/MMBtu * MMBtu/hr |
| | | **-** | **1.6E-03** | **1.6E+00** | lb/hr | 98% combustion $H_2S$; 100% conversion to $SO_2$ |
| **0.015** | **40.6** | **-** | **1.6E-06** | **1.6E-03** | tpy | |

*Flared Gas*

| NOx | CO | VOC | $H_2S$ | $SO_2$ | Total HAPs | Units | |
|---|---|---|---|---|---|---|---|
| 0.0680 | 0.3700 | | | | | lb/MMBtu | AP-42 Table 13.5-1 (9/91) (Reformatted 1/95) |
| | | 0.18% | 18.71% | | 0.05% | mol% | Flare Gas |
| | | 5.840 | 11.136 | | 4.404 | $ft^3$/lb | Specific volume |
| | | 93.5 | 5,041.4 | | 37.3 | lb/hr | vol. Gas * mole fraction / specific volume |
| 2.67 | 14.53 | | | | | lb/hr | lb/MMBtu * MMBtu/hr |
| **2.7** | **14.5** | **93.5** | **5,041.4** | **9,299.9** | **37.3** | **lb/hr** | Uncontrolled emissions at maximum rate |
| **0.0011** | **0.0062** | **0.040** | **2.2** | **4.1** | **0.016** | **tpy** | |

| Controlled AGI Flare | NOx | CO | VOC | $H_2S$ | $SO_2$ | HAPs | Units |
|---|---|---|---|---|---|---|---|
| **Pilot + Purge Gas+ Flared Gas** | **18** | **97** | **1.9** | **101** | **9,301** | **0.75** | lb/hr |
| | **0.71** | **44** | **8.0E-04** | **0.043** | **4.1** | **0.00032** | tpy |

Total HAPs conservatively assumed to be Hexanes+

**GHG Emissions**

| | $CO_2$e Short Tons/yr | | |
|---|---|---|---|
| $CO_2$ | 0.2 | Eq 4-15 | API Compendium |
| $CH_4$ | 9.7E-05 | Eq 4-16 | API Compendium |
| $N_2O$ | 4.2E-07 | Eq 4-17 | API Compendium |
| **Total CO2e** | **0** | | |

*DCP Operating Company, LP - Linam Ranch Gas Plant*

**ESD Flare- per 11/11/13 Extended Inlet Gas Analysis**

Emission Unit: ESD Flare

| | | | | | | | | | | n-Pentane & | Cyclo- | non-HAP | non-HAP | non-HAP | | | | HAPs | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter # | Name | Date | Carbon Dioxide | Nitrogen | Methane | Ethane | Propane | iso-Butane | n-Butane | iso-Pentanes | Pentane | C6 HCs | C7 HCs | C8 HCs | C9 HCs | n-Hexane | Benzene | Toluene | Ethyl Benzene | Xylenes | Water | Hydrogen Sulfide |
| M0500-00 | Inlet Gas | 11/6/2013 | 1.61% | 2.46% | 73.54% | 12.59% | 6.15% | 0.70% | 1.62% | 0.65% | 0.03% | 0.15% | 0.044% | 5.2E-05 | 0.001% | 0.054% | 0.028% | 5.6E-05 | 1.0E-06 | 2.0E-06 | 0.0E+00 | 0.38% |
| | **Average** | | **1.608%** | **2.461%** | **73.538%** | **12.587%** | **6.148%** | **0.696%** | **1.619%** | **0.647%** | **0.028%** | **0.149%** | **0.044%** | **5.2E-05** | **0.001%** | **0.054%** | **0.028%** | **5.6E-05** | **1.0E-06** | **2.0E-06** | **0.0E+00** | **0.380%** |

# ESD Flare- per 11/11/13 Extended Inlet Gas Analysis

Emission Unit: ESD Flare

**Estimated Flared Gas Composition Used for Calculations**

| Component | MW | Flared Gas[1] Mol% | MW * wet vol % | HHV Btu/scf[2] | Btu/scf * wet vol % | Mass Fraction (wet) | Spec. Volume[2] ft³/lb | Spec. Volume VOC ft³/lb |
|---|---|---|---|---|---|---|---|---|
| Water | 18.02 | 0.00% | 0.00 | 0.0 | 0.0 | 0.00 | 21.06 | |
| Hydrogen Sulfide | 34.08 | 0.38% | 0.13 | 637.02 | 2.4 | 0.01 | 11.136 | |
| Carbon Dioxide | 44.01 | 1.61% | 0.71 | 0.0 | 0.0 | 0.03 | 8.623 | |
| Nitrogen | 28.01 | 2.46% | 0.69 | 0.0 | 0.0 | 0.03 | 13.547 | |
| Oxygen | 32.00 | 0.00% | 0.00 | 0.0 | 0.0 | 0.00 | 11.859 | |
| Methane | 16.04 | 73.54% | 11.80 | 1009.7 | 742.5 | 0.54 | 23.65 | |
| Ethane | 30.07 | 12.59% | 3.78 | 1768.7 | 222.6 | 0.17 | 12.62 | |
| Propane | 44.10 | 6.15% | 2.71 | 2517.2 | 154.7 | 0.12 | 8.606 | 4.863 |
| i-Butane | 58.12 | 0.70% | 0.40 | 3252.6 | 22.6 | 0.02 | 6.529 | 0.551 |
| n-Butane | 58.12 | 1.62% | 0.94 | 3262 | 52.8 | 0.04 | 6.529 | 1.281 |
| n- & iso-Pentanes | 72.15 | 0.65% | 0.47 | 3999.7 | 25.9 | 0.02 | 5.26 | 0.512 |
| Cyclopentane | 70.14 | 0.03% | 0.02 | 4008.7 | 1.1 | 0.00 | 5.26 | 0.022 |
| C6 HCs | 86.18 | 0.15% | 0.13 | 4747.3 | 7.1 | 0.006 | 4.404 | 0.118 |
| C7 HCs | 100.21 | 0.04% | 0.04 | 5498.6 | 2.4 | 0.002 | 3.787 | 0.035 |
| C8 HCs | 114.23 | 0.01% | 0.01 | 6248.9 | 0.3 | 0.0003 | 3.322 | 0.004 |
| C9 HCs | 128.26 | 0.00% | 0.00 | 6996.3 | 0.1 | 0.0001 | 2.959 | 0.001 |
| n-Hexane | 86.18 | 0.05% | 0.05 | 4756.1 | 2.6 | 0.00213 | 4.404 | 0.043 |
| Benzene | 78.11 | 0.03% | 0.02 | 3741.9 | 1.0 | 0.00098 | 4.858 | 0.022 |
| Toluene | 92.14 | 0.01% | 0.01 | 4474.8 | 0.3 | 0.00024 | 4.119 | 0.004 |
| Ethyl Benzene | 106.17 | 0.0001% | 0.00 | 5222.1 | 0.0 | 0.000005 | 3.574 | 0.000 |
| Xylenes | 106.17 | 0.0002% | 0.00 | 5207.8 | 0.0 | 0.00001 | 3.574 | 0.000 |
| | | 100% | 21.91 | | 1238.6 | 1.00 | | 7.456 |
| NMNEHC (VOC) | | 9.4% | | | | 21.9% | | |

[1] *Based on DCP's recent 11/11/13 Linam Ranch inlet gas analysis from 11/6/13 sample to provide accurate estimates for sulfur dioxide and heat release.*

[2] *Component HHVs and specific volumes obtained from Physical Properties of Hydrocarbons, API Research Project 44, Fig. 16-1, Rev. 1981.*

**Fuel Data**

| | | | |
|---|---|---|---|
| *Flare Pilot* | 500 | scf/hr | Engineering judgement |
| | 0.00050 | MMscf/hr | |
| | 1000 | Btu/scf | Pipeline Gas, HHV, nominal from Linam T5 app. |
| | 0.50 | MMBtu/hr | MMscf/hr * Btu/scf |
| *Purge Gas* | 63.8 | Mscf/day | per DCP Midstream (Jennifer Corser 10/29/13 email) |
| | 2.7 | Mscf/hr | Mscf/d / 24 hr/day |
| | 0.0027 | MMscf/hr | Mscf/hr / 1000 |
| | 1000 | Btu/scf | Pipeline Gas, HHV, nominal from Linam T5 app. |
| | 2.7 | MMBtu/hr | MMscf/hr * Btu/scf |
| *Flared Gas - Short Term* | 3.410 | MMscf/hr | Maximum Effective hourly flowrate taken from 2010 - 2013 Blowdown Data for AGI Flare |
| | 1,239 | Btu/scf | Heating value calculated from gas compostion above. |
| | 4,224 | MMBtu/hr | Hourly heat rate = Heating value * Effective hourly flow rate. |
| *Flared Gas - Annual* | 58.2 | MMscf/yr | Estimated Maximum annual SSM flow rate. Taken from avg of 2010 - 2013 SSM blowdown data for Linam Ranch GP. Not a requested limit; for calculation only. |
| *Total* | 4227 | MMBtu/hr | **Pilot + Purge gas + Flared gas** |

**Stack Parameters**

| | | | | |
|---|---|---|---|---|
| | 1,832 | ˚F | Exhaust temperature | Per Linam 2-H sheet |
| | 65.6 | ft/sec | Exhaust velocity | Per Linam 2-H sheet |
| | 175.0 | ft | Flare height | |
| *Pilot+ Purge Gas only* | | | | |
| | 16.04 | g/mol | Pilot & Purge gas molecular weight | Mol. wt. of methane, the dominant species |

# ESD Flare- per 11/11/13 Extended Inlet Gas Analysis

Emission Unit: ESD Flare

| | | | |
|---|---|---|---|
| 221,083 | cal/sec | Heat release (q) | MMBtu/hr * $10^6$ * 252 cal/Btu ÷ 3600 sec/hr |
| 178,582 | | $q_n$ | $q_n = q(1\text{-}0.048(MW)^{1/2})$ |
| 0.42 | m | Effective stack diameter (D) | $D = (10^{-6} q_n)^{1/2}$ |

*Pilot + Purge Gas+ Flared Gas*

| | | | |
|---|---|---|---|
| 21.90 | g/mol | Flared gas molecular weight | Volume weighted mol. wt. of all components |
| 2.96E+08 | cal/sec | Heat release (q) | MMBtu/hr * $10^6$ * 252 cal/Btu ÷ 3600 sec/hr |
| 2.29E+08 | | $q_n$ | $q_n = q(1\text{-}0.048(MW)^{1/2})$ |
| 15.1 | m | Effective stack diameter (D) | $D = (10^{-6} q_n)^{1/2}$ |

**Emission Rates**

*Pilot+ Purge Gas*

| NOx | CO | VOC | $H_2S$ | $SO_2$ | Units | |
|---|---|---|---|---|---|---|
| 0.068 | 0.370 | | | | lb/MMBtu | AP-42 Table 13.5-1 (9/91) (Reformatted 1/95) |
| | | | 4E-04 | | lb $H_2S$/Mscf | Purchased sweet natural gas fuel, 0.25 gr $H_2S$/100scf |
| | | | 1.1E-03 | | lb $H_2S$/hr | $H_2S$ rate * fuel usage |
| | | | | 7E-03 | lb S/Mscf | Sweet natural gas fuel, 5 gr S/100scf |
| | | | | 2E-02 | lb $SO_2$/hr* | $SO_2$ rate * fuel usage |
| | | 0.00% | | | mol% | Assume no VOC content in purchased fuel (methane) |
| | | 12.6 | | | $ft^3$/lb | Specific volume (methane) |
| | | 0.00 | | | lb/hr | vol. Gas * mole fraction / specific volume |
| 100% | 100% | 100% | 100% | 100% | % | Safety Factor |
| 0.14 | 0.74 | | | | lb/MMBtu | Unit emission rate with Safety Factor |
| **0.43** | **2.3** | | | | lb/hr | lb/MMBtu * MMBtu/hr |
| | | **-** | **4.5E-05** | **4.5E-02** | lb/hr | 98% combustion $H_2S$; 100% conversion to $SO_2$ |
| **1.9** | **10.2** | **-** | **2.0E-04** | **2.0E-01** | tpy | 8760 hrs/yr |

*Flared Gas*

| NOx | CO | VOC | $H_2S$ | $SO_2$ | Total HAPs | Units | |
|---|---|---|---|---|---|---|---|
| 0.068 | 0.370 | | | | | lb/MMBtu | AP-42 Table 13.5-1 (9/91) (Reformatted 1/95) |
| | | 9.43% | 0.38% | | 0.09% | mol% | Flare Gas |
| | | 7.5 | 11 | | 4.1 | $ft^3$/lb | Specific volume |
| | | 43,114 | 1,165 | | 728 | lb/hr | vol. Gas * mole fraction / specific volume |
| 287 | 1563 | | | | | lb/hr | lb/MMBtu * MMBtu/hr |
| **287** | **1563** | **43,114** | **1,165** | **2,148** | **728** | **lb/hr** | Uncontrolled emissions at maximum rate |
| **2.4** | **13** | **368** | **9.9** | **19** | **6.2** | **tpy** | |

| Controlled AGI Flare | NOx | CO | VOC | $H_2S$ | $SO_2$ | HAPs | Units |
|---|---|---|---|---|---|---|---|
| **Pilot + Purge Gas+ Flared Gas** | **288** | **1,565** | **862** | **23.3** | **2,148** | **15** | lb/hr |
| | **4.3** | **24** | **7.4** | **0.20** | **19** | **0.12** | tpy |

Total HAPs conservatively assumed to be Hexanes+

**GHG Emissions**

| | $CO_2$e Short Tons/yr | | |
|---|---|---|---|
| $CO_2$ | 4,387 | Eq 4-15 | API Compendium |
| $CH_4$ | 4.5E+00 | Eq 4-16 | API Compendium |
| $N_2O$ | 9.6E-05 | Eq 4-17 | API Compendium |
| **Total CO2e** | **4,500** | | |

# Section 7

## Information Used To Determine Emissions

**<u>Information Used to Determine Emissions</u> shall include the following**:

☑ If manufacturer data are used, include specifications for emissions units <u>and</u> 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.

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### Information used to Determine Emissions during Steady State Operation

<u>Engines (Units 6, 7, 8, 9, 10, and 11)</u>
- Manufacturer's data for Clark TLA-6 engines
- Manufacturer's data for Clark HBA-6 engines
- EPA AP-42 Table 3.2-1

<u>Turbine (Units 29, 30, 31, and 32B)</u>
- Manufacture data for Solar Turbine Taurus 70-10302S
- Manufacture data for Solar Turbine Taurus 70-9702S
- Manufacture data for Solar Turbine Centaur T-4700
- Manufacture data for Solar Turbine Centaur T-4000
- EPA AP-42 Tables 3.1-2a and 3.1-3

<u>Heaters/Boilers (Units 34, 36, and 37)</u>
- EPA AP-42 Tables 1.4-1, 1.4-2, and 1.4-3

<u>Tank (Unit TK-2)</u>
- Tanks 4.09d

<u>Dehydrator (Unit DH-10)</u>
- Gri-GlyCalc

<u>Tanks (Units TK-VRU and TK-VRUTMP)</u>
- Tanks 4.09d
- ProMax analysis

<u>Turbine (Unit 28)</u>
- Manufacture data for Solar Turbine Taurus 60-7800S
- Manufacture emission estates for Turbine particulate matter

Unit 2 Gas Flare, AGI Flare, and Unit 4A ESD Flare
- Site-specific gas analysis dated 1/20/2016
- AP-42 Tables 13.5-1 and 13.5-2 (4/15)
- 40 CFR Part 98- Mandatory Greenhouse Gas Reporting

Cooling Towers (Units CT-1 and CT-2)
- AP-42 Section 13.4 – Wet Cooling Towers

Fugitive Emissions (Unit FUG)
- The EPA Protocol for Equipment Leak Emissions Estimates Tables 2-4 and 2-10

Methanol Tanks (TK-20, TK-21, TK-27, TK-77, TK-1370)
- Tanks 4.09d. These tanks are exempt units per 20.2.72.202.B.5 NMAC

Greenhouse Gas (GHG) Emissions
- 40 CFR 98 Subpart W

## Information used to Determine Emissions during Startup, Shutdown, and Scheduled Maintenance (SSM)

Unit 2 Flare and AGI Flare, and
- Site-specific acid gas analysis dated 11/11/13
- AP-42 Tables 13.5-1 and 13.5-2 (4/15)
- 40 CFR Part 98- Mandatory Greenhouse Gas Reporting

Unit 4A ESD Flare
- Site-specific inlet gas analysis dated 11/11/13
- AP-42 Tables 13.5-1 and 13.5-2 (4/15)
- 40 CFR Part 98- Mandatory Greenhouse Gas Reporting

SSM Venting

*Plant Turnaround*
- Site-specific inlet gas analysis dated 11/11/13

*Plant Startup (post turnaround)*
- Site-specific inlet gas analysis dated 11/11/13

*Gas Piping Degassing & Pig Launcher Degassing*
- Site-specific inlet gas analysis dated 11/11/13

*Vacuum Trucks*
- Site-specific inlet gas analysis dated 11/11/13
- AP-42, Chapter 5.2: Transportation and Marketing of Petroleum Liquids, 1995

*Engine Startup*
- Site-specific residue gas analysis dated 10/21/13

*Turbine Blowdown & Compressor Blowdown*
- Site-specific inlet gas analysis dated 11/11/13
- Expected volume venting to the atmosphere and events per year

# DUKE ENERGY FIELD SERVICES

## Portable Flue Gas Analyzer

TABLE I I

## Emission Calculations - Fuel Flow (SCFH) & Fuel Heating Value (Btu/scf)

| | | |
|---|---|---|
| Unit Designation: | Linam Ranch # 6 | TLA-6 |
| P.B. Number | 162335 | |

***PARAMETERS:***

| | | | |
|---|---|---|---|
| Test No. | 1 | 2 | 3 |
| Date: | 1/25/05 | 1/25/05 | 1/25/05 |
| Start Time: | 14:32 | 15:09 | 15:41 |
| Test Duration (min.) | 20 | 20 | 20 |

***EQUIPMENT DESIGN DATA:***

| | |
|---|---|
| Equipment Description: | Inlet Compression |
| Manufacturer: | Clark |
| Serial Number | 73780 |
| Engine rpm | 300 |
| * Engine H.P. | 2000 |

***OPERATING DATA:***

| | | | | Average : ( 1 ) |
|---|---|---|---|---|
| Engine Load, % | 92.2 | 92.2 | 92.2 | 92.2 |
| * Engine Horsepower, BHP | 1843 | 1843 | 1843 | 1843 |
| * Fuel Flow, scfh | 13447 | 13493 | 13427 | 13456 |
| * Fuel Heating Valu Btu,hhv | 989 | 989 | 989 | 989 |
| Fired Duty, MMBtu/hr | 13.30 | 13.34 | 13.28 | 13.31 |

***FLUE GAS:***

| | | | | |
|---|---|---|---|---|
| Exhaust Temp., °F | 689 | 688 | 690 | 689 |
| * % O2 ,dry | 14.3 | 14.4 | 14.5 | 14.4 |
| Method 19 "F" Factor | 8710 | 8710 | 8710 | 8710 |
| Stack flow, dscfm (F-factor) | 6114 | 6229 | 6295 | 6213 |

***EMISSION DATA:***

| | | | | | Permit Limit: |
|---|---|---|---|---|---|
| * NOX, ppmvd | 396.0 | 411.0 | 349.0 | 385.3 | |
| NOX, lb/hr (F-factor) | 17.36 | 18.35 | 15.75 | 17.15 | 39.30 |
| NOX, gm/Hp-hr | 4.28 | 4.52 | 3.88 | 4.23 | |
| * CO, ppmvd | 402.0 | 400.0 | 407.0 | 403.0 | |
| CO, lb/hr (F-factor) | 10.72 | 10.86 | 11.17 | 10.92 | 11.00 |
| CO, gm/Hp-hr | 2.64 | 2.68 | 2.75 | 2.69 | |

***NOTES:***

* Items marked with " * " are required input values.

( 1 ) Must enter data in all three (3) columns to calculate proper average.

FUELFLOW.WK1

**PRELIMINARY TEST–Method 1, 2C, 3A, 4, 7E and 10**

Clark – Unit No. 3

HBA-6

GPM GAS CORPORATION
Hobbs Gas Plant
Hobbs, New Mexico

Test Date:
August 31, 1994

Report Date: September 16, 1994
CETCON Job Number: CJ–1309C

* We certify that we have personally examined and we are familiar with the information submitted herein, and base on our inquiries of those individual immediately responsible for obtaining the information, We believe the submitted information is true, accurate, and complete..

| | |
|---|---|
| Gerald L. McCloskey<br>Consulting Engineer | Andrew J. Williams<br>Andrew J. Williams<br>Project Coordintor |
| Randall J. Swedeen<br>Consulting Engineer | Robert A. Stenberg<br>Sr. Environmental Technician |
| L. Kelly Sandberg<br>Consulting Engineer | Galen T. McCloskey<br>Galen T. McCloskey<br>Environmental Technician |

CETCON

## EXECUTIVE SUMMARY

Preliminary testing of Clark Unit #3, at the Hobbs Gas Plant, located approximately 5 miles West of Hobbs, New Mexico, was conducted Wednesday, August 31, 1994. Preliminary testing was conducted to document mass emission rates of oxides of nitrogen ($NO_x$) and carbon monoxide (CO). A series of three one hour test runs were conducted.

Testing was conducted in accordance with procedures set forth in the Code of Federal Regulations (CFR) Title 40, Part 60, Appendix A, Methods 1, 2C, 3A, 4, 7E and 10.

The average $NO_x$ and CO emissions for the three one hour test runs were as follows:

**Clark Unit #3**

| | PPM | lb/hr | Tons/yr (1) |
|---|---|---|---|
| $NO_x$ | 556.8 | 31.93 | 139.9 |
| CO | 509.9 | 17.78 | 77.9 |

A complete breakdown of all test data can be found on the following page of this report titled "Summary of Results".

Note: (1) Based on 8760 hours per year.

CETCON

# CETCON, Inc.

## Reciprocating Gas Engine Data

## Engine Operation Record

***Test Operator:*** GPM Gas Corporation Date 8/31/94

### *Engine Identification:*

| | |
|---|---|
| Manufacturer | Clark |
| Model | HBA–6 |
| Serial No. | 36289 |

### *Emission Control:*

| | |
|---|---|
| Fuel / Air Ratio Contoller | NA |
| Catalytic Converter | NA |

### *Location:*

| | |
|---|---|
| Plant | Hobbs Gas Plant |
| City | Hobbs, New Mexico |
| Ambient temperature, ° F | 82 |
| Ambient humidity, % RH | NA |
| Test time start | 1544 |
| Test time finish | 1931 |
| Fuel flow rate, MMBtu/hr | NA |
| Ambient pressure, IN. Hg | 30.06 |
| Elevation, Ft above sea level | 3500 |

### *Fuel analysis:*

| | |
|---|---|
| Fuel type | Natural Gas |
| HHV, Btu/scf | NA |
| LHV, Btu/scf | NA |

### *Operating Conditions:*

| | |
|---|---|
| Engine Speed, RPM | 305 |
| Exhaust Temp, ° F | 502 |
| Air Manifold Press., in. Hg | 5.6 |
| Ignition Timing, ° BTC | 11 |
| 1st Stage Suction Press, psig | 234 |
| 1st Stage Discharge Press, psig | 615 |
| 2nd Stage Discharge Press, psig | NA |
| 3rd Stage Discharge Press, psig | NA |

CETCON, Inc.

## SUMMARY OF RESULTS

Unit Designation: GPM – HOBBS
Clark Unit #3

### PARAMETERS:

| | | | |
|---|---|---|---|
| Test No. | P7 | P8 | P9 |
| Date: | 8/31/94 | 8/31/94 | 8/31/94 |
| Start Time: | 1544 | 1712 | 1831 |
| Test Duration (min.) | 60 | 60 | 60 |

### EQUIPMENT DESIGN DATA:

| | | |
|---|---|---|
| Equipment Description: | HBA–6 | |
| Manufacturer: | Clark | |
| Serial Number: | 36289 | |
| Engine rpm: | 300 | |
| Engine Hp: | 1267 | (Site Rated) |

### OPERATING DATA:

| | | | | Average : | |
|---|---|---|---|---|---|
| Engine Load, % | 84 | 84 | 84 | 84 | |
| Fuel Flow, scfh | NA | NA | NA | NA | |
| Fuel Heating Value, Btu/scf, HHV | NA | NA | NA | NA | |
| Fired Duty, mmBtu/hr | NA | NA | NA | NA | |
| Engine Horsepower, Bhp w/air | 1068 | 1068 | 1066 | 1067 | |
| **FLUE GAS:** | | | | | |
| Stack Temp., F | 503 | 503 | 500 | 502 | |
| % Moisture | 5.49 | 6.03 | 8.50 | 6.67 | |
| % $O_2$, dry | 16.60 | 16.60 | 16.60 | 16.60 | |
| % $CO_2$, dry | 2.80 | 2.80 | 2.80 | 2.80 | |
| Method 19 "F" Factor | NA | NA | NA | NA | |
| Stack flow, dscfm (F–factor) | NA | NA | NA | NA | |
| Stack flow, dscfm (measured) * | 8029 | 8026 | 7936 | 7997 | |
| **EMISSION DATA :** | | | | | Permit Limit : |
| $NO_x$, ppm (1) | 631.3 | 524.8 | 514.3 | 556.8 | |
| $NO_x$, lb/hr | 36.34 | 30.20 | 29.26 | 31.93 | NA |
| $NO_x$, gm/Hp–hr | 15.46 | 12.84 | 12.46 | 13.58 | |
| CO, ppm (2) | 511.5 | 516.5 | 501.6 | 509.9 | |
| CO, lb/hr | 17.91 | 18.07 | 17.36 | 17.78 | NA |
| CO, gm/Hp–hr | 7.61 | 7.68 | 7.39 | 7.56 | |

(1) Corrected per Bias check, $NO_x$ (ppm) CORR = $NO_x$ (ppm) * $NO_x$ Span Gas (ppm) / $NO_x$ Bias (ppm))

## CETCON, Inc.

Job Number OJ-1309C
Customer GPM
Plant HOBBS

Run No. 1306P7 - Ps
Engine ID. HBA-6 / 38289
Manufacture Clark

Barometer No. NO. 3
Barometric Pressure, $P_s$ 30.06
Ambient Temp., °F 63

File Name: 09CENG.WK1

| Clock Time | Engine Rpm | Fuel Gas CF-DAY | Manifold In. Hd. | 1st Stage Suction psig / temp. | 1st Stage Discharge psig / temp. | 2nd Stage Suction psig / temp. | 2nd Stage Discharge psig / temp. | 3rd Stage Suction psig / temp. | 3rd Stage Discharge psig / temp. | Exhaust Temp. °F | Ambient Temp. °F | Compressor Gas Flow MMcfd | By-pass Flow MMcfd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1556 | 306 | 314.1 | 5.6 | 232 / 97 | 616 / 210 | NA | NA | NA | NA | 503 | 63 | NA | NA |
| 1623 | 304 | 314.1 | 5.6 | 232 / 97 | 616 / 210 | NA | NA | NA | NA | 503 | 63 | NA | NA |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 1716 | 301 | 314.1 | 5.6 | 235 / 98 | 615 / 209 | NA | NA | NA | NA | 503 | 84 | NA | NA |
| 1745 | 307 | 314.1 | 5.6 | 235 / 96 | 615 / 209 | NA | NA | NA | NA | 503 | 84 | NA | NA |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 1843 | 306 | 314.1 | 5.6 | 235 / 94 | 612 / 206 | NA | NA | NA | NA | 500 | 80 | NA | NA |
| 1913 | 306 | 314.1 | 5.6 | 238 / 93 | 615 / 205 | NA | NA | NA | NA | 500 | 80 | NA | NA |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Average: | 305 | 314.1 | 5.6 | 234 / 96 | 615 / 208 | NA | NA | NA | NA | 502 | 82 | NA | NA |

# CETCON, In.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Job No. | CJ–1309 | Field Data | Moist./ Vel. | Barometer No. | 3 | Barometric Pressure, $P_b$ | 30.06 |
| Date | 8/31/94 | Run No. | P9 | Pitot Tube No. | STD | Ambient Temp., °F | 80 |
| Customer | GPM | Time of Run, $T_R$ | 60 min. | Pitot Tube, $C_p$ | 0.990 | Stack Pressure, $P_s$ | 0.1 in. $H_2O$ = 30.07 in. Hg |
| Unit | #3 CLARK | Sample Box No. | 1 | Nozzle No. | | Initial Leak @ | 15.0 in. Hg = 0.000 cfm |
| Operator | AJW/GTM | Meter Box No. | CM #3 | Nozzle Dia., $D_N$ | in. | Final Leak @ | 10.0 in. Hg = 0.000 cfm |
| File Name | 1309P9.WK1 | Stack Area, $A_s$ | 420.9 in² | Assumed %M | (default only) | Purge To: | Time: |

| Point | Clock Time | Dry Gas Meter, CF | Pitot "$H_2O$ $\Delta P_s$ | Orifice $\Delta H$ $P_M$ in. $H_2O$ Desired | Orifice $\Delta H$ $P_M$ in. $H_2O$ Actual | Vacuum in. Hg | Stack Temp. °F $T_s$ | Probe Temp. °F | Oven Temp. °F | Effluent Temp. °F | Dry Gas Temp. °F $T_M$ Inlet | Dry Gas Temp. °F $T_M$ Outlet | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1820 | 683.300 | 1.20 | 0.60 | 0.60 | 5.0 | 500 | | | 66 | 85 | 84 | |
| 7 | 1825 | 685.400 | 1.30 | 0.60 | 0.60 | 5.0 | 501 | | | 66 | 85 | 84 | |
| 6 | 1830 | 687.480 | 1.20 | 0.60 | 0.60 | 5.0 | 503 | | | 66 | 85 | 84 | |
| 5 | 1835 | 689.300 | 1.10 | 0.60 | 0.60 | 5.0 | 500 | | | 64 | 84 | 84 | |
| 4 | 1840 | 691.570 | 0.84 | 0.60 | 0.60 | 5.0 | 500 | | | 64 | 84 | 84 | |
| 3 | 1845 | 693.500 | 0.82 | 0.60 | 0.60 | 5.0 | 495 | | | 64 | 84 | 84 | |
| 2 | 1850 | 695.550 | 0.80 | 0.60 | 0.60 | 5.0 | 493 | | | 63 | 84 | 83 | |
| 1 | 1855 | 697.650 | 0.80 | 0.60 | 0.60 | 5.0 | 490 | | | 63 | 84 | 83 | |
| 8 | 1900 | 699.235 | 0.98 | 0.60 | 0.60 | 5.0 | 505 | | | 62 | 84 | 83 | |
| 7 | 1905 | 701.680 | 1.00 | 0.60 | 0.60 | 5.0 | 506 | | | 63 | 84 | 83 | |
| 6 | 1910 | 703.960 | 1.00 | 0.60 | 0.60 | 5.0 | 508 | | | 63 | 84 | 83 | |
| 5 | 1915 | 705.340 | 0.98 | 0.60 | 0.60 | 5.0 | 504 | | | 63 | 84 | 83 | |
| END 4 | 1920 | 707.286 | 0.84 | | | | 496 | | | | | | |
| 3 | | | 0.81 | | | | 500 | | | | | | |
| 2 | | | 0.77 | | | | 499 | | | | | | |
| 1 | | | 0.74 | | | | 495 | | | | | | |

Avg $\Delta P_s$ 0.949 Avg $P_M$ 0.600 Avg $T_s$ 500 Avg $T_M$ 84

Avg($\Delta P_s^{1/2}$) 0.971

Volume DGM 23.988 CF x $C_F$ 0.961 = $V_M$ 23.052 SCF

| Impinger No. | (1) | (2) | (3) | (4) | (5) | (6) | Total |
|---|---|---|---|---|---|---|---|
| Final Wt. gm | 629.7 | 565.1 | 506.6 | 785.8 | | | 2509.2 |
| Initial Wt. gm | 593.0 | 563.5 | 507.7 | 780.7 | | | 2464.9 |
| Difference, gm | 36.7 | 1.6 | 0.9 | 5.1 | | | 44.3 = $V_w$ |

| | |
|---|---|
| Filter No. | |
| Final Wt., gm | |
| Initial Wt., gm | |
| Difference, gm | |
| $V_w$ (gm) | 44.3000 |
| $SO_2$ gm (–) | |
| $V_w$ = | |

| ORSAT | |
|---|---|
| % $CO_2$ | 2.6 |
| % $O_2$ (dry) | 16.6 |
| %CO | |
| % $N_2$ | 80.8 |
| % Excess Air | 346.6 |

| | | |
|---|---|---|
| Avg $\Delta P$ | 0.949 | in. $H_2O$ |
| Avg($\Delta P_s^{1/2}$) | 0.971 | |
| Avg. $P_M$ | 0.600 | in. $H_2O$ |
| Avg. $T_s$ | 500 | °F |
| Avg. $T_s$ | 960 | °R |
| Avg. $T_M$ | 84 | °F |
| Avg. $T_M$ | 544 | °R |

| Formula | Value | Units |
|---|---|---|
| $V_{M\,std} = 17.65\ V_M\ [(P_b + (P_M / 13.6)) / T_M]$ | 22.515 | SCF |
| $Q_{M\,std} = V_{M\,std} / T_R$ | 0.375 | SCFM |
| $V_{W\,gas} = 0.0472 \times V_w$ | 2.091 | SCF |
| $\%M = V_{W\,gas} / (V_{M\,std} + V_{W\,gas}) \times 100$ | 8.50 | % |
| $M_D = (100 - \%M) / 100$ | 0.9150 | dry frac. |
| $MW_D = (\%\ CO_2 \times 0.44) + (\%\ O_2 \times 0.32) + (\%\ N_2 \times 0.28)$ | 29.112 | lb/lb-mole |
| $MW = M_D \times MW_D + 18\ (1 - M_D)$ | 28.17 | lb/lb-mole |
| $V_s = 5129.4 \times C_p\ (T_s / (P_s \times MW))^{1/2} \times \mathrm{Avg}(\Delta P_s^{1/2})$ | 5,249 | FPM |
| $Q_A = (V_s \times A_s)/144$ | 15,634 | ACFM |
| $Q_s = (0.123 \times V_s \times M_D \times P_s \times A_s) / T_s$ | 7936 | SCFM |
| $\%I = (1040.1 \times V_{Mstd} \times T_s) / (M_D \times P_s \times V_s \times T_R \times D_N^2)$ | | % |

# CETCON, Inc.



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Job No. | CJ-1309 | Field Data | Moist./ Vel. | Barometer No. | 3 | Barometric Pressure, $P_B$ | 30.06 |
| Date | 8/31/94 | Run No. | P8 | Pitot Tube No. | STD | Ambient Temp., °F | 84 |
| Customer | GPM | Time of Run, $T_R$ | 60 min. | Pitot Tube, $C_P$ | 0.990 | Stack Pressure, $P_S$ | 0.1 in. $H_2O$ = 30.07 in. Hg |
| Unit | #3 CLARK | Sample Box No. | 1 | Nozzle No. | | Initial Leak @ | 15.0 in. Hg = 0.000 cfm |
| Operator | AJW/GTM | Meter Box No. | CM #3 | Nozzle Dia., $D_N$ | [illegible] in. | Final Leak @ | 10.0 in. Hg = 0.000 cfm |
| File Name | 1309P8.WK1 | Stack Area, $A_S$ | 428.9 in² | Assumed %M | (default only) | Purge To: | Time: |

| Point | Clock Time | Dry Gas Meter, CF | Pitot "$H_2O$ $\Delta P_S$ | Orifice ΔH $P_M$ In. $H_2O$ Desired | Orifice ΔH $P_M$ In. $H_2O$ Actual | Vacuum In. Hg | Stack Temp. °F $T_S$ | Probe Temp. °F | Oven Temp. °F | Effluent Temp. °F | Dry Gas Temp. °F $T_M$ Inlet | Dry Gas Temp. °F $T_M$ Outlet | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1700 | 662.200 | 1.20 | 0.60 | 0.60 | 5.0 | 506 | | | 66 | 83 | 83 | |
| 7 | 1705 | 664.000 | 1.20 | 0.60 | 0.60 | 5.0 | 506 | | | 66 | 83 | 83 | |
| 6 | 1710 | 665.600 | 1.20 | 0.60 | 0.60 | 5.0 | 506 | | | 66 | 83 | 83 | |
| 5 | 1715 | 667.300 | 1.00 | 0.60 | 0.60 | 5.0 | 504 | | | 65 | 83 | 82 | |
| 4 | 1720 | 668.740 | 0.88 | 0.60 | 0.60 | 5.0 | 500 | | | 64 | 83 | 82 | |
| 3 | 1725 | 670.400 | 0.84 | 0.60 | 0.60 | 5.0 | 496 | | | 64 | 83 | 82 | |
| 2 | 1730 | 671.980 | 0.82 | 0.60 | 0.60 | 5.0 | 496 | | | 64 | 83 | 82 | |
| 1 | 1735 | 673.730 | 0.82 | 0.60 | 0.60 | 5.0 | 487 | | | 63 | 83 | 82 | |
| 8 | 1740 | 675.600 | 0.92 | 0.60 | 0.60 | 5.0 | 505 | | | 62 | 84 | 82 | |
| 7 | 1745 | 677.270 | 0.99 | 0.60 | 0.60 | 5.0 | 508 | | | 63 | 84 | 82 | |
| 6 | 1750 | 679.100 | 1.00 | 0.60 | 0.60 | 5.0 | 508 | | | 63 | 84 | 82 | |
| 5 | 1755 | 680.680 | 0.99 | 0.60 | 0.60 | 5.0 | 509 | | | 63 | 84 | 82 | |
| ND 4 | 1800 | 683.410 | 0.87 | | | | 504 | | | | | | |
| 3 | | | 0.76 | | | | 498 | | | | | | |
| 2 | | | 0.74 | | | | 496 | | | | | | |
| 1 | | | 0.70 | | | | 498 | | | | | | |

Avg $\Delta P_S$ 0.933 Avg $P_M$ 0.600 Avg $T_S$ 503 Avg $T_M$ 83

Avg($\Delta P_S$ $^{1/2}$) 0.962

Volume DGM 21.210 CF x $C_P$ 0.961 = $V_M$ 20.383 SCF

| Impinger No. | (1) | (2) | (3) | (4) | (5) | (6) | Total |
|---|---|---|---|---|---|---|---|
| Final Wt, gm | 617.6 | 567.4 | 504.2 | 760.3 | | | 2469.5 |
| Initial Wt, gm | 595.7 | 566.4 | 503.6 | 756.7 | | | 2442.4 |
| Difference, gm | 21.9 | 1.0 | 0.6 | 3.6 | | | 27.1 = $V_W$ |

| | |
|---|---|
| Filter No. | |
| Final Wt., gm | |
| Initial Wt., gm | |
| Difference, gm | |
| $V_W$ (gm) | 27.1000 |
| $SO_2$ gm (−) | |

| ORSAT | |
|---|---|
| $\%CO_2$ | 2.6 |
| $\%O_2$ (dry) | 16.6 |
| %CO | |
| $\%N_2$ | 80.8 |
| % Excess Air | 346.8 |

| | | |
|---|---|---|
| Avg ΔP | 0.933 | In. $H_2O$ |
| Avg($\Delta P_S$ $^{1/2}$) | 0.962 | |
| Avg. $P_M$ | 0.600 | In. $H_2O$ |
| Avg. $T_S$ | 503 | °F |
| Avg. $T_S$ | 963 | °R |
| Avg. $T_M$ | 83 | °F |
| Avg. $T_M$ | 543 | °R |

| | | |
|---|---|---|
| $V_{M\,std} = 17.65\ V_M\ ((P_B + (P_M / 13.6)) / T_M)$ | 19.945 | SCF |
| $Q_{M\,std} = V_{Mstd} / T_R$ | 0.332 | SCFM |
| $V_{Wstd} = 0.0472 \times V_W$ | 1.279 | SCF |
| $\%M = V_{W\,std} / (V_{M\,std} + V_{W\,std}) \times 100$ | 6.03 | % |
| $M_D = (100 - \%M) / 100$ | 0.9397 | dry fract. |
| $MW_D = (\%\ CO_2 \times 0.44) + (\%\ O_2 \times 0.32) + (\%\ N_2 \times 0.28)$ | 29.112 | lb/lbmole |
| $MW = M_D \times MW_D + 18\ (1 - M_D)$ | 28.44 | lb/lbmole |
| $V_S = 5129.4 \times C_P\ (T_S / (P_S \times MW))^{1/2} \times Avg(\Delta P_S{}^{1/2})$ | 5,184 | FPM |
| $Q_A = (V_S \times A_S)/144$ | 15,440 | ACFM |
| $Q_S = (0.123 \times V_S \times M_D \times P_S \times A_S) / T_S$ | 8025 | SCFM |
| $\%I = (1040.1 \times V \ldots \times T\ldots) / (M\ldots \times P \ldots \times V \ldots \times T \ldots \times D \ldots)$ [illegible] | | |

# CETCON, inc.



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Job No. | CJ-1309 | Field Data | Metst./ Vel. | Barometer No. | 3 | Barometric Pressure, $P_B$ | 30.06 |
| Date | 8/31/94 | Run No. | P7 | Pitot Tube No. | STD | Ambient Temp., °F | 83 |
| Customer | GPM | Time of Run, $T_R$ | 60 min. | Pitot Tube, $C_P$ | 0.990 | Stack Pressure, $P_S$ | 0.1 in. $H_2O$ = 30.07 in. Hg |
| Unit | #3 CLARK | Sample Box No. | 1 | Nozzle No. | | Initial Leak @ | 15.0 in. Hg = cfm |
| Operator | AJW/GTM | Meter Box No. | CM #3 | Nozzle Dia., $D_N$ | [illegible] in. | Final Leak @ | 10.0 in. Hg = cfm |
| File Name | 1309P7.WK1 | Stack Area, $A_S$ | [illegible] in² | Assumed %M | (default only) | Purge To: | Time: |

| Point | Clock Time | Dry Gas Meter, CF | Pitot "$H_2O$ $\Delta P_S$ | Orifice $\Delta H$ $P_M$ in. $H_2O$ Desired | Orifice $\Delta H$ $P_M$ in. $H_2O$ Actual | Vacuum in. Hg | Stack Temp. °F $T_S$ | Probe Temp. °F | Oven Temp. °F | Effluent Temp. °F | Dry Gas Temp. °F $T_M$ Inlet | Dry Gas Temp. °F $T_M$ Outlet | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1553 | 638.323 | 1.10 | 0.60 | 0.60 | 4.0 | 505 | | | 67 | 82 | 82 | |
| 7 | 1558 | 640.320 | 1.10 | 0.60 | 0.60 | 4.0 | 505 | | | 64 | 82 | 82 | |
| 6 | 1603 | 642.000 | 1.20 | 0.60 | 0.60 | 4.0 | 507 | | | 64 | 81 | 82 | |
| 5 | 1608 | 643.830 | 1.10 | 0.60 | 0.60 | 4.0 | 506 | | | 64 | 82 | 82 | |
| 4 | 1613 | 645.850 | 0.86 | 0.60 | 0.60 | 4.0 | 500 | | | 63 | 81 | 81 | |
| 3 | 1618 | 647.930 | 0.81 | 0.60 | 0.60 | 4.0 | 498 | | | 65 | 81 | 81 | |
| 2 | 1623 | 650.100 | 0.80 | 0.60 | 0.60 | 4.0 | 498 | | | 63 | 82 | 82 | |
| 1 | 1628 | 652.000 | 0.75 | 0.60 | 0.60 | 4.0 | 500 | | | 63 | 82 | 82 | |
| 8 | 1633 | 654.340 | 0.95 | 0.60 | 0.60 | 4.0 | 506 | | | 64 | 82 | 82 | |
| 7 | 1636 | 656.200 | 1.00 | 0.60 | 0.60 | 4.0 | 510 | | | 64 | 82 | 82 | |
| 6 | 1643 | 658.400 | 0.99 | 0.60 | 0.60 | 4.0 | 511 | | | 65 | 82 | 82 | |
| 5 | 1648 | 660.610 | 1.00 | 0.60 | 0.60 | 4.0 | 509 | | | 65 | 83 | 82 | |
| ND 4 | 1653 | 662.045 | 0.87 | | | | 502 | | | | | | |
| 3 | | | 0.78 | | | | 497 | | | | | | |
| 2 | | | 0.75 | | | | 494 | | | | | | |
| 1 | | | 0.73 | | | | 494 | | | | | | |

Avg $\Delta P_S$ 0.924 Avg $P_M$ 0.600 Avg $T_S$ 503 Avg $T_M$ 82

Avg($\Delta P_S^{1/2}$) 0.958

Volume DGM 23.722 CF x $C_F$ 0.961 = $V_M$ 22.797 SCF

| Impinger No. | (1) | (2) | (3) | (4) | (5) | (6) | Total | |
|---|---|---|---|---|---|---|---|---|
| Final Wt, gm | 603.0 | 583.5 | 607.7 | 780.7 | | | 2474.9 | |
| Initial Wt, gm | 580.7 | 581.8 | 607.7 | 777.2 | | | 2447.4 | |
| Difference, gm | 22.3 | 1.7 | 0.0 | 3.5 | | | 27.5 | = $V_W$ |

| | |
|---|---|
| ter No. | |
| tal Wt., gm | |
| tial Wt., gm | |
| ference, gm | |
| (gm) | 27.5000 |
| gm (-) | |

| ORSAT | |
|---|---|
| %$CO_2$ | 2.8 |
| %$O_2$ (dry) | 16.6 |
| %CO | |
| %$N_2$ | 80.6 |
| % Excess Air | 348.8 |

| | | |
|---|---|---|
| Avg $\Delta P$ | 0.924 | in. $H_2O$ |
| Avg($\Delta P_S^{1/2}$) | 0.958 | |
| Avg. $P_M$ | 0.600 | in. $H_2O$ |
| Avg. $T_S$ | 503 | °F |
| Avg. $T_S$ | 963 | °R |
| Avg. $T_M$ | 82 | °F |
| Avg. $T_M$ | 542 | °R |

| | | |
|---|---|---|
| $V_{M\,std} = 17.65\ V_M\ [(P_B + (P_M / 13.6)) / T_M]$ | 22.349 | SCF |
| $Q_{M\,std} = V_{Mstd} / T_R$ | 0.372 | SCFM |
| $V_{Wgas} = 0.0472 \times V_W$ | 1.298 | SCF |
| $\%M = V_{W\,gas} / (V_{M\,std} + V_{W\,gas}) \times 100$ | 5.49 | % |
| $M_D = (100 - \%M) / 100$ | 0.9451 | dry frac. |
| $MW_D = (\%\ CO_2 \times 0.44) + (\%\ O_2 \times 0.32) + (\%\ N_2 \times 0.28)$ | 29.112 | lb/lbmole |
| $MW = M_D \times MW_D + 18\ (1 - M_D)$ | 28.50 | lb/lbmole |
| $V_S = 5129.4 \times C_P\ (T_S / (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$ | 5,157 | FPM |
| $Q_A = (V_S \times A_S)/144$ | 15,380 | ACFM |
| $Q_S = (0.123 \times V_S \times M_D \times P_S \times A_S) / T_S$ | 8029 | SCFM |
| $\%I = (1040.1 \times V_{M\,std} \times T_S) / (M_D \times P_S \times V_S \times T_R \times D_N^2)$ | | % |

ENGINE TEST 140, TEST SITE 37 EXHAUST STACK AREA SQ FT. 1.268
CLARK HBA-6 RATED 1320. HP AT 300. RPM, 2-STROKE SC
SOURCE: PR-15-613 HCR-3.90 NOX-CLH CO-NDIR, HC- FID O2-POL FLOW-CB

| RUN | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DATE | 10/19/87 | 10/19/87 | 10/19/87 | 10/19/87 | 10/19/87 |
| TIME | 1000 | 1100 | 1145 | 1300 | 1350 |
| **OPERATIONAL DATA** | | | | | |
| BAROMETER IN. HG. | 29.70 | 29.73 | 29.73 | 29.78 | 29.69 |
| AMBIENT TEMP. DEG. F | 56. | 56. | 56. | 59. | 60. |
| INLET MAN. TEMP DEG. F | 121. | 121. | 118. | 120. | 118. |
| EXHAUST VEL. FT/SEC | 133.22 | 132.79 | 133.81 | 142.47 | 131.40 |
| SP. HUMIDITY GRAIN/LB | 59. | 67. | 67. | 66. | 69. |
| ENGINE SPEED RPM | 300 | 300 | 300 | 300 | 300 |
| HORSEPOWER | $\boxed{1320.}$ | $\boxed{1165.}$ | $\boxed{1320.}$ | 1150. | 1320. |
| SCAV. AIR PRES. IN. HG | 7.6 | 7.2 | 7.4 | 7.0 | 7.2 |
| IGNIT. TIME DEG. BTDC | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| FUEL SP. GR. (STP) | .5802 | .5802 | .5802 | .5802 | .5802 |
| HI HEAT VALUE BTU/SCF | 1006. | 1006. | 1006. | 1006. | 1006. |
| LO HEAT VALUE BTU/SCF | 906. | 906. | 906. | 906. | 906. |
| CALC. EXH. FLOW LB/HR | 21608. | 22160. | 21845. | 24151. | 21402. |
| EXHAUST SP. GR. (STP) | .9794 | .9793 | .9787 | .9803 | .9785 |
| EXHAUST TEMP. DEG. F | 649. | 619. | 643. | 604. | 644. |
| FUEL FLOW SCF/HR | 10956. | 10835. | 11088. | 10695. | 10956. |
| FUEL MIL. BTU/HR (HHV) | 11.023 | 10.901 | 11.156 | 10.760 | 11.023 |
| FUEL FLOW LB/HR | 486. | 481. | 492. | 475. | 486. |
| AIR FLOW LB/HR (WET) | 21122. | 21679. | 21352. | 23677. | 20916. |
| AIR/FUEL RATIO (WET) | 43.4 | ~~45.1~~ | 43.4 | 49.9 | 43.0 |
| BSFC BTU/HP-HR(HHV) | 8351. | 9357. | 8451. | 9357. | 8351. |
| EXHAUST H2O PERCENT | 8.36 | 8.33 | 8.52 | 7.65 | 8.62 |
| AVG. PEAK PRESSURE | ND | ND | ND | ND | ND |
| PEAK PRESS. STD. DEV. | ND | ND | ND | ND | ND |
| **EMISSIONS AS MEASURED** | | | | | |
| NOX PPM | 1560.00 | 940.00 | 1529.00 | 614.00 | 1498.00 |
| NO PPM | 1446.00 | 897.00 | 1405.00 | 565.00 | 1325.00 |
| NO2 PPM | 114.00 | 43.00 | 124.00 | 49.00 | 173.00 |
| CO2 PERCENT | 3.94 | 3.83 | 3.94 | 3.43 | 3.98 |
| HC PPM | 3100.00 | 2700.00 | 3200.00 | 2600.00 | 3200.00 |
| CO PPM | 153.00 | 130.00 | 144.00 | 144.00 | 144.00 |
| O2 PERCENT | 13.75 | 14.25 | 13.75 | 14.63 | 13.75 |
| NO/NOX | .927 | .954 | .919 | .920 | .885 |
| **CALCULATED EMISSIONS** | | | | | |
| NOX LB/HR | 50.445 | 31.182 | 49.931 | 22.343 | 47.884 |
| HC LB/HR TOTAL | 34.825 | 31.115 | 36.303 | 32.868 | 35.536 |
| CO LB/HR | 2.874 | 2.508 | 2.732 | 3.060 | 2.673 |
| NOX LB/MIL BTU | 4.576 | 2.860 | 4.476 | 2.076 | 4.344 |
| HC LB/MIL BTU TOTAL | 3.159 | 2.854 | 3.254 | 3.055 | 3.224 |
| CO LB/MIL BTU | .261 | .230 | .245 | .284 | .242 |
| NOX G/BHP HR | 17.335 | 12.141 | 17.158 | 8.813 | 16.455 |
| HC G/BHP HR TOTAL | 11.967 | 12.115 | 12.475 | 12.964 | 12.211 |
| CO G/BHP HR | .988 | .976 | .939 | 1.207 | .918 |
| NOX PPM CORR TO 15 PCT O2 | 1287. | 834. | 1262. | 578. | 1236. |

NOTE: NOX AS NO2 AND BTU AS HHV FOR ALL CALCULATED EMISSIONS

CLARK HBA-6 05/01/88

ENGINE TEST 141, TEST SITE 37 EXHAUST STACK AREA SQ FT. 1.268
CLARK HBA-6 RATED 1320. HP AT 300. RPM, 2-STROKE SC
SOURCE: PR-15-613 HCR-3.90 NOX-CLH CO-NDIR, HC- FID O2-POL FLOW-CB

| RUN | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DATE | 10/19/87 | 10/19/87 | 10/20/87 | 10/20/87 | 10/20/87 |
| TIME | 1430 | 1500 | 800 | 900 | 1000 |
| **OPERATIONAL DATA** | | | | | |
| BAROMETER IN. HG. | 29.67 | 29.67 | 29.84 | 29.85 | 29.85 |
| AMBIENT TEMP. DEG. F | 57. | 58. | 56. | 55. | 55. |
| INLET MAN. TEMP DEG. F | 121. | 127. | 122. | 121. | 122. |
| EXHAUST VEL. FT/SEC | 137.11 | 135.42 | 148.11 | 144.15 | 141.46 |
| SP. HUMIDITY GRAIN/LB | 66. | 64. | 55. | 61. | 53. |
| ENGINE SPEED RPM | 300 | 300 | 300 | 300 | 300 |
| HORSEPOWER | $\boxed{1305.}$ | $\boxed{1150.}$ | 1300. | 1270. | 1265. |
| SCAV. AIR PRES. IN. HG | 7.6 | 7.4 | 7.6 | 7.7 | 7.7 |
| IGNIT. TIME DEG. BTDC | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| FUEL SP. GR. (STP) | .5802 | .5802 | .5802 | .5802 | .5802 |
| HI HEAT VALUE BTU/SCF | 1006. | 1006. | 1006. | 1006. | 1006. |
| LO HEAT VALUE BTU/SCF | 906. | 906. | 906. | 906. | 906. |
| CALC. EXH. FLOW LB/HR | 22297. | 22387. | 24694. | 23756. | 23441. |
| EXHAUST SP. GR. (STP) | .9790 | .9799 | .9811 | .9801 | .9808 |
| EXHAUST TEMP. DEG. F | 645. | 627. | 624. | 637. | 631. |
| FUEL FLOW SCF/HR | 11484. | 10695. | 11050. | 11430. | 11258. |
| FUEL MIL. BTU/HR (HHV) | 11.554 | 10.760 | 11.118 | 11.500 | 11.327 |
| FUEL FLOW LB/HR | 510. | 475. | 490. | 507. | 500. |
| AIR FLOW LB/HR (WET) | 21788. | 21912. | 24204. | 23249. | 22941. |
| AIR/FUEL RATIO (WET) | 42.8 | 46.2 | 49.4 | 45.8 | 45.9 |
| BSFC BTU/HP-HR(HHV) | 8854. | 9357. | 8552. | 9055. | 8954. |
| EXHAUST H2O PERCENT | 8.48 | 7.90 | 7.29 | 7.89 | 7.74 |
| AVG. PEAK PRESSURE | ND | ND | ND | ND | ND |
| PEAK PRESS. STD. DEV. | ND | ND | ND | ND | ND |
| **EMISSIONS AS MEASURED** | | | | | |
| NOX PPM | 1338.00 | 996.00 | 918.00 | 1244.00 | 1066.00 |
| NO PPM | 1228.00 | 899.00 | 846.00 | 1138.00 | 993.00 |
| NO2 PPM | 110.00 | 97.00 | 72.00 | 106.00 | 73.00 |
| CO2 PERCENT | 3.94 | 3.61 | 3.36 | 3.65 | 3.65 |
| HC PPM | 3850.00 | 3800.00 | 3600.00 | 3700.00 | 3698.00 |
| CO PPM | 112.00 | 126.00 | 117.00 | 117.00 | 108.00 |
| O2 PERCENT | 14.18 | 14.50 | 14.63 | 14.38 | 14.50 |
| NO/NOX | .918 | .903 | .922 | .915 | .932 |
| **CALCULATED EMISSIONS** | | | | | |
| NOX LB/HR | 44.603 | 33.520 | 34.259 | 44.417 | 37.594 |
| HC LB/HR TOTAL | 44.586 | 44.428 | 46.672 | 45.895 | 44.082 |
| CO LB/HR | 2.169 | 2.472 | 2.552 | 2.434 | 2.219 |
| NOX LB/MIL BTU | 3.860 | 3.115 | 3.081 | 3.862 | 3.319 |
| HC LB/MIL BTU TOTAL | 3.859 | 4.129 | 4.198 | 3.991 | 3.892 |
| CO LB/MIL BTU | .188 | .230 | .230 | .212 | .196 |
| NOX G/BHP HR | 15.503 | 13.221 | 11.954 | 15.864 | 13.480 |
| HC G/BHP HR TOTAL | 15.497 | 17.524 | 16.285 | 16.392 | 15.807 |
| CO G/BHP HR | .754 | .975 | .890 | .869 | .796 |
| NOX PPM CORR TO 15 PCT O2 | 1175. | 918. | 864. | 1126. | 983. |

NOTE: NOX AS NO2 AND BTU AS HHV FOR ALL CALCULATED EMISSIONS

A) INLET COMPRESSOR CLARK MODEL TLA-6
EXHAUST FLOW 19,100 lb/Hr
EXHAUST TEMPERATURE 720 DEG.F
EXHAUST GAS DENSITY @ 720 DEG. F 0.032874 lb/cu ft
STACK HEIGHT 75 FEET
STACK I.D. 29"

B) INLET COMPRESSOR CLARK MODEL TLA-6
EXHAUST FLOW 19,100 lb/Hr
EXHAUST TEMPERATURE 720 DEG.F
EXHAUST GAS DENSITY @ 720 DEG. F 0.032874 lb/cu ft
STACK HEIGHT 75 FEET
STACK I.D. 23"

C) INLET COMPRESSOR CLARK MODEL HBA-6
EXHAUST FLOW 12,915 lb/Hr
EXHAUST TEMPERATURE 700 DEG.F
EXHAUST GAS DENSITY @ 700 DEG. F 0.033441 lb/cu ft
STACK HEIGHT 75 FEET
STACK I.D. 23"

D) INLET COMPRESSOR CLARK MODEL HBA-6
EXHAUST FLOW 12,915 lb/Hr
EXHAUST TEMPERATURE 700 DEG.F
EXHAUST GAS DENSITY @ 700 DEG. F 0.033441 lb/cu ft
STACK HEIGHT 75 FEET
STACK I.D. 23"

F) INLET COMPRESSOR CLARK MODEL HBA-6
EXHAUST FLOW 12,915 lb/Hr
EXHAUST TEMPERATURE 700 DEG.F
EXHAUST GAS DENSITY @ 700 DEG. F 0.033441 lb/cu ft
STACK HEIGHT 75 FEET
STACK I.D. 23"

E) INLET COMPRESSOR CLARK MODEL HBA-6
EXHAUST FLOW 12,915 lb/Hr
EXHAUST TEMPERATURE 700 DEG.F
EXHAUST GAS DENSITY @ 700 DEG. F 0.033441 lb/cu ft
STACK HEIGHT 75 FEET
STACK I.D. 23"

TABLE 3.2-1 UNCONTROLLED EMISSION FACTORS FOR 2-STROKE LEAN-BURN ENGINES[a]
(SCC 2-02-002-52)

| Pollutant | Emission Factor (lb/MMBtu)[b] (fuel input) | Emission Factor Rating |
| --- | --- | --- |
| Criteria Pollutants and Greenhouse Gases | | |
| $NO_x$[c] 90 - 105% Load | 3.17 E+00 | A |
| $NO_x$[c] <90% Load | 1.94 E+00 | A |
| CO[c] 90 - 105% Load | 3.86 E-01 | A |
| CO[c] <90% Load | 3.53 E-01 | A |
| $CO_2$[d] | 1.10 E+02 | A |
| $SO_2$[e] | 5.88 E-04 | A |
| TOC[f] | 1.64 E+00 | A |
| Methane[g] | 1.45 E+00 | C |
| VOC[h] | 1.20 E-01 | C |
| PM10 (filterable)[i] | 3.84 E-02 | C |
| PM2.5 (filterable)[i] | 3.84 E-02 | C |
| PM Condensable[j] | 9.91 E-03 | E |
| Trace Organic Compounds | | |
| 1,1,2,2-Tetrachloroethane[k] | 6.63 E-05 | C |
| 1,1,2-Trichloroethane[k] | 5.27 E-05 | C |
| 1,1-Dichloroethane | 3.91 E-05 | C |
| 1,2,3-Trimethylbenzene | 3.54 E-05 | D |
| 1,2,4-Trimethylbenzene | 1.11 E-04 | C |
| 1,2-Dichloroethane | 4.22 E-05 | D |
| 1,2-Dichloropropane | 4.46 E-05 | C |
| 1,3,5-Trimethylbenzene | 1.80 E-05 | D |
| 1,3-Butadiene[k] | 8.20 E-04 | D |
| 1,3-Dichloropropene[k] | 4.38 E-05 | C |
| 2,2,4-Trimethylpentane[k] | 8.46 E-04 | B |
| 2-Methylnaphthalene[k] | 2.14 E-05 | C |
| Acenaphthene[k] | 1.33 E-06 | C |

Table 3.2-1. UNCONTROLLED EMISSION FACTORS FOR 2-STROKE LEAN-BURN ENGINES

(Continued)

| Pollutant | Emission Factor (lb/MMBtu)[b] (fuel input) | Emission Factor Rating |
|---|---|---|
| Acenaphthylene[k] | 3.17 E-06 | C |
| Acetaldehyde[k,l] | 7.76 E-03 | A |
| Acrolein[k,l] | 7.78 E-03 | A |
| Anthracene[k] | 7.18 E-07 | C |
| Benz(a)anthracene[k] | 3.36 E-07 | C |
| Benzene[k] | 1.94 E-03 | A |
| Benzo(a)pyrene[k] | 5.68 E-09 | D |
| Benzo(b)fluoranthene[k] | 8.51 E-09 | D |
| Benzo(e)pyrene[k] | 2.34 E-08 | D |
| Benzo(g,h,i)perylene[k] | 2.48 E-08 | D |
| Benzo(k)fluoranthene[k] | 4.26 E-09 | D |
| Biphenyl[k] | 3.95 E-06 | C |
| Butane | 4.75 E-03 | C |
| Butyr/Isobutyraldehyde | 4.37 E-04 | C |
| Carbon Tetrachloride[k] | 6.07 E-05 | C |
| Chlorobenzene[k] | 4.44 E-05 | C |
| Chloroform[k] | 4.71 E-05 | C |
| Chrysene[k] | 6.72 E-07 | C |
| Cyclohexane | 3.08 E-04 | C |
| Cyclopentane | 9.47 E-05 | C |
| Ethane | 7.09 E-02 | A |
| Ethylbenzene[k] | 1.08 E-04 | B |
| Ethylene Dibromide[k] | 7.34 E-05 | C |
| Fluoranthene[k] | 3.61 E-07 | C |
| Fluorene[k] | 1.69 E-06 | C |
| Formaldehyde[k,l] | 5.52 E-02 | A |

Table 3.2-1. UNCONTROLLED EMISSION FACTORS FOR 2-STROKE LEAN-BURN ENGINES (Concluded)

| Pollutant | Emission Factor (lb/MMBtu)[b] (fuel input) | Emission Factor Rating |
|---|---|---|
| Indeno(1,2,3-c,d)pyrene[k] | 9.93 E-09 | D |
| Isobutane | 3.75 E-03 | C |
| Methanol[k] | 2.48 E-03 | A |
| Methylcyclohexane | 3.38 E-04 | C |
| Methylene Chloride[k] | 1.47 E-04 | C |
| n-Hexane[k] | 4.45 E-04 | C |
| n-Nonane | 3.08 E-05 | C |
| n-Octane | 7.44 E-05 | C |
| n-Pentane | 1.53 E-03 | C |
| Naphthalene[k] | 9.63 E-05 | C |
| PAH[k] | 1.34 E-04 | D |
| Perylene[k] | 4.97 E-09 | D |
| Phenanthrene[k] | 3.53 E-06 | C |
| Phenol[k] | 4.21 E-05 | C |
| Propane | 2.87 E-02 | C |
| Pyrene[k] | 5.84 E-07 | C |
| Styrene[k] | 5.48 E-05 | A |
| Toluene[k] | 9.63 E-04 | A |
| Vinyl Chloride[k] | 2.47 E-05 | C |
| Xylene[k] | 2.68 E-04 | A |

[a] Reference 7. Factors represent uncontrolled levels. For $NO_x$, CO, and PM10, "uncontrolled" means no combustion or add-on controls; however, the factor may include turbocharged units. For all other pollutants, "uncontrolled" means no oxidation control; the data set may include units with control techniques used for NOx control, such as PCC and SCR for lean burn engines, and PSC for rich burn engines. Factors are based on large population of engines. Factors are for engines at all loads, except as indicated. SCC = Source Classification Code. TOC = Total Organic Compounds. PM10 = Particulate Matter $\leq$ 10 microns ($\mu$m) aerodynamic diameter. A "<" sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

[b] Emission factors were calculated in units of (lb/MMBtu) based on procedures in EPA

Method 19. To convert from (lb/MMBtu) to (lb/$10^6$ scf), multiply by the heat content of the fuel. If the heat content is not available, use 1020 Btu/scf. To convert from (lb/MMBtu) to (lb/hp-hr) use the following equation:

$$\text{lb/hp-hr} = (\text{lb/MMBtu})\,(\text{heat input, MMBtu/hr})\,(\text{1/operating HP, 1/hp})$$

[c] Emission tests with unreported load conditions were not included in the data set.
[d] Based on 99.5% conversion of the fuel carbon to $CO_2$. $CO_2$ [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to $CO_2$, C = carbon content of fuel by weight (0.75), D = density of fuel, 4.1 E+04 lb/$10^6$ scf, and h = heating value of natural gas (assume 1020 Btu/scf at 60°F).
[e] Based on 100% conversion of fuel sulfur to $SO_2$. Assumes sulfur content in natural gas of 2,000 gr/$10^6$ scf.
[f] Emission factor for TOC is based on measured emission levels of 43 tests.
[g] Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor. Measured emission factor for methane compares well with the calculated emission factor, 1.48 lb/MMBtu vs. 1.45 lb/MMBtu, respectively.
[h] VOC emission factor is based on the sum of the emission factors for all speciated organic compounds less ethane and methane.
[i] Considered $\leq$ 1 $\mu$m in aerodynamic diameter. Therefore, for filterable PM emissions, PM10(filterable) = PM2.5(filterable).
[j] No data were available for condensable PM emissions. The presented emission factor reflects emissions from 4SLB engines.
[k] Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.
[l] For lean burn engines, aldehyde emissions quantification using CARB 430 may reflect interference with the sampling compounds due to the nitrogen concentration in the stack. The presented emission factor is based on FTIR measurements. Emissions data based on CARB 430 are available in the background report.

**Solar Turbines**
*A Caterpillar Company*

# PREDICTED ENGINE PERFORMANCE

| | |
|---|---|
| Customer: Duke Energy Field Services | Model: TAURUS 70-10302S |
| Job ID: Linam Ranch T70 | Package Type: CS/MD |
| Run By: Eric L Moore — Date Run: 4-Feb-06 | Match: 59F MATCH |
| Engine Performance Code: REV. 3.40 — Engine Performance Data: REV. 0.5 | Fuel System: GAS |
| | Fuel Type: SD NATURAL GAS |

## DATA FOR MINIMUM PERFORMANCE

| | | |
|---|---|---|
| Elevation | feet | 3710 |
| Inlet Loss | in H20 | 3.0 |
| Exhaust Loss | in H20 | 4.0 |
| Accessory on GP Shaft | HP | 26.0 |

| | | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Engine Inlet Temperature | deg F | 0 | 20.0 | 40.0 | 60.0 | 80.0 | 100.0 |
| Relative Humidity | % | 60.0 | 60.0 | 60.0 | 60.0 | 60.0 | 60.0 |
| Driven Equipment Speed | RPM | 11279 | 11205 | 11099 | 10964 | 10799 | 10587 |
| Specified Load | HP | FULL | FULL | FULL | FULL | FULL | FULL |
| Net Output Power | HP | 10702 | 10010 | 9301 | 8510 | 7687 | 6876 |
| Fuel Flow | mmBtu/hr | 77.63 | 73.70 | 69.62 | 64.99 | 60.38 | 56.35 |
| Heat Rate | Btu/HP-hr | 7254 | 7362 | 7486 | 7638 | 7855 | 8195 |
| Therm Eff | % | 35.076 | 34.560 | 33.991 | 33.315 | 32.394 | 31.047 |
| Engine Exhaust Flow | lbm/hr | 216159 | 204605 | 193208 | 181710 | 168939 | 156979 |
| Exhaust Temperature | deg F | 858 | 885 | 908 | 927 | 952 | 981 |

Fuel Gas Composition (Volume Percent)

| | |
|---|---|
| Methane (CH4) | 92.79 |
| Ethane (C2H6) | 4.16 |
| Propane (C3H8) | 0.84 |
| N-Butane (C4H10) | 0.18 |
| N-Pentane (C5H12) | 0.04 |
| Hexane (C6H14) | 0.04 |
| Carbon Dioxide (CO2) | 0.44 |
| Hydrogen Sulfide (H2S) | 0.0001 |
| Nitrogen (N2) | 1.51 |

Fuel Gas Properties

| | | | | | |
|---|---|---|---|---|---|
| LHV (Btu/Scf) | 939.2 | Specific Gravity | 0.5970 | Wobbe Index at 60F | 1215.6 |

# Solar Turbines

*A Caterpillar Company*

## PREDICTED EMISSION PERFORMANCE

| Customer | | Engine Model | |
|---|---|---|---|
| Duke Energy Field Services | | TAURUS 70-10302S<br>CS/MD 59F MATCH | |
| Job ID | | | |
| Linam Ranch T70 | | | |
| Inquiry Number | | Fuel Type | Water Injection |
| Linam Ranch T70 | | SD NATURAL GAS | NO |
| Run By | Date Run | Engine Emissions Data | Engines Tested |
| Eric L Moore | 4-Feb-06 | REV. 0.1 | 0 |

| | NOx EMISSIONS | | CO EMISSIONS | | UHC EMISSIONS | |
|---|---|---|---|---|---|---|
| | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum |
| **4** — 8510 Hp, 100.0% Load, Elev. 3710 ft, Rel. Humidity 60.0%, Temperature 60.0 Deg. F | | | | | | |
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 43.05 | * | 34.49 | * | 9.88 |
| lbm/MMBtu (Fuel LHV) | * | 0.151 | * | 0.121 | * | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.55 | * | 1.24 | * | 0.36 |
| lbm/hr | * | 9.83 | * | 7.87 | * | 2.25 |
| **5** — 7687 Hp, 100.0% Load, Elev. 3710 ft, Rel. Humidity 60.0%, Temperature 80.0 Deg. F | | | | | | |
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 39.70 | * | 31.80 | * | 9.11 |
| lbm/MMBtu (Fuel LHV) | * | 0.150 | * | 0.120 | * | 0.034 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.58 | * | 1.27 | * | 0.36 |
| lbm/hr | * | 9.06 | * | 7.26 | * | 2.08 |
| **6** — 6876 Hp, 100.0% Load, Elev. 3710 ft, Rel. Humidity 60.0%, Temperature 100.0 Deg. F | | | | | | |
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 36.56 | * | 29.29 | * | 8.39 |
| lbm/MMBtu (Fuel LHV) | * | 0.148 | * | 0.119 | * | 0.034 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.63 | * | 1.30 | * | 0.37 |
| lbm/hr | * | 8.35 | * | 6.69 | * | 1.91 |

Important Notes

1. For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another. The emission values on this form are only predicted emissions at the specific operating conditions listed.
2. Solar's typical SoLoNOx warranty is for greater than 0 deg F, and between 50% and 100% load for gas fuel, and between 80% and 100% load for liquid fuel. An emission warranty for non-SoLoNOx equipment is for greater than 0 deg F and between 80% and 100% load.
3. Fuel must meet Solar standard fuel specification ES 9-98. Predicted emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
4. If needed, Solar can provide generic documents to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
5. Solar can optionally provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.

**Solar Turbines**
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# PREDICTED EMISSION PERFORMANCE

| | |
|---|---|
| Customer: **Duke Energy Field Services** | Engine Model: **TAURUS 70-10302S CS/MD 59F MATCH** |
| Job ID: **Linam Ranch T70** | |
| Inquiry Number: **Linam Ranch T70** | Fuel Type: **SD NATURAL GAS** — Water Injection: **NO** |
| Run By: **Eric L Moore** — Date Run: **4-Feb-06** | Engine Emissions Data: **REV. 0.1** — Engines Tested: **0** |

| | NOx EMISSIONS Nominal | NOx EMISSIONS Maximum | CO EMISSIONS Nominal | CO EMISSIONS Maximum | UHC EMISSIONS Nominal | UHC EMISSIONS Maximum |
|---|---|---|---|---|---|---|
| **1** — 10702 Hp, 100.0% Load | Elev. 3710 ft | | Rel. Humidity 60.0% | | Temperature 0 Deg. F | |
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 51.78 | * | 41.48 | * | 11.88 |
| lbm/MMBtu (Fuel LHV) | * | 0.152 | * | 0.122 | * | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.48 | * | 1.19 | * | 0.34 |
| lbm/hr | * | 11.82 | * | 9.47 | * | 2.71 |
| **2** — 10010 Hp, 100.0% Load | Elev. 3710 ft | | Rel. Humidity 60.0% | | Temperature 20.0 Deg. F | |
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 49.11 | * | 39.34 | * | 11.27 |
| lbm/MMBtu (Fuel LHV) | * | 0.152 | * | 0.122 | * | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.50 | * | 1.20 | * | 0.34 |
| lbm/hr | * | 11.21 | * | 8.98 | * | 2.57 |
| **3** — 9301 Hp, 100.0% Load | Elev. 3710 ft | | Rel. Humidity 60.0% | | Temperature 40.0 Deg. F | |
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 46.30 | * | 37.09 | * | 10.62 |
| lbm/MMBtu (Fuel LHV) | * | 0.152 | * | 0.122 | * | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.52 | * | 1.22 | * | 0.35 |
| lbm/hr | * | 10.57 | * | 8.47 | * | 2.43 |

Important Notes

1. For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another. The emission values on this form are only predicted emissions at the specific operating conditions listed.
2. Solar's typical SoLoNOx warranty is for greater than 0 deg F, and between 50% and 100% load for gas fuel, and between 80% and 100% load for liquid fuel. An emission warranty for non-SoLoNOx equipment is for greater than 0 deg F and between 80% and 100% load.
3. Fuel must meet Solar standard fuel specification ES 9-98. Predicted emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
4. If needed, Solar can provide generic documents to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
5. Solar can optionally provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.

**Solar Turbines**
*A Caterpillar Company*

# PREDICTED EMISSION PERFORMANCE

| | | | |
|---|---|---|---|
| Customer | Duke Energy | Engine Model | TAURUS 70-9702S CS/MD 59F MATCH |
| Job ID | | Fuel Type | SD NATURAL GAS |
| Inquiry Number | | Water Injection | NO |
| Run By | Michael E Clay | Engine Emissions Data | REV. 0.1 |
| Date Run | 12-Jan-06 | Engines Tested | 0 |

[illegible] | [illegible] Hp | 100.0% Load | Elev. [illegible] ft | Rel. Humidity 60.0% | Temperature [illegible] Deg F

| | NOx EMISSIONS Nominal | NOx EMISSIONS Maximum | CO EMISSIONS Nominal | CO EMISSIONS Maximum | UHC EMISSIONS Nominal | UHC EMISSIONS Maximum |
|---|---|---|---|---|---|---|
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 41.31 | * | 33.09 | * | 9.48 |
| lbm/MMBtu (Fuel LHV) | * | 0.151 | * | 0.121 | * | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.59 | * | 1.27 | * | 0.36 |
| lbm/hr | * | 9.43 | * | 7.55 | * | 2.16 |

[illegible] | [illegible] Hp | 100.0% Load | Elev. [illegible] ft | Rel. Humidity 60.0% | Temperature 80.0 Deg F

| | NOx EMISSIONS Nominal | NOx EMISSIONS Maximum | CO EMISSIONS Nominal | CO EMISSIONS Maximum | UHC EMISSIONS Nominal | UHC EMISSIONS Maximum |
|---|---|---|---|---|---|---|
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 38.07 | * | 30.50 | * | 8.73 |
| lbm/MMBtu (Fuel LHV) | * | 0.150 | * | 0.120 | * | 0.034 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.63 | * | 1.31 | * | 0.37 |
| lbm/hr | * | 8.69 | * | 6.96 | * | 1.99 |

[illegible] | [illegible] Hp | 100.0% Load | Elev. [illegible] ft | Rel. Humidity 60.0% | Temperature [illegible] Deg F

| | NOx EMISSIONS Nominal | NOx EMISSIONS Maximum | CO EMISSIONS Nominal | CO EMISSIONS Maximum | UHC EMISSIONS Nominal | UHC EMISSIONS Maximum |
|---|---|---|---|---|---|---|
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 35.09 | * | 28.11 | * | 8.05 |
| lbm/MMBtu (Fuel LHV) | * | 0.148 | * | 0.119 | * | 0.034 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.69 | * | 1.35 | * | 0.39 |
| lbm/hr | * | 8.01 | * | 6.42 | * | 1.84 |

**Important Notes**

1. For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another. The emission values on this form are only predicted emissions at the specific operating conditions listed.
2. Solar's typical SoLoNOx warranty is for greater than 0 deg F, and between 50% and 100% load for gas fuel, and between 80% and 100% load for liquid fuel. An emission warranty for non-SoLoNOx equipment is for greater than 0 deg F and between 80% and 100% load.
3. Fuel must meet Solar standard fuel specification ES 9-98. Predicted emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
4. If needed, Solar can provide generic documents to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
5. Solar can optionally provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.

**Solar Turbines**
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# PREDICTED EMISSION PERFORMANCE

| | |
|---|---|
| Customer: **Duke Energy** | Engine Model: **TAURUS 70-9702S CS/MD 59F MATCH** |
| Job ID: | |
| Inquiry Number: | Fuel Type: **SD NATURAL GAS** — Water Injection: **NO** |
| Run By: **Michael E Clay** — Date Run: **12-Jan-06** | Engine Emissions Data: **REV. 0.1** — Engines Tested: **0** |

| | NOx EMISSIONS Nominal | NOx EMISSIONS Maximum | CO EMISSIONS Nominal | CO EMISSIONS Maximum | UHC EMISSIONS Nominal | UHC EMISSIONS Maximum |
|---|---|---|---|---|---|---|
| **Set 1 — [illegible] Hp — 100.0% Load — Elev. [illegible] ft — Rel Humidity 60.0% — Temperature [illegible] Deg F** | | | | | | |
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 49.32 | * | 39.50 | * | 11.31 |
| lbm/MMBtu (Fuel LHV) | * | 0.152 | * | 0.122 | * | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.51 | * | 1.21 | * | 0.35 |
| lbm/hr | * | 11.26 | * | 9.02 | * | 2.58 |
| **Set 2 — 9866 Hp — 100.0% Load — Elev. 3710 ft — Rel Humidity 60.0% — Temperature 20.0 Deg F** | | | | | | |
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 46.90 | * | 37.57 | * | 10.76 |
| lbm/MMBtu (Fuel LHV) | * | 0.152 | * | 0.122 | * | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.53 | * | 1.23 | * | 0.35 |
| lbm/hr | * | 10.71 | * | 8.58 | * | 2.46 |
| **Set 3 — 9706 Hp — 100.0% Load — Elev. 3710 ft — Rel Humidity 60.0% — Temperature 40.0 Deg F** | | | | | | |
| PPMvd at 15% O2 | * | 38.00 | * | 50.00 | * | 25.00 |
| ton/yr | * | 44.32 | * | 35.51 | * | 10.17 |
| lbm/MMBtu (Fuel LHV) | * | 0.152 | * | 0.122 | * | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | * | 1.56 | * | 1.25 | * | 0.36 |
| lbm/hr | * | 10.12 | * | 8.11 | * | 2.32 |

**Important Notes**

1. For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another. The emission values on this form are only predicted emissions at the specific operating conditions listed.
2. Solar's typical SoLoNOx warranty is for greater than 0 deg F, and between 50% and 100% load for gas fuel, and between 80% and 100% load for liquid fuel. An emission warranty for non-SoLoNOx equipment is for greater than 0 deg F and between 80% and 100% load.
3. Fuel must meet Solar standard fuel specification ES 9-98. Predicted emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
4. If needed, Solar can provide generic documents to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
5. Solar can optionally provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.

Table 3.1-2a. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM STATIONARY GAS TURBINES

| Emission Factors[a] - Uncontrolled | | | | |
|---|---|---|---|---|
| Pollutant | Natural Gas-Fired Turbines[b] | | Distillate Oil-Fired Turbines[d] | |
| | (lb/MMBtu)[c] (Fuel Input) | Emission Factor Rating | (lb/MMBtu)[e] (Fuel Input) | Emission Factor Rating |
| $CO_2$[f] | 110 | A | 157 | A |
| $N_2O$ | 0.003[g] | E | ND | NA |
| Lead | ND | NA | 1.4 E-05 | C |
| $SO_2$ | 0.94S[h] | B | 1.01S[h] | B |
| Methane | 8.6 E-03 | C | ND | NA |
| VOC | 2.1 E-03 | D | 4.1 E-04[j] | E |
| TOC[k] | 1.1 E-02 | B | 4.0 E-03[l] | C |
| PM (condensible) | 4.7 E-03[l] | C | 7.2 E-03[l] | C |
| PM (filterable) | 1.9 E-03[l] | C | 4.3 E-03[l] | C |
| PM (total) | 6.6 E-03[l] | C | 1.2 E-02[l] | C |

[a] Factors are derived from units operating at high loads ($\geq$80 percent load) only. For information on units operating at other loads, consult the background report for this chapter (Reference 16), available at "www.epa.gov/ttn/chief". ND = No Data, NA = Not Applicable.

[b] SCCs for natural gas-fired turbines include 2-01-002-01, 2-02-002-01 & 03, and 2-03-002-02 & 03.

[c] Emission factors based on an average natural gas heating value (HHV) of 1020 Btu/scf at $60^oF$. To convert from (lb/MMBtu) to (lb/$10^6$ scf), multiply by 1020. Similarly, these emission factors can be converted to other natural gas heating values.

[d] SCCs for distillate oil-fired turbines are 2-01-001-01, 2-02-001-01, 2-02-001-03, and 2-03-001-02.

[e] Emission factors based on an average distillate oil heating value of 139 MMBtu/$10^3$ gallons. To convert from (lb/MMBtu) to (lb/$10^3$ gallons), multiply by 139.

[f] Based on 99.5% conversion of fuel carbon to $CO_2$ for natural gas and 99% conversion of fuel carbon to $CO_2$ for distillate oil. $CO_2$ (Natural Gas) [lb/MMBtu] = (0.0036 scf/Btu)(%CON)(C)(D), where %CON = weight percent conversion of fuel carbon to $CO_2$, C = carbon content of fuel by weight, and D = density of fuel. For natural gas, C is assumed at 75%, and D is assumed at 4.1 E+04 lb/$10^6$scf. For distillate oil, $CO_2$ (Distillate Oil) [lb/MMBtu] = (26.4 gal/MMBtu) (%CON)(C)(D), where C is assumed at 87%, and the D is assumed at 6.9 lb/gallon.

[g] Emission factor is carried over from the previous revision to AP-42 (Supplement B, October 1996) and is based on limited source tests on a single turbine with water-steam injection (Reference 5).

[h] All sulfur in the fuel is assumed to be converted to $SO_2$. S = percent sulfur in fuel. Example, if sulfur content in the fuel is 3.4 percent, then S = 3.4. If S is not available, use 3.4 E-03 lb/MMBtu for natural gas turbines, and 3.3 E-02 lb/MMBtu for distillate oil turbines (the equations are more accurate).

[j] VOC emissions are assumed equal to the sum of organic emissions.

[k] Pollutant referenced as THC in the gathered emission tests. It is assumed as TOC, because it is based on EPA Test Method 25A.

[l] Emission factors are based on combustion turbines using water-steam injection.

Table 3.1-3. EMISSION FACTORS FOR HAZARDOUS AIR POLLUTANTS FROM NATURAL GAS-FIRED STATIONARY GAS TURBINES[a]

| Emission Factors[b] - Uncontrolled | | |
|---|---|---|
| Pollutant | Emission Factor (lb/MMBtu)[c] | Emission Factor Rating |
| 1,3-Butadiene[d] | < 4.3 E-07 | D |
| Acetaldehyde | 4.0 E-05 | C |
| Acrolein | 6.4 E-06 | C |
| Benzene[e] | 1.2 E-05 | A |
| Ethylbenzene | 3.2 E-05 | C |
| Formaldehyde[f] | 7.1 E-04 | A |
| Naphthalene | 1.3 E-06 | C |
| PAH | 2.2 E-06 | C |
| Propylene Oxide[d] | < 2.9 E-05 | D |
| Toluene | 1.3 E-04 | C |
| Xylenes | 6.4 E-05 | C |

[a] SCC for natural gas-fired turbines include 2-01-002-01, 2-02-002-01, 2-02-002-03, 2-03-002-02, and 2-03-002-03. Hazardous Air Pollutants as defined in Section 112 (b) of the *Clean Air Act*.
[b] Factors are derived from units operating at high loads ($\geq$80 percent load) only. For information on units operating at other loads, consult the background report for this chapter (Reference 16), available at "www.epa.gov/ttn/chief".
[c] Emission factors based on an average natural gas heating value (HHV) of 1020 Btu/scf at 60$^{o}$F. To convert from (lb/MMBtu) to (lb/$10^6$ scf), multiply by 1020. These emission factors can be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this heating value.
[d] Compound was not detected. The presented emission value is based on one-half of the detection limit.
[e] Benzene with SCONOX catalyst is 9.1 E-07, rating of D.
[f] Formaldehyde with SCONOX catalyst is 2.0 E-05, rating of D.

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

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

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

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

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

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

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

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

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

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

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

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

| CAS No. | Pollutant | Emission Factor (lb/$10^6$ scf) | Emission Factor Rating |
|---|---|---|---|
| 91-57-6 | 2-Methylnaphthalene[b, c] | 2.4E-05 | D |
| 56-49-5 | 3-Methylchloranthrene[b, c] | <1.8E-06 | E |
| | 7,12-Dimethylbenz(a)anthracene[b,c] | <1.6E-05 | E |
| 83-32-9 | Acenaphthene[b,c] | <1.8E-06 | E |
| 203-96-8 | Acenaphthylene[b,c] | <1.8E-06 | E |
| 120-12-7 | Anthracene[b,c] | <2.4E-06 | E |
| 56-55-3 | Benz(a)anthracene[b,c] | <1.8E-06 | E |
| 71-43-2 | Benzene[b] | 2.1E-03 | B |
| 50-32-8 | Benzo(a)pyrene[b,c] | <1.2E-06 | E |
| 205-99-2 | Benzo(b)fluoranthene[b,c] | <1.8E-06 | E |
| 191-24-2 | Benzo(g,h,i)perylene[b,c] | <1.2E-06 | E |
| 207-08-9 | Benzo(k)fluoranthene[b,c] | <1.8E-06 | E |
| 106-97-8 | Butane | 2.1E+00 | E |
| 218-01-9 | Chrysene[b,c] | <1.8E-06 | E |
| 53-70-3 | Dibenzo(a,h)anthracene[b,c] | <1.2E-06 | E |
| 25321-22-6 | Dichlorobenzene[b] | 1.2E-03 | E |
| 74-84-0 | Ethane | 3.1E+00 | E |
| 206-44-0 | Fluoranthene[b,c] | 3.0E-06 | E |
| 86-73-7 | Fluorene[b,c] | 2.8E-06 | E |
| 50-00-0 | Formaldehyde[b] | 7.5E-02 | B |
| 110-54-3 | Hexane[b] | 1.8E+00 | E |
| 193-39-5 | Indeno(1,2,3-cd)pyrene[b,c] | <1.8E-06 | E |
| 91-20-3 | Naphthalene[b] | 6.1E-04 | E |
| 109-66-0 | Pentane | 2.6E+00 | E |
| 85-01-8 | Phenanathrene[b,c] | 1.7E-05 | D |
| 74-98-6 | Propane | 1.6E+00 | E |

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

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

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

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

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

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

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

**Identification**

| | |
|---|---|
| User Identification: | Linam Ranch TK-2 |
| City: | Near Hobbs |
| State: | New Mexico |
| Company: | DCP Midstream, LP |
| Type of Tank: | Horizontal Tank |
| Description: | 500 gallon gasoline tank |

**Tank Dimensions**

| | | |
|---|---|---|
| Shell Length (ft): | | 5.25 |
| Diameter (ft): | | 4.00 |
| Volume (gallons): | | 500.00 |
| Turnovers: | | 6.00 |
| Net Throughput(gal/yr): | | 3,000.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | Red/Primer |
| Shell Condition | Poor |

**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
# Detail Calculations (AP-42)

## Linam Ranch TK-2 - Horizontal Tank
## Near Hobbs, New Mexico

Annual Emission Calcaulations

| | |
|---|---|
| Standing Losses (lb): | 1,358.4042 |
| Vapor Space Volume (cu ft): | 42.0213 |
| Vapor Density (lb/cu ft): | 0.1006 |
| Vapor Space Expansion Factor: | 1.7509 |
| Vented Vapor Saturation Factor: | 0.5026 |
| | |
| Tank Vapor Space Volume: | |
| Vapor Space Volume (cu ft): | 42.0213 |
| Tank Diameter (ft): | 4.0000 |
| Effective Diameter (ft): | 5.1722 |
| Vapor Space Outage (ft): | 2.0000 |
| Tank Shell Length (ft): | 5.2500 |
| | |
| Vapor Density | |
| Vapor Density (lb/cu ft): | 0.1006 |
| Vapor Molecular Weight (lb/lb-mole): | 62.0000 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 9.3367 |
| 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 |
| Daily Total Solar Insulation Factor (Btu/sqft day): | 1,810.0000 |
| | |
| Vapor Space Expansion Factor | |
| Vapor Space Expansion Factor: | 1.7509 |
| Daily Vapor Temperature Range (deg. R): | 67.5988 |
| Daily Vapor Pressure Range (psia): | 5.5751 |
| Breather Vent Press. Setting Range(psia): | 0.0600 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 9.3367 |
| Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia): | 6.8731 |
| Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia): | 12.4481 |
| 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: | 0.5026 |
| Vapor Pressure at Daily Average Liquid: Surface Temperature (psia): | 9.3367 |
| Vapor Space Outage (ft): | 2.0000 |
| | |
| Working Losses (lb): | 41.3484 |
| Vapor Molecular Weight (lb/lb-mole): | 62.0000 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 9.3367 |
| Annual Net Throughput (gal/yr.): | 3,000.0000 |
| Annual Turnovers: | 6.0000 |
| Turnover Factor: | 1.0000 |
| Tank Diameter (ft): | 4.0000 |
| Working Loss Product Factor: | 1.0000 |
| | |
| Total Losses (lb): | 1,399.7525 |

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

## Emissions Report for: Annual

**Linam Ranch TK-2 - Horizontal Tank**
**Near Hobbs, New Mexico**

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Gasoline (RVP 13) | 41.35 | 1,358.40 | 1,399.75 |
| Hexane (-n) | 0.19 | 6.22 | 6.41 |
| Benzene | 0.21 | 7.02 | 7.23 |
| Isooctane | 0.26 | 8.55 | 8.81 |
| Toluene | 0.25 | 8.14 | 8.39 |
| Ethylbenzene | 0.02 | 0.57 | 0.58 |
| Xylene (-m) | 0.07 | 2.37 | 2.44 |
| Isopropyl benzene | 0.00 | 0.10 | 0.10 |
| 1,2,4-Trimethylbenzene | 0.01 | 0.21 | 0.21 |
| Cyclohexane | 0.03 | 0.96 | 0.99 |
| Unidentified Components | 40.31 | 1,324.27 | 1,364.58 |

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Linam DH-10, 27MM/day, 25gpm, 100% control
File Name: P:\1. CLIENTS\DCP Midstream\Linam Ranch\Projects\163201.0074 Linam Ranch GP Tech Rev\04 REFERENCE\Linam DH-10 2016 pump uprate.ddf
Date: February 25, 2016

DESCRIPTION:

Description: Linam DH-10, 27MM/day, 25gpm, 100% control
Flash and Cond to flare

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

| Component | lbs/hr | lbs/day | tons/yr |
|---|---|---|---|
| Methane | 1.6465 | 39.517 | 7.2119 |
| Ethane | 3.3535 | 80.483 | 14.6881 |
| Propane | 1.4901 | 35.763 | 6.5267 |
| Isobutane | 0.0509 | 1.221 | 0.2228 |
| n-Butane | 0.0734 | 1.762 | 0.3215 |
| Isopentane | 0.0016 | 0.039 | 0.0071 |
| n-Pentane | 0.0012 | 0.028 | 0.0051 |
| Total Emissions | 6.6172 | 158.812 | 28.9832 |
| Total Hydrocarbon Emissions | 6.6172 | 158.812 | 28.9832 |
| Total VOC Emissions | 1.6172 | 38.812 | 7.0832 |

UNCONTROLLED REGENERATOR EMISSIONS

| Component | lbs/hr | lbs/day | tons/yr |
|---|---|---|---|
| Methane | 1.6466 | 39.519 | 7.2122 |
| Ethane | 3.3537 | 80.488 | 14.6891 |
| Propane | 1.4902 | 35.765 | 6.5270 |
| Isobutane | 0.0509 | 1.221 | 0.2228 |
| n-Butane | 0.0734 | 1.762 | 0.3215 |
| Isopentane | 0.0016 | 0.039 | 0.0071 |
| n-Pentane | 0.0012 | 0.028 | 0.0051 |
| Total Emissions | 6.6176 | 158.821 | 28.9849 |
| Total Hydrocarbon Emissions | 6.6176 | 158.821 | 28.9849 |
| Total VOC Emissions | 1.6173 | 38.814 | 7.0836 |

FLASH TANK OFF GAS

| Component | lbs/hr | lbs/day | tons/yr |
|---|---|---|---|
| Methane | 24.6184 | 590.841 | 107.8285 |
| Ethane | 14.7762 | 354.629 | 64.7199 |
| Propane | 3.2959 | 79.102 | 14.4361 |
| Isobutane | 0.0769 | 1.847 | 0.3370 |
| n-Butane | 0.0867 | 2.081 | 0.3798 |

| | | | |
|---|---|---|---|
| Isopentane | 0.0017 | 0.041 | 0.0076 |
| n-Pentane | 0.0010 | 0.024 | 0.0044 |
| Total Emissions | 42.8569 | 1028.566 | 187.7133 |
| Total Hydrocarbon Emissions | 42.8569 | 1028.566 | 187.7133 |
| Total VOC Emissions | 3.4623 | 83.095 | 15.1649 |

EQUIPMENT REPORTS:

CONDENSER

| | |
|---|---|
| Condenser Outlet Temperature: | 80.00 deg. F |
| Condenser Pressure: | 2.00 psia |
| Condenser Duty: | 7.84e-002 MM BTU/hr |
| Produced Water: | 6.31 bbls/day |
| VOC Control Efficiency: | 0.00 % |
| HAP Control Efficiency: | 0.00 % |
| BTEX Control Efficiency: | 0.00 % |
| Dissolved Hydrocarbons in Water: | 4.05 mg/L |

| Component | Emitted | Condensed |
|---|---|---|
| Water | 1.69% | 98.31% |
| Carbon Dioxide | 99.88% | 0.12% |
| Nitrogen | 100.00% | 0.00% |
| Methane | 100.00% | 0.00% |
| Ethane | 99.99% | 0.01% |
| Propane | 100.00% | 0.00% |
| Isobutane | 100.00% | 0.00% |
| n-Butane | 100.00% | 0.00% |
| Isopentane | 100.00% | 0.00% |
| n-Pentane | 100.00% | 0.00% |

ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

| | |
|---|---|
| Calculated Absorber Stages: | 1.25 |
| Calculated Dry Gas Dew Point: | 3.27 lbs. H2O/MMSCF |
| Temperature: | 100.0 deg. F |
| Pressure: | 600.0 psig |
| Dry Gas Flow Rate: | 27.0000 MMSCF/day |
| Glycol Losses with Dry Gas: | 0.1869 lb/hr |
| Wet Gas Water Content: | Saturated |
| Calculated Wet Gas Water Content: | 86.45 lbs. H2O/MMSCF |
| Calculated Lean Glycol Recirc. Ratio: | 16.03 gal/lb H2O |

| Component | Remaining in Dry Gas | Absorbed in Glycol |
|---|---|---|
| Water | 3.77% | 96.23% |
| Carbon Dioxide | 99.13% | 0.87% |
| Nitrogen | 99.93% | 0.07% |
| Methane | 99.94% | 0.06% |

| | | |
|---|---|---|
| Ethane | 99.78% | 0.22% |
| Propane | 99.62% | 0.38% |
| Isobutane | 99.44% | 0.56% |
| n-Butane | 99.26% | 0.74% |
| Isopentane | 99.22% | 0.78% |
| n-Pentane | 98.99% | 1.01% |

FLASH TANK

Flash Control: Vented to atmosphere
Flash Temperature: 150.0 deg. F
Flash Pressure: 30.0 psig

| Component | Left in Glycol | Removed in Flash Gas |
|---|---|---|
| Water | 99.94% | 0.06% |
| Carbon Dioxide | 40.32% | 59.68% |
| Nitrogen | 6.16% | 93.84% |
| Methane | 6.27% | 93.73% |
| Ethane | 18.50% | 81.50% |
| Propane | 31.14% | 68.86% |
| Isobutane | 39.80% | 60.20% |
| n-Butane | 45.84% | 54.16% |
| Isopentane | 48.87% | 51.13% |
| n-Pentane | 54.05% | 45.95% |

REGENERATOR

No Stripping Gas used in regenerator.

| Component | Remaining in Glycol | Distilled Overhead |
|---|---|---|
| Water | 69.27% | 30.73% |
| Carbon Dioxide | 0.00% | 100.00% |
| Nitrogen | 0.00% | 100.00% |
| Methane | 0.00% | 100.00% |
| Ethane | 0.00% | 100.00% |
| Propane | 0.00% | 100.00% |
| Isobutane | 0.00% | 100.00% |
| n-Butane | 0.00% | 100.00% |
| Isopentane | 1.02% | 98.98% |
| n-Pentane | 0.93% | 99.07% |

STREAM REPORTS:

WET GAS STREAM

Temperature: 100.00 deg. F
Pressure: 614.70 psia
Flow Rate: 1.13e+006 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|

| | | |
|---|---|---|
| Water | 1.82e-001 | 9.75e+001 |
| Carbon Dioxide | 2.99e-003 | 3.92e+000 |
| Nitrogen | 2.68e+000 | 2.23e+003 |
| Methane | 8.69e+001 | 4.14e+004 |
| Ethane | 9.26e+000 | 8.27e+003 |
| Propane | 9.57e-001 | 1.25e+003 |
| Isobutane | 1.33e-002 | 2.29e+001 |
| n-Butane | 1.26e-002 | 2.17e+001 |
| Isopentane | 2.00e-004 | 4.28e-001 |
| n-Pentane | 9.98e-005 | 2.14e-001 |
| Total Components | 100.00 | 5.33e+004 |

DRY GAS STREAM

Temperature: 100.00 deg. F
Pressure: 614.70 psia
Flow Rate: 1.13e+006 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Water | 6.89e-003 | 3.68e+000 |
| Carbon Dioxide | 2.98e-003 | 3.88e+000 |
| Nitrogen | 2.68e+000 | 2.23e+003 |
| Methane | 8.71e+001 | 4.14e+004 |
| Ethane | 9.26e+000 | 8.26e+003 |
| Propane | 9.56e-001 | 1.25e+003 |
| Isobutane | 1.32e-002 | 2.28e+001 |
| n-Butane | 1.25e-002 | 2.16e+001 |
| Isopentane | 1.99e-004 | 4.25e-001 |
| n-Pentane | 9.91e-005 | 2.12e-001 |
| Total Components | 100.00 | 5.32e+004 |

LEAN GLYCOL STREAM

Temperature: 100.00 deg. F
Flow Rate: 2.50e+001 gpm

| Component | Conc. (wt%) | Loading (lb/hr) |
|---|---|---|
| TEG | 9.85e+001 | 1.39e+004 |
| Water | 1.50e+000 | 2.11e+002 |
| Carbon Dioxide | 2.42e-014 | 3.40e-012 |
| Nitrogen | 1.09e-012 | 1.53e-010 |
| Methane | 6.27e-018 | 8.82e-016 |
| Ethane | 6.08e-008 | 8.56e-006 |
| Propane | 1.38e-009 | 1.95e-007 |
| Isobutane | 2.72e-011 | 3.83e-009 |
| n-Butane | 2.82e-011 | 3.97e-009 |
| Isopentane | 1.20e-007 | 1.69e-005 |
| n-Pentane | 7.71e-008 | 1.09e-005 |
| Total Components | 100.00 | 1.41e+004 |

RICH GLYCOL STREAM

Temperature: 100.00 deg. F
Pressure: 614.70 psia
Flow Rate: 2.53e+001 gpm
NOTE: Stream has more than one phase.

| Component | Conc. (wt%) | Loading (lb/hr) |
|---|---|---|
| TEG | 9.75e+001 | 1.39e+004 |
| Water | 2.14e+000 | 3.05e+002 |
| Carbon Dioxide | 2.39e-004 | 3.40e-002 |
| Nitrogen | 1.07e-002 | 1.52e+000 |
| Methane | 1.85e-001 | 2.63e+001 |
| Ethane | 1.27e-001 | 1.81e+001 |
| Propane | 3.37e-002 | 4.79e+000 |
| Isobutane | 8.99e-004 | 1.28e-001 |
| n-Butane | 1.13e-003 | 1.60e-001 |
| Isopentane | 2.37e-005 | 3.37e-003 |
| n-Pentane | 1.53e-005 | 2.17e-003 |
| Total Components | 100.00 | 1.42e+004 |

FLASH TANK OFF GAS STREAM

Temperature: 150.00 deg. F
Pressure: 44.70 psia
Flow Rate: 8.21e+002 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Water | 4.34e-001 | 1.69e-001 |
| Carbon Dioxide | 2.13e-002 | 2.03e-002 |
| Nitrogen | 2.35e+000 | 1.42e+000 |
| Methane | 7.09e+001 | 2.46e+001 |
| Ethane | 2.27e+001 | 1.48e+001 |
| Propane | 3.45e+000 | 3.30e+000 |
| Isobutane | 6.12e-002 | 7.69e-002 |
| n-Butane | 6.89e-002 | 8.67e-002 |
| Isopentane | 1.10e-003 | 1.72e-003 |
| n-Pentane | 6.39e-004 | 9.97e-004 |
| Total Components | 100.00 | 4.45e+001 |

FLASH TANK GLYCOL STREAM

Temperature: 150.00 deg. F
Flow Rate: 2.52e+001 gpm

| Component | Conc. (wt%) | Loading (lb/hr) |
|---|---|---|
| TEG | 9.78e+001 | 1.39e+004 |
| Water | 2.15e+000 | 3.05e+002 |
| Carbon Dioxide | 9.67e-005 | 1.37e-002 |
| Nitrogen | 6.59e-004 | 9.34e-002 |
| Methane | 1.16e-002 | 1.65e+000 |
| Ethane | 2.37e-002 | 3.35e+000 |
| Propane | 1.05e-002 | 1.49e+000 |
| Isobutane | 3.59e-004 | 5.09e-002 |
| n-Butane | 5.18e-004 | 7.34e-002 |
| Isopentane | 1.16e-005 | 1.65e-003 |

| | | |
|---|---|---|
| n-Pentane | 8.28e-006 | 1.17e-003 |
| Total Components | 100.00 | 1.42e+004 |

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 2.07e+003 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Water | 9.53e+001 | 9.37e+001 |
| Carbon Dioxide | 5.71e-003 | 1.37e-002 |
| Nitrogen | 6.12e-002 | 9.34e-002 |
| Methane | 1.88e+000 | 1.65e+000 |
| Ethane | 2.04e+000 | 3.35e+000 |
| Propane | 6.19e-001 | 1.49e+000 |
| Isobutane | 1.60e-002 | 5.09e-002 |
| n-Butane | 2.32e-002 | 7.34e-002 |
| Isopentane | 4.14e-004 | 1.63e-003 |
| n-Pentane | 2.95e-004 | 1.16e-003 |
| Total Components | 100.00 | 1.00e+002 |

CONDENSER VENT GAS STREAM

Temperature: 80.00 deg. F
Pressure: 2.00 psia
Flow Rate: 1.30e+002 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Water | 2.57e+001 | 1.58e+000 |
| Carbon Dioxide | 9.11e-002 | 1.37e-002 |
| Nitrogen | 9.77e-001 | 9.34e-002 |
| Methane | 3.01e+001 | 1.65e+000 |
| Ethane | 3.27e+001 | 3.35e+000 |
| Propane | 9.90e+000 | 1.49e+000 |
| Isobutane | 2.56e-001 | 5.09e-002 |
| n-Butane | 3.70e-001 | 7.34e-002 |
| Isopentane | 6.62e-003 | 1.63e-003 |
| n-Pentane | 4.72e-003 | 1.16e-003 |
| Total Components | 100.00 | 8.30e+000 |

CONDENSER PRODUCED WATER STREAM

Temperature: 80.00 deg. F
Flow Rate: 1.84e-001 gpm

| Component | Conc. (wt%) | Loading (lb/hr) | (ppm) |
|---|---|---|---|
| Water | 1.00e+002 | 9.21e+001 | 999996. |
| Carbon Dioxide | 1.77e-005 | 1.63e-005 | 0. |
| Nitrogen | 2.37e-006 | 2.18e-006 | 0. |
| Methane | 8.92e-005 | 8.21e-005 | 1. |
| Ethane | 2.37e-004 | 2.19e-004 | 2. |

| | | | |
|---|---|---|---|
| Propane | 7.40e-005 | 6.81e-005 | 1. |
| Isobutane | 1.45e-006 | 1.34e-006 | 0. |
| n-Butane | 2.93e-006 | 2.69e-006 | 0. |
| Isopentane | 4.90e-008 | 4.51e-008 | 0. |
| n-Pentane | 3.88e-008 | 3.57e-008 | 0. |
| Total Components | 100.00 | 9.21e+001 | 1000000. |

CONDENSER RECOVERED OIL STREAM

Temperature: 80.00 deg. F

The calculated flow rate is less than 0.000001 #mol/hr.
The stream flow rate and composition are not reported.

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

| | |
|---|---|
| **Identification** | |
| User Identification: | TK-VRU |
| City: | Hobbs, NM |
| State: | |
| Company: | DCP Midstream |
| Type of Tank: | Vertical Fixed Roof Tank |
| Description: | 750 bbl Linam Ranch Gas Plant |
| **Tank Dimensions** | |
| Shell Height (ft): | 24.00 |
| Diameter (ft): | 15.50 |
| Liquid Height (ft) : | 24.00 |
| Avg. Liquid Height (ft): | 12.00 |
| Volume (gallons): | 31,500.00 |
| Turnovers: | 876.00 |
| Net Throughput(gal/yr): | 27,594,000.00 |
| Is Tank Heated (y/n): | N |
| **Paint Characteristics** | |
| Shell Color/Shade: | White/White |
| Shell Condition | Good |
| Roof Color/Shade: | White/White |
| Roof Condition: | Good |
| **Roof Characteristics** | |
| Type: | Cone |
| Height (ft) | 0.00 |
| Slope (ft/ft) (Cone Roof) | 0.06 |
| **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

**LRGP G-Tank - Vertical Fixed Roof Tank**
**Artesia, New Mexico**

| 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 10) | All | 63.26 | 55.73 | 70.78 | 60.84 | 5.5219 | 4.7708 | 6.3647 | 66.0000 | | | 92.00 | Option 4: RVP=10, ASTM Slope=3 |

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

## LRGP G-Tank - Vertical Fixed Roof Tank
## Artesia, New Mexico

Annual Emission Calcaulations

| | |
|---|---|
| Standing Losses (lb): | 3,225.4083 |
| Vapor Space Volume (cu ft): | 2,294.7688 |
| Vapor Density (lb/cu ft): | 0.0649 |
| Vapor Space Expansion Factor: | 0.2703 |
| Vented Vapor Saturation Factor: | 0.2193 |
| | |
| Tank Vapor Space Volume: | |
| Vapor Space Volume (cu ft): | 2,294.7688 |
| Tank Diameter (ft): | 15.5000 |
| Vapor Space Outage (ft): | 12.1615 |
| Tank Shell Height (ft): | 24.0000 |
| Average Liquid Height (ft): | 12.0000 |
| Roof Outage (ft): | 0.1615 |
| | |
| Roof Outage (Cone Roof) | |
| Roof Outage (ft): | 0.1615 |
| Roof Height (ft): | 0.0000 |
| Roof Slope (ft/ft): | 0.0625 |
| Shell Radius (ft): | 7.7500 |
| | |
| Vapor Density | |
| Vapor Density (lb/cu ft): | 0.0649 |
| Vapor Molecular Weight (lb/lb-mole): | 66.0000 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 5.5219 |
| Daily Avg. Liquid Surface Temp. (deg. R): | 522.9287 |
| 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): | 520.5067 |
| Tank Paint Solar Absorptance (Shell): | 0.1700 |
| Tank Paint Solar Absorptance (Roof): | 0.1700 |
| Daily Total Solar Insulation Factor (Btu/sqft day): | 1,810.0000 |
| | |
| Vapor Space Expansion Factor | |
| Vapor Space Expansion Factor: | 0.2703 |
| Daily Vapor Temperature Range (deg. R): | 30.0956 |
| Daily Vapor Pressure Range (psia): | 1.5939 |
| Breather Vent Press. Setting Range(psia): | 0.0600 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 5.5219 |
| Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia): | 4.7708 |
| Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia): | 6.3647 |
| Daily Avg. Liquid Surface Temp. (deg R): | 522.9287 |
| Daily Min. Liquid Surface Temp. (deg R): | 515.4048 |
| Daily Max. Liquid Surface Temp. (deg R): | 530.4526 |
| Daily Ambient Temp. Range (deg. R): | 29.8333 |
| | |
| Vented Vapor Saturation Factor | |
| Vented Vapor Saturation Factor: | 0.2193 |
| Vapor Pressure at Daily Average Liquid: Surface Temperature (psia): | 5.5219 |
| Vapor Space Outage (ft): | 12.1615 |
| | |
| Working Losses (lb): | 48,106.3704 |
| Vapor Molecular Weight (lb/lb-mole): | 66.0000 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 5.5219 |
| Annual Net Throughput (gal/yr.): | 27,594,000.0000 |
| Annual Turnovers: | 876.0000 |
| Turnover Factor: | 0.2009 |
| Maximum Liquid Volume (gal): | 31,500.0000 |
| Maximum Liquid Height (ft): | 24.0000 |
| Tank Diameter (ft): | 15.5000 |
| Working Loss Product Factor: | 1.0000 |
| | |
| Total Losses (lb): | 51,331.7787 |

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

## Emissions Report for: Annual

**LRGP G-Tank - Vertical Fixed Roof Tank**
**Artesia, New Mexico**

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Gasoline (RVP 10) | 48,106.37 | 3,225.41 | 51,331.78 |

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

| | |
|---|---|
| **Identification** | |
| User Identification: | TK-VRUTMP 1 and 2 |
| City: | Hobbs |
| State: | New Mexico |
| Company: | DCP Midstream |
| Type of Tank: | Horizontal Tank |
| Description: | Horizontal bullet tanks, 1500 bbl |
| **Tank Dimensions** | |
| Shell Length (ft): | 72.50 |
| Diameter (ft): | 12.00 |
| Volume (gallons): | 63,000.00 |
| Turnovers: | 438.00 |
| Net Throughput(gal/yr): | 27,594,000.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |
| **Paint Characteristics** | |
| Shell Color/Shade: | White/White |
| Shell Condition | Good |
| **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

**TK-VRUTMP 1 and 2 - Horizontal Tank**
**Hobbs, New Mexico**

| 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 10) | All | 63.26 | 55.73 | 70.78 | 60.84 | 5.5219 | 4.7708 | 6.3647 | 66.0000 | | | 92.00 | Option 4: RVP=10, ASTM Slope=3 |

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

## TK-VRUTMP 1 and 2 - Horizontal Tank
## Hobbs, New Mexico

Annual Emission Calcaulations

| | |
|---|---|
| Standing Losses (lb): | 12,143.6488 |
| Vapor Space Volume (cu ft): | 5,222.6477 |
| Vapor Density (lb/cu ft): | 0.0649 |
| Vapor Space Expansion Factor: | 0.2703 |
| Vented Vapor Saturation Factor: | 0.3629 |
| | |
| Tank Vapor Space Volume: | |
| Vapor Space Volume (cu ft): | 5,222.6477 |
| Tank Diameter (ft): | 12.0000 |
| Effective Diameter (ft): | 33.2908 |
| Vapor Space Outage (ft): | 6.0000 |
| Tank Shell Length (ft): | 72.5000 |
| | |
| Vapor Density | |
| Vapor Density (lb/cu ft): | 0.0649 |
| Vapor Molecular Weight (lb/lb-mole): | 66.0000 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 5.5219 |
| Daily Avg. Liquid Surface Temp. (deg. R): | 522.9287 |
| 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): | 520.5067 |
| Tank Paint Solar Absorptance (Shell): | 0.1700 |
| Daily Total Solar Insulation Factor (Btu/sqft day): | 1,810.0000 |
| | |
| Vapor Space Expansion Factor | |
| Vapor Space Expansion Factor: | 0.2703 |
| Daily Vapor Temperature Range (deg. R): | 30.0956 |
| Daily Vapor Pressure Range (psia): | 1.5939 |
| Breather Vent Press. Setting Range(psia): | 0.0600 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 5.5219 |
| Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia): | 4.7708 |
| Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia): | 6.3647 |
| Daily Avg. Liquid Surface Temp. (deg R): | 522.9287 |
| Daily Min. Liquid Surface Temp. (deg R): | 515.4048 |
| Daily Max. Liquid Surface Temp. (deg R): | 530.4526 |
| Daily Ambient Temp. Range (deg. R): | 29.8333 |
| | |
| Vented Vapor Saturation Factor | |
| Vented Vapor Saturation Factor: | 0.3629 |
| Vapor Pressure at Daily Average Liquid: Surface Temperature (psia): | 5.5219 |
| Vapor Space Outage (ft): | 6.0000 |
| | |
| Working Losses (lb): | 56,306.3199 |
| Vapor Molecular Weight (lb/lb-mole): | 66.0000 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 5.5219 |
| Annual Net Throughput (gal/yr.): | 27,594,000.0000 |

| | |
|---|---|
| Annual Turnovers: | 438.0000 |
| Turnover Factor: | 0.2352 |
| Tank Diameter (ft): | 12.0000 |
| Working Loss Product Factor: | 1.0000 |

| | |
|---|---|
| Total Losses (lb): | 68,449.9687 |

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

## Emissions Report for: Annual

**TK-VRUTMP 1 and 2 - Horizontal Tank**
**Hobbs, New Mexico**

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Gasoline (RVP 10) | 56,306.32 | 12,143.65 | 68,449.97 |

**Gas Analysis: Meter #M0501-00 Linam total inlet West from PGAS dated 4/22/05**

| Gas Constituent | Mol. Wt. (lb/lbmole) | Mole % (Vol %) | **Weight (lb/lbmole Gas)** | Wt. % (Wt %) |
|---|---|---|---|---|
| Methane | 16.0 | 78.957 | 12.63 | 60.83 |
| Ethane | 30.0 | 9.477 | 2.84 | 13.69 |
| **Hydrogen Sulfide** | **34.1** | **0.661** | **0.23** | **1.08** |
| Propane | 44.0 | 4.757 | 2.09 | 10.08 |
| i-Butane | 58.0 | 0.678 | 0.39 | 1.89 |
| n-Butane | 58.0 | 1.390 | 0.81 | 3.88 |
| i-Pentane | 72.0 | 0.301 | 0.22 | 1.04 |
| n-Pentane | 72.0 | 0.284 | 0.20 | 0.98 |
| Hexanes+ | 86.0 | 0.270 | 0.23 | 1.12 |
| n-Hexane | 86.0 | 0.000 | 0.00 | 0.00 |
| Carbon Dioxide | 44.0 | 1.359 | 0.60 | 2.88 |
| Helium | 4.0 | 0.000 | 0.00 | 0.00 |
| Nitrogen | 28.0 | 1.866 | 0.52 | 2.52 |
| Total | | **100.00** | **20.77** | **100.0** |

**Gas Analysis: Meter #M0500-00 Linam total inlet East from PGAS dated 7/27/05**

| Gas Constituent | Mol. Wt. (lb/lbmole) | Mole % (Vol %) | **Weight (lb/lbmole Gas)** | Wt. % (Wt %) |
|---|---|---|---|---|
| Methane | 16.0 | 79.337 | 12.69 | 61.12 |
| Ethane | 30.0 | 9.553 | 2.87 | 13.80 |
| **Hydrogen Sulfide** | **34.1** | **0.300** | **0.10** | **0.49** |
| Propane | 44.0 | 4.578 | 2.01 | 9.70 |
| i-Butane | 58.0 | 0.596 | 0.35 | 1.66 |
| n-Butane | 58.0 | 1.314 | 0.76 | 3.67 |
| i-Pentane | 72.0 | 0.363 | 0.26 | 1.26 |
| n-Pentane | 72.0 | 0.363 | 0.26 | 1.26 |
| Hexanes+ | 86.0 | 0.549 | 0.47 | 2.27 |
| n-Hexane | 86.0 | 0.000 | 0.00 | 0.00 |
| Carbon Dioxide | 44.0 | 1.280 | 0.56 | 2.71 |
| Helium | 4.0 | 0.000 | 0.00 | 0.00 |
| Nitrogen | 28.0 | 1.767 | 0.49 | 2.38 |
| Total | | **100.00** | **20.84** | **100.3** |

Solar Turbines
A Caterpillar Company

# PREDICTED EMISSION PERFORMANCE

| | |
|---|---|
| Customer | Engine Model<br>**TAURUS 60-7800S**<br>**CS/MD 59F MATCH** |
| Job ID | |
| Inquiry Number | Fuel Type: **SD NATURAL GAS** / Water Injection: **NO** |
| Run By: **David A Pocengal** / Date Run: **7-Mar-11** | Engine Emissions Data: **REV. 0.1** |

| | NOx EMISSIONS | CO EMISSIONS | UHC EMISSIONS |
|---|---|---|---|
| **1** — 7340 HP, 100.0% Load, Elev. 3647 ft, Rel. Humidity 60.0%, Temperature 0 Deg. F | | | |
| PPMvd at 15% O2 | 15.00 | 25.00 | 25.00 |
| ton/yr | 15.18 | 15.41 | 8.82 |
| lbm/MMBtu (Fuel LHV) | 0.060 | 0.061 | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | 0.63 | 0.64 | 0.37 |
| lbm/hr | 3.47 | 3.52 | 2.01 |
| g/(Hp-hr) (gas turbine shaft pwr) | 0.21 | 0.22 | 0.12 |
| **2** — 7121 HP, 100.0% Load, Elev. 3647 ft, Rel. Humidity 60.0%, Temperature 20.0 Deg. F | | | |
| PPMvd at 15% O2 | 15.00 | 25.00 | 25.00 |
| ton/yr | 14.84 | 15.05 | 8.62 |
| lbm/MMBtu (Fuel LHV) | 0.060 | 0.061 | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | 0.64 | 0.65 | 0.37 |
| lbm/hr | 3.39 | 3.44 | 1.97 |
| g/(Hp-hr) (gas turbine shaft pwr) | 0.22 | 0.22 | 0.13 |

Notes

1. For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
2. Solar's typical SoLoNOx warranty, for ppm values, is available for greater than 0 deg F, and between 50% and 100% load for gas fuel, and between 65% and 100% load for liquid fuel (except for the Centaur 40). An emission warranty for non-SoLoNOx equipment is available for greater than 0 deg F and between 80% and 100% load.
3. Fuel must meet Solar standard fuel specification ES 9-98. Emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
4. If needed, Solar can provide Product Information Letters to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
5. Solar can provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
6. Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

**Solar Turbines**
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# PREDICTED EMISSION PERFORMANCE

| Customer | | Engine Model |  |
|---|---|---|---|
| | | **TAURUS 60-7800S CS/MD 59F MATCH** | |
| Job ID | | | |
| Inquiry Number | | Fuel Type | Water Injection |
| | | **SD NATURAL GAS** | **NO** |
| Run By | Date Run | Engine Emissions Data | |
| **David A Pocengal** | **7-Mar-11** | **REV. 0.1** | |

| | NOx EMISSIONS | CO EMISSIONS | UHC EMISSIONS |
|---|---|---|---|
| **3** — 6868 HP, 100.0% Load, Elev. 3647 ft, Rel. Humidity 60.0%, Temperature 40.0 Deg. F | | | |
| PPMvd at 15% O2 | 15.00 | 25.00 | 25.00 |
| ton/yr | 14.40 | 14.61 | 8.37 |
| lbm/MMBtu (Fuel LHV) | 0.060 | 0.061 | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | 0.64 | 0.65 | 0.37 |
| lbm/hr | 3.29 | 3.34 | 1.91 |
| g/(Hp-hr) (gas turbine shaft pwr) | 0.22 | 0.22 | 0.13 |
| **4** — 6520 HP, 100.0% Load, Elev. 3647 ft, Rel. Humidity 60.0%, Temperature 60.0 Deg. F | | | |
| PPMvd at 15% O2 | 15.00 | 25.00 | 25.00 |
| ton/yr | 13.82 | 14.02 | 8.03 |
| lbm/MMBtu (Fuel LHV) | 0.060 | 0.061 | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | 0.65 | 0.66 | 0.38 |
| lbm/hr | 3.16 | 3.20 | 1.83 |
| g/(Hp-hr) (gas turbine shaft pwr) | 0.22 | 0.22 | 0.13 |

Notes

1. For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
2. Solar's typical SoLoNOx warranty, for ppm values, is available for greater than 0 deg F, and between 50% and 100% load for gas fuel, and between 65% and 100% load for liquid fuel (except for the Centaur 40). An emission warranty for non-SoLoNOx equipment is available for greater than 0 deg F and between 80% and 100% load.
3. Fuel must meet Solar standard fuel specification ES 9-98. Emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
4. If needed, Solar can provide Product Information Letters to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
5. Solar can provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
6. Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

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# PREDICTED EMISSION PERFORMANCE

| | |
|---|---|
| Customer | Engine Model<br>**TAURUS 60-7800S**<br>**CS/MD 59F MATCH** |
| Job ID | |
| Inquiry Number | Fuel Type: **SD NATURAL GAS** — Water Injection: **NO** |
| Run By: **David A Pocengal** — Date Run: **7-Mar-11** | Engine Emissions Data<br>**REV. 0.1** |

| | NOx EMISSIONS | CO EMISSIONS | UHC EMISSIONS |
|---|---|---|---|
| **3** — 6868 HP, 100.0% Load, Elev. 3647 ft, Rel. Humidity 60.0%, Temperature 40.0 Deg. F | | | |
| PPMvd at 15% O2 | 15.00 | 25.00 | 25.00 |
| ton/yr | 14.40 | 14.61 | 8.37 |
| lbm/MMBtu (Fuel LHV) | 0.060 | 0.061 | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | 0.64 | 0.65 | 0.37 |
| lbm/hr | 3.29 | 3.34 | 1.91 |
| g/(Hp-hr) (gas turbine shaft pwr) | 0.22 | 0.22 | 0.13 |
| **4** — 6520 HP, 100.0% Load, Elev. 3647 ft, Rel. Humidity 60.0%, Temperature 60.0 Deg. F | | | |
| PPMvd at 15% O2 | 15.00 | 25.00 | 25.00 |
| ton/yr | 13.82 | 14.02 | 8.03 |
| lbm/MMBtu (Fuel LHV) | 0.060 | 0.061 | 0.035 |
| lbm/(MW-hr) (gas turbine shaft pwr) | 0.65 | 0.66 | 0.38 |
| lbm/hr | 3.16 | 3.20 | 1.83 |
| g/(Hp-hr) (gas turbine shaft pwr) | 0.22 | 0.22 | 0.13 |

Notes

1. For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
2. Solar's typical SoLoNOx warranty, for ppm values, is available for greater than 0 deg F, and between 50% and 100% load for gas fuel, and between 65% and 100% load for liquid fuel (except for the Centaur 40). An emission warranty for non-SoLoNOx equipment is available for greater than 0 deg F and between 80% and 100% load.
3. Fuel must meet Solar standard fuel specification ES 9-98. Emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
4. If needed, Solar can provide Product Information Letters to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
5. Solar can provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
6. Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

**Solar Turbines**
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# PREDICTED EMISSION PERFORMANCE

| | |
|---|---|
| Customer | Engine Model<br>**TAURUS 60-7800S**<br>**CS/MD 59F MATCH** |
| Job ID | |
| Inquiry Number | Fuel Type: **SD NATURAL GAS** — Water Injection: **NO** |
| Run By: **David A Pocengal** — Date Run: **7-Mar-11** | Engine Emissions Data<br>**REV. 0.1** |

| | NOx EMISSIONS | CO EMISSIONS | UHC EMISSIONS |
|---|---|---|---|
| **5** — 6006 HP, 100.0% Load, Elev. 3647 ft, Rel. Humidity 60.0%, Temperature 80.0 Deg. F | | | |
| PPMvd at 15% O2 | 15.00 | 25.00 | 25.00 |
| ton/yr | 12.98 | 13.17 | 7.54 |
| lbm/MMBtu (Fuel LHV) | 0.059 | 0.060 | 0.034 |
| lbm/(MW-hr) (gas turbine shaft pwr) | 0.66 | 0.67 | 0.38 |
| lbm/hr | 2.96 | 3.01 | 1.72 |
| g/(Hp-hr) (gas turbine shaft pwr) | 0.22 | 0.23 | 0.13 |
| **6** — 5169 HP, 100.0% Load, Elev. 3647 ft, Rel. Humidity 60.0%, Temperature 110.0 Deg. F | | | |
| PPMvd at 15% O2 | 15.00 | 25.00 | 25.00 |
| ton/yr | 11.59 | 11.76 | 6.74 |
| lbm/MMBtu (Fuel LHV) | 0.058 | 0.059 | 0.034 |
| lbm/(MW-hr) (gas turbine shaft pwr) | 0.69 | 0.70 | 0.40 |
| lbm/hr | 2.65 | 2.69 | 1.54 |
| g/(Hp-hr) (gas turbine shaft pwr) | 0.23 | 0.24 | 0.13 |

Notes

1. For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
2. Solar's typical SoLoNOx warranty, for ppm values, is available for greater than 0 deg F, and between 50% and 100% load for gas fuel, and between 65% and 100% load for liquid fuel (except for the Centaur 40). An emission warranty for non-SoLoNOx equipment is available for greater than 0 deg F and between 80% and 100% load.
3. Fuel must meet Solar standard fuel specification ES 9-98. Emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
4. If needed, Solar can provide Product Information Letters to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
5. Solar can provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
6. Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

Solar Turbines
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# PREDICTED ENGINE PERFORMANCE

| | |
|---|---|
| Customer | Model<br>**TAURUS 60-7800S** |
| | Package Type<br>**CS/MD** |
| Job ID | Match<br>**59F MATCH** |
| Run By<br>**David A Pocengal**   Date Run<br>**7-Mar-11** | Fuel System<br>**GAS** |
| Engine Performance Code<br>**REV. 3.48**   Engine Performance Data<br>**REV. 0.8** | Fuel Type<br>**SD NATURAL GAS** |

## DATA FOR NOMINAL PERFORMANCE

| | | |
|---|---|---|
| Elevation | feet | 3647 |
| Inlet Loss | in H2O | 4.0 |
| Exhaust Loss | in H2O | 4.0 |
| Accessory on GP Shaft | HP | 14.0 |

| | | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Engine Inlet Temperature | deg F | 0 | 20.0 | 40.0 | 60.0 | 80.0 | 110.0 |
| Relative Humidity | % | 60.0 | 60.0 | 60.0 | 60.0 | 60.0 | 60.0 |
| Driven Equipment Speed | RPM | 13721 | 13769 | 13815 | 13846 | 13803 | 13678 |
| Specified Load | HP | FULL | FULL | FULL | FULL | FULL | FULL |
| Net Output Power | HP | 7340 | 7121 | 6868 | 6520 | 6006 | 5169 |
| Fuel Flow | mmBtu/hr | 57.66 | 56.39 | 54.84 | 52.84 | 49.99 | 45.70 |
| Heat Rate | Btu/HP-hr | 7855 | 7918 | 7985 | 8104 | 8324 | 8841 |
| Therm Eff | % | 32.391 | 32.133 | 31.864 | 31.397 | 30.569 | 28.781 |
| Engine Exhaust Flow | lbm/hr | 163305 | 158768 | 153869 | 148153 | 140672 | 128015 |
| Exhaust Temperature | deg F | 890 | 914 | 937 | 957 | 977 | 1013 |

**Fuel Gas Composition (Volume Percent)**

| | |
|---|---|
| Methane (CH4) | 92.79 |
| Ethane (C2H6) | 4.16 |
| Propane (C3H8) | 0.84 |
| N-Butane (C4H10) | 0.18 |
| N-Pentane (C5H12) | 0.04 |
| Hexane (C6H14) | 0.04 |
| Carbon Dioxide (CO2) | 0.44 |
| Hydrogen Sulfide (H2S) | 0.0001 |
| Nitrogen (N2) | 1.51 |

**Fuel Gas Properties**

| | | | | | |
|---|---|---|---|---|---|
| LHV (Btu/Scf) | 939.2 | Specific Gravity | 0.5970 | Wobbe Index at 60F | 1215.6 |

*This performance was calculated with a basic inlet and exhaust system. Special equipment such as low noise silencers, special filters, heat recovery systems or cooling devices will affect engine performance. Performance shown is "Expected" performance at the pressure drops stated, not guaranteed.*

# Particulate Matter Emission Estimates

**Leslie Witherspoon**
Solar Turbines Incorporated

## PURPOSE

Since particulate matter is a regulated pollutant, most air permitting agencies require customers to provide particulate matter emission estimates during the air permitting process. In addition, many air permit agencies require dispersion modeling analyses for particulate matter. More and more often, regulatory agencies are including a particulate matter compliance testing requirement in the air permit.

This document summarizes Solar's recommended $PM_{10/2.5}$ emission levels for our combustion turbines. The recommended levels are based on an analysis of emissions tests collected from customer sites.

### Particulate Matter Definition

National Ambient Air Quality Standards (NAAQS) for particulate matter were first set in 1971. Total suspended particulate (TSP) was the first indicator used to represent suspended particles in the ambient air. Since July 1, 1987, the Environmental Protection Agency (EPA) has used the indicator $PM_{10}$, which includes only the particles with aerodynamic diameter smaller than 10 micrometers. $PM_{10}$ (coarse particles) come from sources such as windblown dust from the desert or agricultural fields and dust kicked up on unpaved roads by vehicle traffic.

The EPA added a $PM_{2.5}$ ambient air standard in 1997. $PM_{2.5}$ includes particles with an aerodynamic diameter less than 2.5 micrometers. $PM_{2.5}$ (fine particles) are generally emitted from activities such as industrial and residential combustion and from vehicle exhaust. Fine particles are also formed in the atmosphere when gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds, emitted by combustion activities, are transformed by chemical reactions.

Nearly all particulate matter from gas turbine exhaust is less than one micrometer (micron) in diameter. Thus the emission rates of TSP, $PM_{10}$, and $PM_{2.5}$ from gas turbines are theoretically equivalent although source testing will show significant variation due to test method detection levels and processes.

## TESTING FOR PARTICULATE MATTER

The turbine combustion process has little effect on the particulate matter generated and measured. The largest contributor to particulate matter emissions for gas and liquid fired combustion turbines is measurement technique and error. Other, minor contributing, sources of particulate matter emissions include carbon, ash, fuel-bound sulfur, artifact sulfate formation, compressor/lubricating oils, and inlet air.

Historical customer particulate matter source test data show that there is significant variability from test to test. The source test results support the common industry argument that particulate matter from natural gas fired combustion sources is difficult to measure accurately. The reference test methods for particulate matter were developed primarily for measuring emissions from coal-fired power plants and other major emitters of particulates. Particulate concentrations from gas turbine can be 100 to 10,000 times lower than the "traditional" particulate sources. The test methods were not developed or verified for low emission levels. There are interferences, insignificant at higher exhaust particulate matter concentrations that result in emissions greater than the actual emissions from gas turbines. New methods are being developed to address this problem.

Due to measurement and procedural errors, the measured results, in most cases, may not be representative of actual particulate matter emitted. There are many potential error sources in measuring particulate matter. Most of these have to do with contamination of the samples, material from the sampling apparatus getting into the samples, and general sloppiness in samples and analysis.

### Recommended Particulate Matter Emission Factors

When necessary to support the air permitting process Solar recommends using a $PM_{10/2.5}$ emission factor of 0.021 lb/MMBtu fuel input (HHV) for natural gas. For landfill gas, the recommended emission factor is 0.03 lb/MMBtu fuel input (HHV). For liquid fuel, the recommended emission factor is 0.06 lb/MMBtu fuel input (HHV). The liquid fuel emission factor assumes fuel sulfur content is <500 ppm and ash content is <0.005% by wt.

The emission levels cited above are only for engine operation with the fuels listed. Other fuels many not yield similar results.

At this time, Solar does not recommend using AP-42 (EPA AP-42 "Compilation of Air Pollutant Emission Factors.") AP-42. While some source tests have had similar results to AP-42, others are higher.

### Test Method Recommendation

For customers who conduct emission source tests for particulate matter, Solar recommends that EPA Methods 201/201A[1] be used to measure the “front half”. “Front half” represents filterable particulate matter.

EPA Method 202[2] (with nitrogen purge and field blanks) should be used to measure the “back half”. “Back half” measurements represent the condensable portion of particulate matter.

EPA Method 5[3], which measures the front and back halves may be substituted (e.g. where exhaust temperatures do not allow the use of Method 202).

Testing should include three test runs of 4 hours each.

Solar recommends using the aforementioned test methods until more representative test methods are developed and made commercially available.

### References

[1] EPA Method 201, Determination of PM10 Emissions, Exhaust Gas Recycle Procedure. EPA Method 201A, Determination of PM10 Emissions, Constant Sampling Rate Procedure, 40 CFR 60, Part 60, Appendix A.

[2] EPA Method 202, Determination of Condensible Particulate Emissions from Stationary Sources, 40 CFR 60, Part 60, Appendix A.

[3] EPA Method 5, Determination of Particulate Emissions from Stationary Sources, 40 CFR 60, Part 60, Appendix

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# Volatile Organic Compound, Sulfur Dioxide, and Formaldehyde Emission Estimates

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Solar Turbines Incorporated

## PURPOSE

This Product Information Letter summarizes methods that are available to estimate emissions of volatile organic compounds (VOC), sulfur dioxide ($SO_2$), and formaldehyde from gas turbines. Most customers are required to estimate emissions of these pollutants during the air permitting process.

## INTRODUCTION

In absence of site-specific or representative source test data, Solar refers customers to a United States Environmental Protection Agency (EPA) document titled "AP-42" or other appropriate EPA reference documents. AP-42 is a collection of emission factors for different emission sources. The emission factors found in AP-42 provide a generally accepted way of estimating emissions when more representative data are not available. The most recent version of AP-42 (dated April 2000) can be found at:

http://www.epa.gov/ttn/chief/ap42/ch03/index.html

Solar does not typically warrant the emission rates for VOC, $SO_2$ or formaldehyde.

### Volatile Organic Compounds

Most permitting agencies require gas turbine users to estimate emissions of VOC, a subpart of the unburned hydrocarbon (UHC) emissions, during the air permitting process. Volatile organic compounds, non-methane hydrocarbons (NMHC), and reactive organic gases (ROG) are some of the many ways of referring to the non-methane (and non-ethane) portion of an "unburned hydrocarbon" emission estimate.

For natural gas fuel, most of Solar's customers use 10-20% of the UHC emission rate to represent VOC emissions. The estimate of 10-20% is based on a ratio of total non-methane hydrocarbons to total organic compounds. The use of 10 up to 20% provides a conservative estimate of VOC emissions. The balance of the UHC is assumed to be primarily methane.

For liquid fuel, it is appropriate to estimate that 100% of the UHC emission estimate is VOC.

### Sulfur Dioxide

Sulfur dioxide emissions are produced by conversion of sulfur in the fuel to $SO_2$. Since Solar does not control the amount of sulfur in the fuel, we are unable to generically predict $SO_2$ emissions. Customers generally estimate $SO_2$ emissions with a mass balance calculation by assuming that any sulfur in the fuel will convert to $SO_2$. For reference, the typical mass balance equation is shown below.

Variables: wt % of sulfur in fuel
Btu/lb fuel (LHV*)
MMBtu/hr fuel flow (LHV)

$$\frac{\text{lb } SO_2}{\text{hr}} = \left(\frac{\text{wt\% Sulfur}}{100}\right)\left(\frac{\text{lb fuel}}{\text{Btu}}\right)\left(\frac{10^6 \text{ Btu}}{\text{MMBtu}}\right)\left(\frac{\text{MMBtu fuel}}{\text{hr}}\right)\left(\frac{\text{MW } SO_2}{\text{MW Sulfur}}\right)$$

As an alternative to a mass balance calculation, EPA's AP-42 document can be used. AP-42 (Table 3.1-2a, April 2000) suggests emission factors of 0.0034 lb/MMBtu for gas fuel (HHV*) and 0.033 lb/MMBtu for liquid fuel (HHV).

*LHV = Lower Heating Value; HHV = Higher Heating Value

### Formaldehyde

In gas turbines, formaldehyde emissions are a result of incomplete combustion. Formaldehyde in the exhaust stream is unstable and very difficult to measure. In addition to turbine characteristics including combustor design, size, maintenance history, and load profile, the formaldehyde emission level is also affected by:

- Ambient temperature
- Humidity
- Atmospheric pressure
- Fuel quality
- Formaldehyde concentration in the ambient air
- Test method measurement variability
- Operational factors

The emission factor data in Table 1 is an excerpt from an EPA memo: "Revised HAP Emission Factors for Stationary Combustion Turbines, 8/22/03." The memo presents hazardous air pollutant (HAP) emission factor data in several categories including: mean, median, maximum, and minimum. The emission factors in the memo are a compilation of the HAP data EPA collected during the Maximum Achievable Control Technology (MACT) standard development process. The emission factor documentation shows there is a high degree of variability in formaldehyde emissions from gas turbines, depending on the manufacturer, rating size of equipment, combustor design, and testing events. To estimate formaldehyde emissions from gas turbines, users should use the emission factor(s) that best represent the gas turbines actual / planned operating profile. Refer to the memo for alternative emission factors.

***Table 1. EPA's Total HAP and Formaldehyde Emission Factors for <50 MW Lean-Premix Gas Turbines burning Natural Gas***

(Source: Revised HAP Emission Factors for Stationary Combustion Turbines, OAR-2002-0060, IV-B-09, 8/22/03)

| Pollutant | Engine Load | 95% Upper Confidence of Mean, lb/MMBtu HHV | 95% Upper Confidence of Data, lb/MMBtu HHV | Memo Reference |
|---|---|---|---|---|
| Total HAP | > 90% | 0.00144 | 0.00258 | Table 19 |
| Total HAP | All | 0.00160 | 0.00305 | Table 16 |
| Formaldehyde | > 90% | 0.00127 | 0.00241 | Table 19 |
| Formaldehyde | All | 0.00143 | 0.00288 | Table 16 |

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# MOBILE ANALYTICAL LABS, INC.

P.O. BOX 69210
ODESSA, TEXAS 79769

## GAS EXTENDED ANALYSIS

01/20/16 LAB # 31643

DCP MIDSTREAM
LINAM RANCH
FUEL GAS
STATION NO. M0483-00

| | MOL % | GPM |
|---|---|---|
| HYDROGEN SULFIDE | 0.0000 | 0.000 |
| NITROGEN | 2.6809 | 0.000 |
| METHANE | 87.0571 | 0.000 |
| CARBON DIOXIDE | 0.0030 | 0.000 |
| ETHANE | 9.2738 | 2.472 |
| PROPANE | 0.9590 | 0.263 |
| ISO-BUTANE | 0.0133 | 0.004 |
| N-BUTANE | 0.0126 | 0.004 |
| ISO-PENTANE | 0.0002 | 0.000 |
| N-PENTANE | 0.0001 | 0.000 |
| NEOHEXANE | 0.0000 | 0.000 |
| CYCLOPENTANE | 0.0000 | 0.000 |
| 2-METHYLPENTANE | 0.0000 | 0.000 |
| 3-METHYLPENTANE | 0.0000 | 0.000 |
| N-HEXANE | 0.0000 | 0.000 |
| METHYLCYCLOPENTANE | 0.0000 | 0.000 |
| BENZENE | 0.0000 | 0.000 |
| CYCLOHEXANE | 0.0000 | 0.000 |
| 2-METHYLHEXANE | 0.0000 | 0.000 |
| 3-METHYLHEXANE | 0.0000 | 0.000 |
| DIMETHYLCYCLOPENTANES | 0.0000 | 0.000 |
| N-HEPTANE | 0.0000 | 0.000 |
| METHYLCYCLOHEXANE | 0.0000 | 0.000 |
| TRIMETHYLCYCLOPENTANES | 0.0000 | 0.000 |
| TOLUENE | 0.0000 | 0.000 |
| 2-METHYLHEPTANE | 0.0000 | 0.000 |
| 3-METHYLHEPTANE | 0.0000 | 0.000 |
| DIMETHYLCYCLOHEXANES | 0.0000 | 0.000 |
| N-OCTANE | 0.0000 | 0.000 |
| ETHYL BENZENE | 0.0000 | 0.000 |
| M&P-XYLENES | 0.0000 | 0.000 |
| O-XYLENE | 0.0000 | 0.000 |
| C9 NAPHTHENES | 0.0000 | 0.000 |
| C9 PARAFFINS | 0.0000 | 0.000 |
| N-NONANE | 0.0000 | 0.000 |
| N-DECANE | 0.0000 | 0.000 |
| UNDECANE PLUS | 0.0000 | 0.000 |
| TOTALS | 100.0000 | 2.743 |

| | |
|---|---|
| SPECIFIC GRAVITY | 0.621 |
| GROSS DRY BTU/CU.FT. | 1067.6 |
| GROSS WET BTU/CU.FT. | 1049.3 |
| TOTAL MOL. WT. | 17.945 |

NOTES:
SAMPLED 01/18/16 BY: SR
597 PSIG @ 85 °F
H2S = 0 PPM
CYLINDER NO. 823
SPOT

DISTRIBUTION
MR. JON BEBBINGTON

BASIS: 14.65 PSIA @ 60 °F

********************************************************************************

MOBILE ANALYTICAL LABORATORIES, INC.
P.O. BOX 69210
ODESSA, TEXAS 79769
432-337-4744

********************************************************************************

01/20/16 GAS EXTENDED SULFUR ANALYSIS LAB NO. 31644

DCP MIDSTREAM
LINAM RANCH
FUEL GAS
STATION NO. M0483-00

| | ppm |
|---|---|
| Hydrogen Sulfide | ND |
| Carbonyl Sulfide | ND |
| Methyl Mercaptan | ND |
| Ethyl Mercaptan | ND |
| Dimethyl Sulfide | ND |
| Carbon Disulfide | ND |
| I-Propyl Mercaptan | ND |
| T-Butyl Mercaptan | ND |
| N-Propyl Mercaptan | ND |
| Methyl Ethyl Sulfide | ND |
| S-Butyl Mercaptan/Thiophene | ND |
| I-Butyl Mercaptan | ND |
| Diethyl Sulfide | ND |
| N-Butyl Mercaptan | ND |
| Dimethyl Disulfide | ND |
| 3-Methyl Thiophene | ND |
| 2-Methyl Thiophene | ND |
| Dimethyl Thiophene | ND |
| Diethyl Disulfide | ND |
| Trimethyl Thiophene | ND |
| Undetermined Organic Sulfur | 0.2 |
| | 0.2 |

Test Methods: H2S by ASTM D4084, Other Sulfur compounds by Capillary GC with SCD Detector ASTM D5504.

Sampled: 01/18/16 BY: SR
ND = NONE DETECTED ( < 0.1 PPM)

Distribution:
Mr. Jon Bebbington

Table 13.5-1 (English Units). THC, NOx AND SOOT EMISSIONS FACTORS FOR FLARE OPERATIONS FOR CERTAIN CHEMICAL MANUFACTURING PROCESSES[a]

| Pollutant | SCC[e] | Emissions Factor Value | Emissions Factor Units | Grade or Representativeness |
|---|---|---|---|---|
| THC, elevated flares[c] | 30190099; 30119701; 30119705; 30119709; 30119741 | 0.14[b,f] | lb/$10^6$ Btu | B |
| THC, enclosed ground flares[g,h] Low Percent Load[i] | | 8.37[j] or 3.88e-3[f] | lb/$10^6$ scf gas burned<br>lb/$10^6$ Btu heat input | Moderately |
| THC, enclosed ground flares[g,h] Normal to High Percent Load[i] | | 2.56[j] or 1.20e-3[f] | lb/$10^6$ scf gas burned<br>lb/$10^6$ Btu heat input | Moderately |
| Nitrogen oxides, elevated flares[d] | | 0.068[b,k] | lb/$10^6$ Btu | B |
| Soot, elevated flares[d] | | 0 – 274[b] | μg/L | B |

[a] All of the emissions factors in this table represent the emissions exiting the flare. Since the flare is not the originating source of the THC emissions, but rather the device controlling these pollutants routed from a process at the facility, the emissions factors are representative of controlled emissions rates for THC. These values are not representative of the uncontrolled THC routed to the flare from the associated process, and as such, they may not be appropriate for estimating the uncontrolled THC emissions or potential to emit from the associated process.

[b] Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.

[c] Measured as methane equivalent. The THC emissions factor may not be appropriate for reporting volatile organic compounds (VOC) emissions when a VOC emissions factor exists.

[d] Soot in concentration values: nonsmoking flares, 0 micrograms per liter (μg/L); lightly smoking flares, 40 μg/L; average smoking flares, 177 μg/L; and heavily smoking flares, 274 μg/L.

[e] See Table 13.5-4 for a description of these SCCs.

[f] Factor developed using the lower (net) heating value of the vent gas.

[g] THC measured as propane by US EPA Method 25A.

[h] These factors apply to well operated ground flares achieving at least 98% destruction efficiency and operating in compliance with the current General Provisions requirements of 40 CFR Part 60, i.e. >200 btu/scf net heating value in the vent gas and less than the specified maximum exit velocity. The emissions factor data set had an average destruction efficiency of 99.99%. Based on tests using pure propylene fuel. References 12 through 33 and 39 through 45.

[i] The dataset for these tests were broken into four different test conditions: ramping back and forth between 0 and 30% of load; ramping back and forth between 30% and 70% of load; ramping back and forth between 70% and 100% of load; and a fixed rate maximum load condition. Analyses determined that only the first condition was statistically different. Low percent load is represented by a unit operating at approximately less than 30% of maximum load.

[j] Heat input is an appropriate basis for combustion emissions factor. However, based on available data, heat input data is not always known, but gas flowrate is generally available. Therefore, the emissions factor is presented in two different forms.

[k] Factor developed using the higher (gross) heating value of the vent gas.

Table 13.5-2 (English Units). VOC and CO EMISSIONS FACTORS FOR ELEVATED FLARE OPERATIONS FOR CERTAIN REFINERY AND CHEMICAL MANUFACTURING PROCESSES[a,b]

<table>
<tr><th>Pollutant</th><th>SCC[e]</th><th>Emissions Factor ($lb/10^6$ Btu)[f]</th><th>Representativeness</th></tr>
<tr><td>Volatile organic compounds[c]</td><td rowspan="2">30190099;<br>30600904;<br>30119701;<br>30119705;<br>30119709;<br>30119741;<br>30119799;<br>30130115;<br>30600201;<br>30600401;<br>30600508;<br>30600903;<br>30600999;<br>30601701;<br>30601801;<br>30688801;<br>40600240</td><td>0.66</td><td>Poorly</td></tr>
<tr><td>Carbon monoxide[d]</td><td>0.31</td><td>Poorly</td></tr>
</table>

[a] The emissions factors in this table represent the emissions exiting the flare. Since the flare is not the originating source of the VOC emissions, but rather the device controlling these pollutants routed from a process at the facility, the emissions factor is representative of controlled emissions rates for VOC. This values is not representative of the uncontrolled VOC routed to the flare from the associated process, and as such, it may not be appropriate for estimating the uncontrolled VOC emissions or potential to emit from the associated process.

[b] These factors apply to well operated flares achieving at least 98% destruction efficiency and operating in compliance with the current General Provisions requirements of 40 CFR Part 60, i.e. >300 btu/scf net heating value in the vent gas and less than the specified maximum flare tip velocity. The VOC emissions factor data set had an average destruction efficiency of 98.9%, and the CO emissions factor data set had an average destruction efficiency of 99.1% (based on test reports where destruction efficiency was provided). These factors are based on steam-assisted and air-assisted flares burning a variety of vent gases.

[c] References 4 through 9 and 11.

[d] References 1, 4 through 8, and 11.

[e] See Table 13.5-4 for a description of these SCCs.

[f] Factor developed using the lower (net) heating value of the vent gas.

*Federal Environment and Safety Codified Regulations*
*TITLE 40—Protection of Environment*
*PART 98—MANDATORY GREENHOUSE GAS REPORTING*
*SUBPART A—General Provision*

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

[100-Year Time Horizon]

| Name | CAS No. | Chemical formula | Global warming potential (100 yr.) |
|---|---|---|---|
| **Chemical-Specific GWPs** | | | |
| Carbon dioxide | 124-38-9 | $CO_2$ | 1 |
| Methane | 74-82-8 | $CH_4$ | [a] 25 |
| Nitrous oxide | 10024-97-2 | $N_2O$ | [a] 298 |
| **Fully Fluorinated GHGs** | | | |
| Sulfur hexafluoride | 2551-62-4 | $SF_6$ | [a] 22,800 |
| Trifluoromethyl sulphur pentafluoride | 373-80-8 | $SF_5\ CF_3$ | 17,700 |
| Nitrogen trifluoride | 7783-54-2 | $NF_3$ | 17,200 |
| PFC-14 (Perfluoromethane) | 75-73-0 | $CF_4$ | [a] 7,390 |
| PFC-116 (Perfluoroethane) | 76-16-4 | $C_2F_6$ | [a] 12,200 |
| PFC-218 (Perfluoropropane) | 76-19-7 | $C_3F_8$ | [a] 8,830 |
| Perfluorocyclopropane | 931-91-9 | $C\text{-}C_3F_6$ | 17,340 |
| PFC-3-1-10 (Perfluorobutane) | 355-25-9 | $C_4F_{10}$ | [a] 8,860 |
| PFC-318 (Perfluorocyclobutane) | 115-25-3 | $C\text{-}C_4F_8$ | [a] 10,300 |
| PFC-4-1-12 (Perfluoropentane) | 678-26-2 | $C_5F_{12}$ | [a] 9,160 |
| PFC-5-1-14 (Perfluorohexane, FC-72) | 355-42-0 | $C_6F_{14}$ | [a] 9,300 |
| PFC-6-1-12 | 335-57-9 | $C_7F_{16}$; $CF_3(CF_2)_5CF_3$ | [b] 7,820 |
| PFC-7-1-18 | 307-34-6 | $C_8F_{18}$; $CF_3(CF_2)_6CF_3$ | [b] 7,620 |
| PFC-9-1-18 | 306-94-5 | $C_{10}F_{18}$ | 7,500 |
| PFPMIE (HT-70) | NA | $CF_3OCF(CF_3)CF_2OCF_2OCF_3$ | 10,300 |
| Perfluorodecalin (cis) | 60433-11-6 | $Z\text{-}C_{10}F_{18}$ | [b] 7,236 |
| Perfluorodecalin (trans) | 60433-12-7 | $E\text{-}C_{10}F_{18}$ | [b] 6,288 |
| **Saturated Hydrofluorocarbons (HFCs) With Two or Fewer Carbon-Hydrogen Bonds** | | | |
| HFC-23 | 75-46-7 | $CHF_3$ | [a] 14,800 |
| HFC-32 | 75-10-5 | $CH_2F_2$ | [a] 675 |
| HFC-125 | 354-33-6 | $C_2HF_5$ | [a] 3,500 |
| HFC-134 | 359-35-3 | $C_2H_2F_4$ | [a] 1,100 |
| HFC-134a | 811-97-2 | $CH_2FCF_3$ | [a] 1,430 |
| HFC-227ca | 2252-84-8 | $CF_3CF_2CHF_2$ | |

Bloomberg BNA

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*Federal Environment and Safety Codified Regulations*
*TITLE 40—Protection of Environment*
*PART 98—MANDATORY GREENHOUSE GAS REPORTING*
*SUBPART C—General Stationary Fuel Combustion Sources*

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

| Fuel type | Default high heat value | Default $CO_2$ emission factor |
|---|---|---|
| Coal and coke | mmBtu/short ton | kg $CO_2$/mmBtu |
| Anthracite | 25.09 | 103.69 |
| Bituminous | 24.93 | 93.28 |
| Subbituminous | 17.25 | 97.17 |
| Lignite | 14.21 | 97.72 |
| Coal Coke | 24.80 | 113.67 |
| Mixed (Commercial sector) | 21.39 | 94.27 |
| Mixed (Industrial coking) | 26.28 | 93.90 |
| Mixed (Industrial sector) | 22.35 | 94.67 |
| Mixed (Electric Power sector) | 19.73 | 95.52 |
| Natural gas | mmBtu/scf | kg $CO_2$/mmBtu |
| (Weighted U.S. Average) | $1.026 \times 10^{-3}$ | 53.06 |
| Petroleum products | mmBtu/gallon | kg $CO_2$/mmBtu |
| Distillate Fuel Oil No. 1 | 0.139 | 73.25 |
| Distillate Fuel Oil No. 2 | 0.138 | 73.96 |
| Distillate Fuel Oil No. 4 | 0.146 | 75.04 |
| Residual Fuel Oil No. 5 | 0.140 | 72.93 |
| Residual Fuel Oil No. 6 | 0.150 | 75.10 |
| Used Oil | 0.138 | 74.00 |
| Kerosene | 0.135 | 75.20 |
| Liquefied petroleum gases (LPG) [1] | 0.092 | 61.71 |
| Propane [1] | 0.091 | 62.87 |
| Propylene [2] | 0.091 | 67.77 |
| Ethane [1] | 0.068 | 59.60 |
| Ethanol | 0.084 | 68.44 |
| Ethylene [2] | 0.058 | 65.96 |
| Isobutane [1] | 0.099 | 64.94 |
| Isobutylene [1] | 0.103 | 68.86 |
| Butane [1] | 0.103 | 64.77 |
| Butylene [1] | 0.105 | 68.72 |
| Naphtha (<401 deg F) | 0.125 | 68.02 |
| Natural Gasoline | 0.110 | 66.88 |
| Other Oil (>401 deg F) | 0.139 | 76.22 |
| Pentanes Plus | 0.110 | 70.02 |
| Petrochemical Feedstocks | 0.125 | 71.02 |
| Petroleum Coke | 0.143 | 102.41 |
| Special Naphtha | 0.125 | 72.34 |

| | | |
|---|---|---|
| Unfinished Oils | 0.139 | 74.54 |
| Heavy Gas Oils | 0.148 | 74.92 |
| Lubricants | 0.144 | 74.27 |
| Motor Gasoline | 0.125 | 70.22 |
| Aviation Gasoline | 0.120 | 69.25 |
| Kerosene-Type Jet Fuel | 0.135 | 72.22 |
| Asphalt and Road Oil | 0.158 | 75.36 |
| Crude Oil | 0.138 | 74.54 |
| Other fuels—solid | mmBtu/short ton | kg $CO_2$/mmBtu |
| Municipal Solid Waste | 9.95 [3] | 90.7 |
| Tires | 28.00 | 85.97 |
| Plastics | 38.00 | 75.00 |
| Petroleum Coke | 30.00 | 102.41 |
| Other fuels—gaseous | mmBtu/scf | kg $CO_2$/mmBtu |
| Blast Furnace Gas | $0.092 \times 10^{-3}$ | 274.32 |
| Coke Oven Gas | $0.599 \times 10^{-3}$ | 46.85 |
| Propane Gas | $2.516 \times 10^{-3}$ | 61.46 |
| Fuel Gas [4] | $1.388 \times 10^{-3}$ | 59.00 |
| Biomass fuels—solid | mmBtu/short ton | kg $CO_2$/mmBtu |
| Wood and Wood Residuals (dry basis) [5] | 17.48 | 93.80 |
| Agricultural Byproducts | 8.25 | 118.17 |
| Peat | 8.00 | 111.84 |
| Solid Byproducts | 10.39 | 105.51 |
| Biomass fuels—gaseous | mmBtu/scf | kg $CO_2$/mmBtu |
| Landfill Gas | $0.485 \times 10^{-3}$ | 52.07 |
| Other Biomass Gases | $0.655 \times 10^{-3}$ | 52.07 |
| Biomass Fuels—Liquid | mmBtu/gallon | kg $CO_2$/mmBtu |
| Ethanol | 0.084 | 68.44 |
| Biodiesel (100%) | 0.128 | 73.84 |
| Rendered Animal Fat | 0.125 | 71.06 |
| Vegetable Oil | 0.120 | 81.55 |

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

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

[3] Use of this default HHV is allowed only for: (a) Units that combust MSW, do not generate steam, and are allowed to use Tier 1; (b) units that derive no more than 10 percent of their annual heat input from MSW and/or tires; and (c) small batch incinerators that combust no more than 1,000 tons of MSW per year.

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

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

[78 FR page 71950, Nov. 29, 2013]



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*Federal Environment and Safety Codified Regulations*
*TITLE 40—Protection of Environment*
*PART 98—MANDATORY GREENHOUSE GAS REPORTING*
*SUBPART C—General Stationary Fuel Combustion Sources*

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

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

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

[75 FR page 79154, Dec. 17, 2010; 78 FR page 71952, Nov. 29, 2013]

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## 13.4 Wet Cooling Towers

### 13.4.1 General[1]

Cooling towers are heat exchangers that are used to dissipate large heat loads to the atmosphere. They are used as an important component in many industrial and commercial processes needing to dissipate heat. Cooling towers may range in size from less than $5.3(10)^6$ kilojoules (kJ) ($5[10]^6$ British thermal units per hour [Btu/hr]) for small air conditioning cooling towers to over $5275(10)^6$ kJ/hr ($5000[10^6]$ Btu/hr) for large power plant cooling towers.

When water is used as the heat transfer medium, wet, or evaporative, cooling towers may be used. Wet cooling towers rely on the latent heat of water evaporation to exchange heat between the process and the air passing through the cooling tower. The cooling water may be an integral part of the process or may provide cooling via heat exchangers.

Although cooling towers can be classified several ways, the primary classification is into dry towers or wet towers, and some hybrid wet-dry combinations exist. Subclassifications can include the draft type and/or the location of the draft relative to the heat transfer medium, the type of heat transfer medium, the relative direction of air movement, and the type of water distribution system.

In wet cooling towers, heat transfer is measured by the decrease in the process temperature and a corresponding increase in both the moisture content and the wet bulb temperature of the air passing through the cooling tower. (There also may be a change in the sensible, or dry bulb, temperature, but its contribution to the heat transfer process is very small and is typically ignored when designing wet cooling towers.) Wet cooling towers typically contain a wetted medium called "fill" to promote evaporation by providing a large surface area and/or by creating many water drops with a large cumulative surface area.

Cooling towers can be categorized by the type of heat transfer; the type of draft and location of the draft, relative to the heat transfer medium; the type of heat transfer medium; the relative direction of air and water contact; and the type of water distribution system. Since wet, or evaporative, cooling towers are the dominant type, and they also generate air pollutants, this section will address only that type of tower. Diagrams of the various tower configurations are shown in Figure 13.4-1 and Figure 13.4-2.

### 13.4.2 Emissions And Controls[1]

Because wet cooling towers provide direct contact between the cooling water and the air passing through the tower, some of the liquid water may be entrained in the air stream and be carried out of the tower as "drift" droplets. Therefore, the particulate matter constituent of the drift droplets may be classified as an emission.

The magnitude of drift loss is influenced by the number and size of droplets produced within the cooling tower, which in turn are determined by the fill design, the air and water patterns, and other interrelated factors. Tower maintenance and operation levels also can influence the formation of drift droplets. For example, excessive water flow, excessive airflow, and water bypassing the tower drift eliminators can promote and/or increase drift emissions.

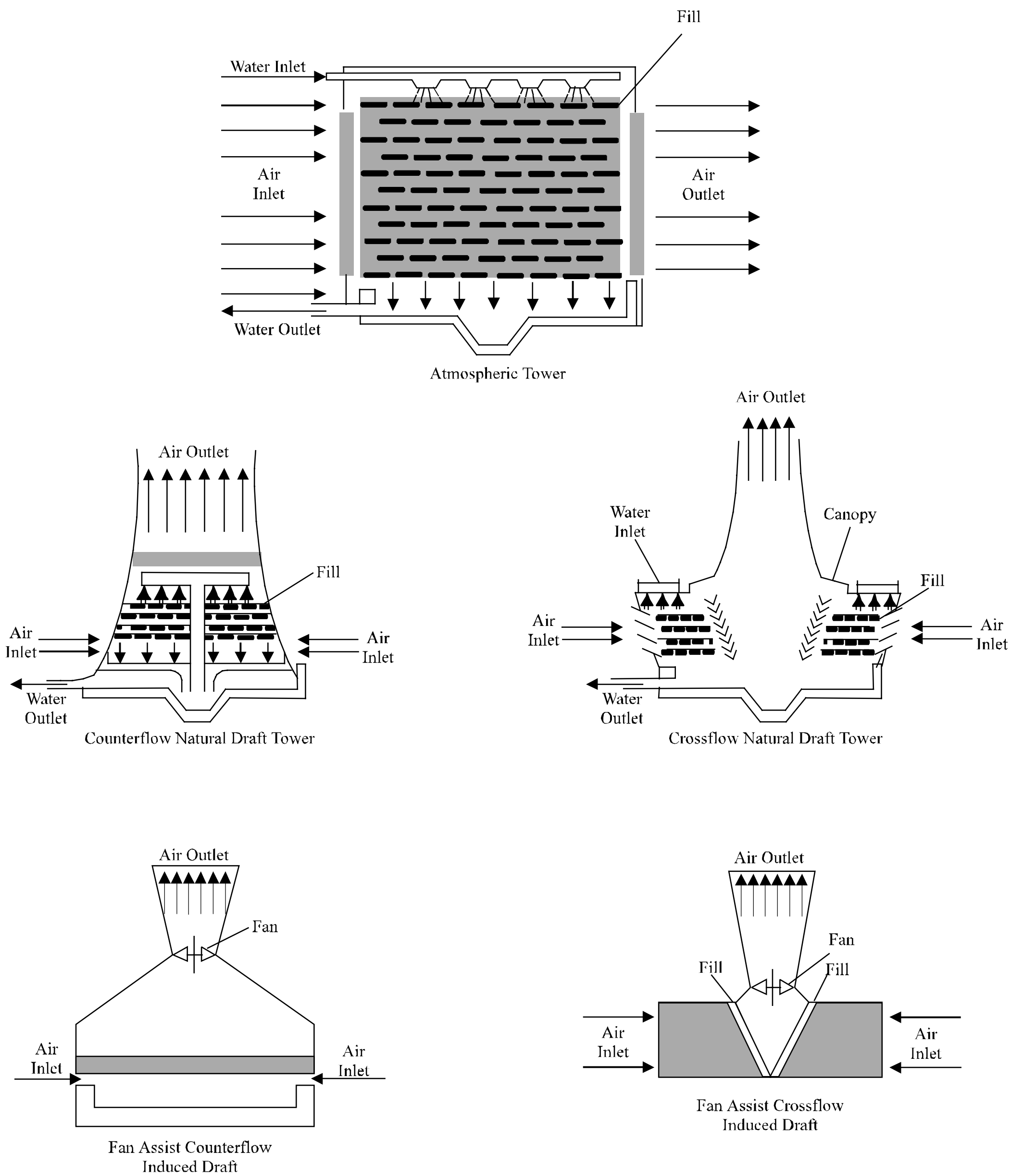


Figure 13.4-1 Atmospheric and natural draft cooling towers.

Because the drift droplets generally contain the same chemical impurities as the water circulating through the tower, these impurities can be converted to airborne emissions. Large drift droplets settle out of the tower exhaust air stream and deposit near the tower. This process can lead to wetting, icing, salt deposition, and related problems such as damage to equipment or to vegetation. Other drift droplets may evaporate before being deposited in the area surrounding the tower, and they also can produce PM-10 emissions. PM-10 is generated when the drift droplets evaporate and leave fine particulate matter formed by crystallization of dissolved solids. Dissolved solids found in cooling tower drift can consist of mineral matter, chemicals for corrosion inhibition, etc.

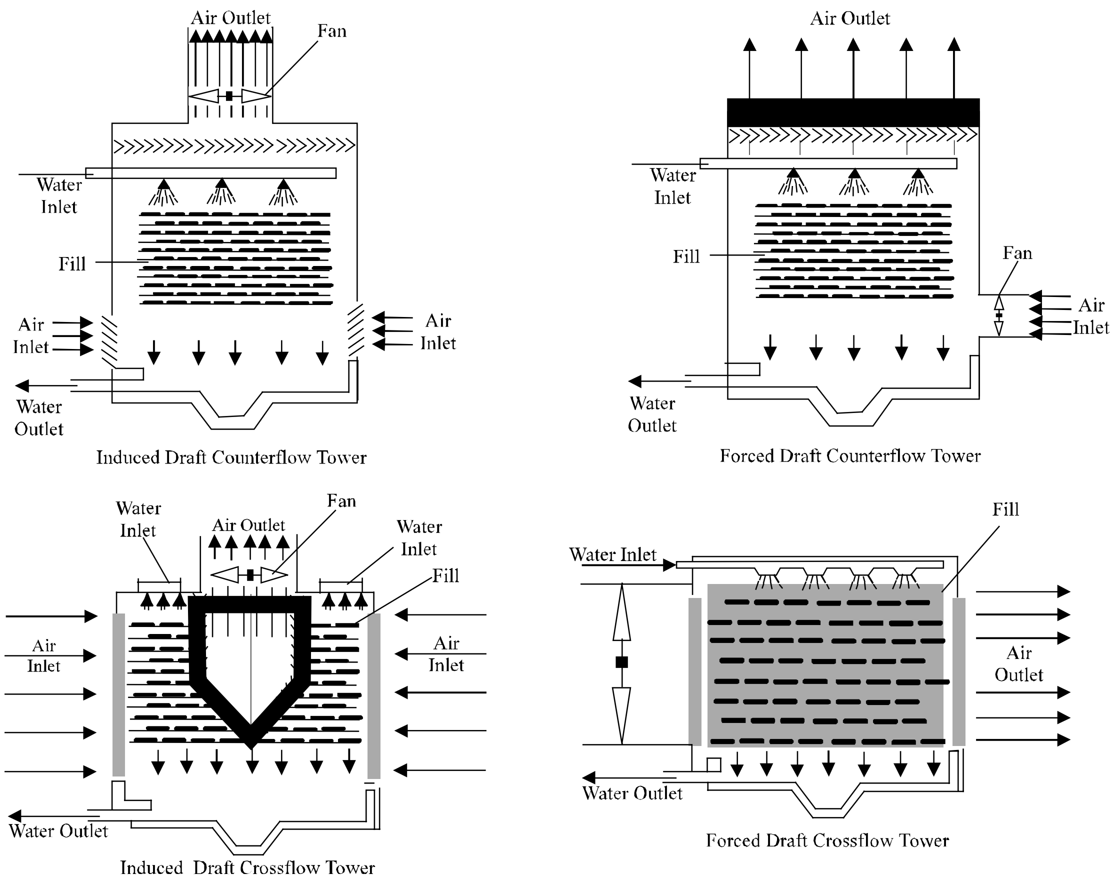


Figure 13.4-2. Mechanical draft cooling towers.

To reduce the drift from cooling towers, drift eliminators are usually incorporated into the tower design to remove as many droplets as practical from the air stream before exiting the tower. The drift eliminators used in cooling towers rely on inertial separation caused by direction changes while passing through the eliminators. Types of drift eliminator configurations include herringbone (blade-type), wave form, and cellular (or honeycomb) designs. The cellular units generally are the most efficient. Drift eliminators may include various materials, such as ceramics, fiber reinforced cement, fiberglass, metal, plastic, and wood installed or formed into closely spaced slats, sheets, honeycomb assemblies, or tiles. The materials may include other features, such as corrugations and water removal channels, to enhance the drift removal further.

Table 13.4-1 provides available particulate emission factors for wet cooling towers. Separate emission factors are given for induced draft and natural draft cooling towers. Several features in Table 13.4-1 should be noted. First, a *conservatively high* PM-10 emission factor can be obtained by (a) multiplying the total liquid drift factor by the total dissolved solids (TDS) fraction in the circulating water and (b) assuming that, once the water evaporates, all remaining solid particles are within the PM-10 size range.

Second, if TDS data for the cooling tower are not available, a source-specific TDS content can be estimated by obtaining the TDS data for the make-up water and multiplying them by the cooling tower cycles of concentration. The cycles of concentration ratio is the ratio of a measured

Table 13.4-1 (Metric And English Units). PARTICULATE EMISSIONS FACTORS FOR WET COOLING TOWERS[a]

| Tower Type[d] | Total Liquid Drift[b] Circulating Water Flow[b] | Total Liquid Drift[b] g/daL | Total Liquid Drift[b] lb/$10^3$ gal | Total Liquid Drift[b] EMISSION FACTOR RATING | PM-10[c] g/daL[e] | PM-10[c] lb/$10^3$ gal | PM-10[c] EMISSION FACTOR RATING |
|---|---|---|---|---|---|---|---|
| Induced Draft (SCC 3-85-001-01, 3-85-001-20, 3-85-002-01) | 0.020 | 2.0 | 1.7 | D | 0.023 | 0.019 | E |
| Natural Draft (SCC 3-85-001-02, 3-85-002-02) | 0.00088 | 0.088 | 0.073 | E | ND | ND | — |

[a] References 1-17. Numbers are given to 2 significant digits. ND = no data. SCC = Source Classification Code.

[b] References 2,5-7,9-10,12-13,15-16. Total liquid drift is water droplets entrained in the cooling tower exit air stream. Factors are for % of circulating water flow ($10^{-2}$ L drift/L [$10^{-2}$ gal drift/gal] water flow) and g drift/daL (lb drift/$10^3$ gal) circulating water flow. 0.12 g/daL = 0.1 lb/$10^3$ gal; 1 daL = $10^1$ L.

[c] See discussion in text on how to use the table to obtain PM-10 emission estimates. Values shown above are the arithmetic average of test results from References 2,4,8, and 11-14, and they imply an effective TDS content of approximately 12,000 parts per million (ppm) in the circulating water.

[d] See Figure 13.4-1 and Figure 13.4-2. Additional SCCs for wet cooling towers of unspecified draft type are 3-85-001-10 and 3-85-002-10.

[e] Expressed as g PM-10/daL (lb PM-10/$10^3$ gal) circulating water flow.

parameter for the cooling tower water (such as conductivity, calcium, chlorides, or phosphate) to that parameter for the make-up water. This estimated cooling tower TDS can be used to calculate the PM-10 emission factor as above. If neither of these methods can be used, the arithmetic average PM-10 factor given in Table 13.4-1 can be used. Table 13.4-1 presents the arithmetic average PM-10 factor calculated from the test data in References 2, 4, 8, and 11 - 14. Note that this average corresponds to an effective cooling tower recirculating water TDS content of approximately 11,500 ppm for induced draft towers. (This can be found by dividing the total liquid drift factor into the PM-10 factor.)

As an alternative approach, if TDS data are unavailable for an induced draft tower, a value may be selected from Table 13.4-2 and then be combined with the total liquid drift factor in Table 13.4-1 to determine an apparent PM-10 factor.

As shown in Table 13.4-2, available data do not suggest that there is any significant difference between TDS levels in counter and cross flow towers. Data for natural draft towers are not available.

Table 13.4-2. SUMMARY STATISTICS FOR TOTAL DISSOLVED SOLIDS (TDS) CONTENT IN CIRCULATING WATER[a]

| Type Of Draft | No. Of Cases | Range Of TDS Values (ppm) | Geometric Mean TDS Value (ppm) |
|---|---|---|---|
| Counter Flow | 10 | 3700 - 55,000 | 18,500 |
| Cross Flow | 7 | 380 - 91,000 | 24,000 |
| Overall[b] | 17 | 380 - 91,000 | 20,600 |

[a] References 2,4,8,11-14.
[b] Data unavailable for natural draft towers.

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EPA-453/R-95-017
November 1995

Air

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# 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.

TABLE 2-10. PETROLEUM INDUSTRY LEAK RATE/SCREENING VALUE CORRELATIONS[a]

| Equipment type/service | Correlation[b,c] |
|---|---|
| Valves/all | Leak rate (kg/hr) = 2.29E-06 × $(SV)^{0.746}$ |
| Pump seals/all | Leak rate (kg/hr) = 5.03E-05 × $(SV)^{0.610}$ |
| Others[d] | Leak rate (kg/hr) = 1.36E-05 × $(SV)^{0.589}$ |
| Connectors/all | Leak rate (kg/hr) = 1.53E-06 × $(SV)^{0.735}$ |
| Flanges/all | Leak rate (kg/hr) = 4.61E-06 × $(SV)^{0.703}$ |
| Open-ended lines/all | Leak rate (kg/hr) = 2.20E-06 × $(SV)^{0.704}$ |

[a]The correlations presented in this table are revised petroleum industry correlations.

[b]SV = Screening value in ppmv.

[c]These correlations predict total organic compound emission rates (including non-VOC's such as methane and ethane).

[d]The "other" equipment type was derived from instruments, loading arms, pressure relief valves, stuffing boxes, and vents. This "other" equipment type should be applied to any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.

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

**Identification**

| | |
|---|---|
| User Identification: | Linam Ranch TK-1370 |
| City: | Near Hobbs |
| State: | New Mexico |
| Company: | DCP Midstream, LP |
| Type of Tank: | Horizontal Tank |
| Description: | 500 gallon methanol tank |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 5.25 |
| Diameter (ft): | 4.00 |
| Volume (gallons): | 500.00 |
| Turnovers: | 144.00 |
| Net Throughput(gal/yr): | 72,000.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | Red/Primer |
| Shell Condition | Poor |

**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

**Linam Ranch TK-1370 - Horizontal Tank**
**Near Hobbs, New Mexico**

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Methyl alcohol | All | 76.33 | 59.43 | 93.23 | 65.28 | 2.3677 | 1.4163 | 3.8159 | 32.0400 | | | 32.04 | Option 2: A=7.897, B=1474.08, C=229.13 |

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

## Linam Ranch TK-1370 - Horizontal Tank
## Near Hobbs, New Mexico

| Annual Emission Calcaulations | |
|---|---|
| Standing Losses (lb): | 56.9023 |
| Vapor Space Volume (cu ft): | 42.0213 |
| Vapor Density (lb/cu ft): | 0.0132 |
| Vapor Space Expansion Factor: | 0.3519 |
| Vented Vapor Saturation Factor: | 0.7994 |
| | |
| Tank Vapor Space Volume: | |
| Vapor Space Volume (cu ft): | 42.0213 |
| Tank Diameter (ft): | 4.0000 |
| Effective Diameter (ft): | 5.1722 |
| Vapor Space Outage (ft): | 2.0000 |
| Tank Shell Length (ft): | 5.2500 |
| | |
| Vapor Density | |
| Vapor Density (lb/cu ft): | 0.0132 |
| Vapor Molecular Weight (lb/lb-mole): | 32.0400 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| 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 |
| Daily Total Solar Insulation Factor (Btu/sqft day): | 1,810.0000 |
| | |
| Vapor Space Expansion Factor | |
| Vapor Space Expansion Factor: | 0.3519 |
| Daily Vapor Temperature Range (deg. R): | 67.5988 |
| Daily Vapor Pressure Range (psia): | 2.3996 |
| Breather Vent Press. Setting Range(psia): | 0.0600 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia): | 1.4163 |
| Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia): | 3.8159 |
| 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: | 0.7994 |
| Vapor Pressure at Daily Average Liquid: Surface Temperature (psia): | 2.3677 |
| Vapor Space Outage (ft): | 2.0000 |
| | |
| Working Losses (lb): | 48.7688 |
| Vapor Molecular Weight (lb/lb-mole): | 32.0400 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| Annual Net Throughput (gal/yr.): | 72,000.0000 |
| Annual Turnovers: | 144.0000 |
| Turnover Factor: | 0.3750 |
| Tank Diameter (ft): | 4.0000 |
| Working Loss Product Factor: | 1.0000 |
| | |
| Total Losses (lb): | 105.6711 |

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

## Emissions Report for: Annual

**Linam Ranch TK-1370 - Horizontal Tank**
**Near Hobbs, New Mexico**

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Methyl alcohol | 48.77 | 56.90 | 105.67 |

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

**Identification**

| | |
|---|---|
| User Identification: | Linam Ranch TK-20 |
| City: | Near Hobbs |
| State: | New Mexico |
| Company: | DCP Midstream, LP |
| Type of Tank: | Horizontal Tank |
| Description: | 1130 gallon methanol tank |

**Tank Dimensions**

| | | |
|---|---|---|
| Shell Length (ft): | | 6.50 |
| Diameter (ft): | | 5.50 |
| Volume (gallons): | | 1,130.00 |
| Turnovers: | | 144.00 |
| Net Throughput(gal/yr): | | 162,720.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | Red/Primer |
| Shell Condition | Poor |

**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

**Linam Ranch TK-20 - Horizontal Tank**
**Near Hobbs, New Mexico**

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Methyl alcohol | All | 76.33 | 59.43 | 93.23 | 65.28 | 2.3677 | 1.4163 | 3.8159 | 32.0400 | | | 32.04 | Option 2: A=7.897, B=1474.08, C=229.13 |

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

## Linam Ranch TK-20 - Horizontal Tank
## Near Hobbs, New Mexico

| Annual Emission Calcaulations | |
|---|---|
| Standing Losses (lb): | 123.8757 |
| Vapor Space Volume (cu ft): | 98.3624 |
| Vapor Density (lb/cu ft): | 0.0132 |
| Vapor Space Expansion Factor: | 0.3519 |
| Vented Vapor Saturation Factor: | 0.7434 |
| | |
| Tank Vapor Space Volume: | |
| Vapor Space Volume (cu ft): | 98.3624 |
| Tank Diameter (ft): | 5.5000 |
| Effective Diameter (ft): | 6.7484 |
| Vapor Space Outage (ft): | 2.7500 |
| Tank Shell Length (ft): | 6.5000 |
| | |
| Vapor Density | |
| Vapor Density (lb/cu ft): | 0.0132 |
| Vapor Molecular Weight (lb/lb-mole): | 32.0400 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| 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 |
| Daily Total Solar Insulation Factor (Btu/sqft day): | 1,810.0000 |
| | |
| Vapor Space Expansion Factor | |
| Vapor Space Expansion Factor: | 0.3519 |
| Daily Vapor Temperature Range (deg. R): | 67.5988 |
| Daily Vapor Pressure Range (psia): | 2.3996 |
| Breather Vent Press. Setting Range(psia): | 0.0600 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia): | 1.4163 |
| Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia): | 3.8159 |
| 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: | 0.7434 |
| Vapor Pressure at Daily Average Liquid: Surface Temperature (psia): | 2.3677 |
| Vapor Space Outage (ft): | 2.7500 |
| | |
| Working Losses (lb): | 110.2175 |
| Vapor Molecular Weight (lb/lb-mole): | 32.0400 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| Annual Net Throughput (gal/yr.): | 162,720.0000 |
| Annual Turnovers: | 144.0000 |
| Turnover Factor: | 0.3750 |
| Tank Diameter (ft): | 5.5000 |
| Working Loss Product Factor: | 1.0000 |
| | |
| Total Losses (lb): | 234.0931 |

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

## Emissions Report for: Annual

**Linam Ranch TK-20 - Horizontal Tank**
**Near Hobbs, New Mexico**

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Methyl alcohol | 110.22 | 123.88 | 234.09 |

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

| | |
|---|---|
| **Identification** | |
| User Identification: | Linam Ranch TK-21 |
| City: | Near Hobbs |
| State: | New Mexico |
| Company: | DCP Midstream, LP |
| Type of Tank: | Horizontal Tank |
| Description: | 659 gallon methanol tank |
| **Tank Dimensions** | |
| Shell Length (ft): | 5.50 |
| Diameter (ft): | 4.50 |
| Volume (gallons): | 660.00 |
| Turnovers: | 144.00 |
| Net Throughput(gal/yr): | 95,040.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |
| **Paint Characteristics** | |
| Shell Color/Shade: | Red/Primer |
| Shell Condition | Poor |
| **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

**Linam Ranch TK-21 - Horizontal Tank**
**Near Hobbs, New Mexico**

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Methyl alcohol | All | 76.33 | 59.43 | 93.23 | 65.28 | 2.3677 | 1.4163 | 3.8159 | 32.0400 | | | 32.04 | Option 2: A=7.897, B=1474.08, C=229.13 |

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

## Linam Ranch TK-21 - Horizontal Tank
## Near Hobbs, New Mexico

| Annual Emission Calcaulations | |
|---|---|
| Standing Losses (lb): | 73.6006 |
| Vapor Space Volume (cu ft): | 55.7157 |
| Vapor Density (lb/cu ft): | 0.0132 |
| Vapor Space Expansion Factor: | 0.3519 |
| Vented Vapor Saturation Factor: | 0.7798 |
| | |
| Tank Vapor Space Volume: | |
| Vapor Space Volume (cu ft): | 55.7157 |
| Tank Diameter (ft): | 4.5000 |
| Effective Diameter (ft): | 5.6150 |
| Vapor Space Outage (ft): | 2.2500 |
| Tank Shell Length (ft): | 5.5000 |
| | |
| Vapor Density | |
| Vapor Density (lb/cu ft): | 0.0132 |
| Vapor Molecular Weight (lb/lb-mole): | 32.0400 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| 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 |
| Daily Total Solar Insulation Factor (Btu/sqft day): | 1,810.0000 |
| | |
| Vapor Space Expansion Factor | |
| Vapor Space Expansion Factor: | 0.3519 |
| Daily Vapor Temperature Range (deg. R): | 67.5988 |
| Daily Vapor Pressure Range (psia): | 2.3996 |
| Breather Vent Press. Setting Range(psia): | 0.0600 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia): | 1.4163 |
| Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia): | 3.8159 |
| 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: | 0.7798 |
| Vapor Pressure at Daily Average Liquid: Surface Temperature (psia): | 2.3677 |
| Vapor Space Outage (ft): | 2.2500 |
| | |
| Working Losses (lb): | 64.3748 |
| Vapor Molecular Weight (lb/lb-mole): | 32.0400 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| Annual Net Throughput (gal/yr.): | 95,040.0000 |
| Annual Turnovers: | 144.0000 |
| Turnover Factor: | 0.3750 |
| Tank Diameter (ft): | 4.5000 |
| Working Loss Product Factor: | 1.0000 |
| | |
| Total Losses (lb): | 137.9754 |

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

## Emissions Report for: Annual

**Linam Ranch TK-21 - Horizontal Tank**
**Near Hobbs, New Mexico**

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Methyl alcohol | 64.37 | 73.60 | 137.98 |

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

**Identification**

| | |
|---|---|
| User Identification: | Linam Ranch TK-27 |
| City: | Near Hobbs |
| State: | New Mexico |
| Company: | DCP Midstream, LP |
| Type of Tank: | Vertical Fixed Roof Tank |
| Description: | 7050 gallon methanol storage tank |

**Tank Dimensions**

| | |
|---|---|
| Shell Height (ft): | 12.00 |
| Diameter (ft): | 10.00 |
| Liquid Height (ft) : | 11.00 |
| Avg. Liquid Height (ft): | 5.50 |
| Volume (gallons): | 7,050.00 |
| Turnovers: | 50.00 |
| Net Throughput(gal/yr): | 352,500.00 |
| 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

## Linam Ranch TK-27 - Vertical Fixed Roof Tank
## Near Hobbs, New Mexico

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Methyl alcohol | All | 76.33 | 59.43 | 93.23 | 65.28 | 2.3677 | 1.4163 | 3.8159 | 32.0400 | | | 32.04 | Option 2: A=7.897, B=1474.08, C=229.13 |

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

## Linam Ranch TK-27 - Vertical Fixed Roof Tank
## Near Hobbs, New Mexico

| Annual Emission Calcaulations | |
|---|---|
| Standing Losses (lb): | 480.4657 |
| Vapor Space Volume (cu ft): | 518.6900 |
| Vapor Density (lb/cu ft): | 0.0132 |
| Vapor Space Expansion Factor: | 0.3519 |
| Vented Vapor Saturation Factor: | 0.5468 |
| | |
| Tank Vapor Space Volume: | |
| Vapor Space Volume (cu ft): | 518.6900 |
| Tank Diameter (ft): | 10.0000 |
| Vapor Space Outage (ft): | 6.6042 |
| Tank Shell Height (ft): | 12.0000 |
| Average Liquid Height (ft): | 5.5000 |
| Roof Outage (ft): | 0.1042 |

| | |
|---|---|
| Roof Outage (Cone Roof) | |
| Roof Outage (ft): | 0.1042 |
| Roof Height (ft): | 0.0000 |
| Roof Slope (ft/ft): | 0.0625 |
| Shell Radius (ft): | 5.0000 |
| | |
| Vapor Density | |
| Vapor Density (lb/cu ft): | 0.0132 |
| Vapor Molecular Weight (lb/lb-mole): | 32.0400 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| 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: | 0.3519 |
| Daily Vapor Temperature Range (deg. R): | 67.5988 |
| Daily Vapor Pressure Range (psia): | 2.3996 |
| Breather Vent Press. Setting Range(psia): | 0.0600 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia): | 1.4163 |
| Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia): | 3.8159 |
| 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: | 0.5468 |
| Vapor Pressure at Daily Average Liquid: Surface Temperature (psia): | 2.3677 |
| Vapor Space Outage (ft): | 6.6042 |
| | |
| Working Losses (lb): | 488.1395 |
| Vapor Molecular Weight (lb/lb-mole): | 32.0400 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 2.3677 |
| Annual Net Throughput (gal/yr.): | 352,500.0000 |
| Annual Turnovers: | 50.0000 |
| Turnover Factor: | 0.7667 |
| Maximum Liquid Volume (gal): | 7,050.0000 |
| Maximum Liquid Height (ft): | 11.0000 |
| Tank Diameter (ft): | 10.0000 |
| Working Loss Product Factor: | 1.0000 |
| | |
| Total Losses (lb): | 968.6051 |

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

## Emissions Report for: Annual

### Linam Ranch TK-27 - Vertical Fixed Roof Tank
### Near Hobbs, New Mexico

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Methyl alcohol | 488.14 | 480.47 | 968.61 |

# MOBILE ANALYTICAL LABS, INC.

**P.O. BOX 69210**
**ODESSA, TEXAS 79769**

## GAS EXTENDED ANALYSIS

**11/11/13** **LAB # 18951**

**DCP MIDSTREAM**
**LINAM RANCH**
**INLET GAS**
**STATION NO. M0500**

| | MOL % | GPM |
|---|---|---|
| HYDROGEN SULFIDE | 0.3803 | 0.000 |
| NITROGEN | 2.4609 | 0.000 |
| METHANE | 73.5375 | 0.000 |
| CARBON DIOXIDE | 1.6084 | 0.000 |
| ETHANE | 12.5872 | 3.360 |
| PROPANE | 6.1477 | 1.690 |
| ISO-BUTANE | 0.6961 | 0.227 |
| N-BUTANE | 1.6193 | 0.509 |
| ISO-PENTANE | 0.3336 | 0.122 |
| N-PENTANE | 0.3137 | 0.113 |
| NEOHEXANE | 0.0031 | 0.001 |
| CYCLOPENTANE | 0.0281 | 0.012 |
| 2-METHYLPENTANE | 0.0532 | 0.022 |
| 3-METHYLPENTANE | 0.0299 | 0.012 |
| N-HEXANE | 0.0541 | 0.022 |
| METHYLCYCLOPENTANE | 0.0333 | 0.012 |
| BENZENE | 0.0276 | 0.008 |
| CYCLOHEXANE | 0.0292 | 0.010 |
| 2-METHYLHEXANE | 0.0057 | 0.003 |
| 3-METHYLHEXANE | 0.0072 | 0.003 |
| DIMETHYLCYCLOPENTANES | 0.0115 | 0.005 |
| N-HEPTANE | 0.0070 | 0.003 |
| METHYLCYCLOHEXANE | 0.0130 | 0.005 |
| TRIMETHYLCYCLOPENTANES | 0.0008 | 0.000 |
| TOLUENE | 0.0056 | 0.002 |
| 2-METHYLHEPTANE | 0.0023 | 0.001 |
| 3-METHYLHEPTANE | 0.0005 | 0.000 |
| DIMETHYLCYCLOHEXANES | 0.0011 | 0.000 |
| N-OCTANE | 0.0005 | 0.000 |
| ETHYL BENZENE | 0.0001 | 0.000 |
| M&P-XYLENES | 0.0002 | 0.000 |
| O-XYLENE | 0.0000 | 0.000 |
| C9 NAPHTHENES | 0.0005 | 0.000 |
| C9 PARAFFINS | 0.0008 | 0.000 |
| N-NONANE | 0.0000 | 0.000 |
| N-DECANE | 0.0000 | 0.000 |
| UNDECANE PLUS | 0.0000 | 0.000 |
| TOTALS | 100.0000 | 6.142 |

| | |
|---|---|
| SPECIFIC GRAVITY | 0.759 |
| GROSS DRY BTU/CU.FT. | 1239.4 |
| GROSS WET BTU/CU.FT. | 1218.3 |
| TOTAL MOL. WT. | 21.907 |
| MOL. WT. C6+ | 86.919 |
| SP. GRAVITY C6+ | 3.342 |
| MOL. WT. C7+ | 100.411 |
| SP. GRAVITY C7+ | 4.187 |

BASIS: 14.65 PSIA @ 60 °F

NOTES:
SAMPLED 11/06/13 BY: SR
285 PSIG @ 58 °F
H2S = 3803 PPM
CYLINDER NO. 1293
SPOT

DISTRIBUTION:
MR. STEVEN BOATENHAMER
MS. DENA RAGSDALE

# MOBILE ANALYTICAL LABS, INC.

P.O. BOX 69210
ODESSA, TEXAS 79769

## GAS EXTENDED ANALYSIS

10/21/13

LAB # 18489

**DCP MIDSTREAM**
**LINAM RANCH**
**FUEL GAS**

| | MOL % | GPM |
|---|---|---|
| HYDROGEN SULFIDE | 0.0000 | 0.000 |
| NITROGEN | 3.1359 | 0.000 |
| METHANE | 91.2431 | 0.000 |
| CARBON DIOXIDE | 0.0030 | 0.000 |
| ETHANE | 5.4849 | 1.462 |
| PROPANE | 0.1310 | 0.036 |
| ISO-BUTANE | 0.0012 | 0.000 |
| N-BUTANE | 0.0009 | 0.000 |
| ISO-PENTANE | 0.0000 | 0.000 |
| N-PENTANE | 0.0000 | 0.000 |
| NEOHEXANE | 0.0000 | 0.000 |
| CYCLOPENTANE | 0.0000 | 0.000 |
| 2-METHYLPENTANE | 0.0000 | 0.000 |
| 3-METHYLPENTANE | 0.0000 | 0.000 |
| N-HEXANE | 0.0000 | 0.000 |
| METHYLCYCLOPENTANE | 0.0000 | 0.000 |
| BENZENE | 0.0000 | 0.000 |
| CYCLOHEXANE | 0.0000 | 0.000 |
| 2-METHYLHEXANE | 0.0000 | 0.000 |
| 3-METHYLHEXANE | 0.0000 | 0.000 |
| DIMETHYLCYCLOPENTANES | 0.0000 | 0.000 |
| N-HEPTANE | 0.0000 | 0.000 |
| METHYLCYCLOHEXANE | 0.0000 | 0.000 |
| TRIMETHYLCYCLOPENTANES | 0.0000 | 0.000 |
| TOLUENE | 0.0000 | 0.000 |
| 2-METHYLHEPTANE | 0.0000 | 0.000 |
| 3-METHYLHEPTANE | 0.0000 | 0.000 |
| DIMETHYLCYCLOHEXANES | 0.0000 | 0.000 |
| N-OCTANE | 0.0000 | 0.000 |
| ETHYL BENZENE | 0.0000 | 0.000 |
| M&P-XYLENES | 0.0000 | 0.000 |
| O-XYLENE | 0.0000 | 0.000 |
| C9 NAPHTHENES | 0.0000 | 0.000 |
| C9 PARAFFINS | 0.0000 | 0.000 |
| N-NONANE | 0.0000 | 0.000 |
| N-DECANE | 0.0000 | 0.000 |
| UNDECANE PLUS | 0.0000 | 0.000 |
| TOTALS | 100.0000 | 1.498 |

| | |
|---|---|
| SPECIFIC GRAVITY | 0.596 |
| GROSS DRY BTU/CU.FT. | 1021.0 |
| GROSS WET BTU/CU.FT. | 1003.4 |
| TOTAL MOL. WT. | 17.226 |

NOTES:
SAMPLED 10/14/13 BY: SR
175 PSIG @ 79 °F
H2S = 0 PPM
CYLINDER NO. 1102
ANNUAL SPOT

DISTRIBUTION
MR. JON BEBBINGTON

BASIS: 14.65 PSIA @ 60 °F

## 5.2 Transportation And Marketing Of Petroleum Liquids[1-3]

### 5.2.1 General

The transportation and marketing of petroleum liquids involve many distinct operations, each of which represents a potential source of evaporation loss. Crude oil is transported from production operations to a refinery by tankers, barges, rail tank cars, tank trucks, and pipelines. Refined petroleum products are conveyed to fuel marketing terminals and petrochemical industries by these same modes. From the fuel marketing terminals, the fuels are delivered by tank trucks to service stations, commercial accounts, and local bulk storage plants. The final destination for gasoline is usually a motor vehicle gasoline tank. Similar distribution paths exist for fuel oils and other petroleum products. A general depiction of these activities is shown in Figure 5.2-1.

### 5.2.2 Emissions And Controls

Evaporative emissions from the transportation and marketing of petroleum liquids may be considered, by storage equipment and mode of transportation used, in four categories:

1. Rail tank cars, tank trucks, and marine vessels: loading, transit, and ballasting losses.
2. Service stations: bulk fuel drop losses and underground tank breathing losses.
3. Motor vehicle tanks: refueling losses.
4. Large storage tanks: breathing, working, and standing storage losses. (See Chapter 7, "Liquid Storage Tanks".)

Evaporative and exhaust emissions are also associated with motor vehicle operation, and these topics are discussed in AP-42 *Volume II: Mobile Sources*.

#### 5.2.2.1 Rail Tank Cars, Tank Trucks, And Marine Vessels -

Emissions from these sources are from loading losses, ballasting losses, and transit losses.

##### 5.2.2.1.1 Loading Losses -

Loading losses are the primary source of evaporative emissions from rail tank car, tank truck, and marine vessel operations. Loading losses occur as organic vapors in "empty" cargo tanks are displaced to the atmosphere by the liquid being loaded into the tanks. These vapors are a composite of (1) vapors formed in the empty tank by evaporation of residual product from previous loads, (2) vapors transferred to the tank in vapor balance systems as product is being unloaded, and (3) vapors generated in the tank as the new product is being loaded. The quantity of evaporative losses from loading operations is, therefore, a function of the following parameters:

- Physical and chemical characteristics of the previous cargo;
- Method of unloading the previous cargo;
- Operations to transport the empty carrier to a loading terminal;
- Method of loading the new cargo; and
- Physical and chemical characteristics of the new cargo.

The principal methods of cargo carrier loading are illustrated in Figure 5.2-2, Figure 5.2-3, and Figure 5.2-4. In the splash loading method, the fill pipe dispensing the cargo is lowered only part way into the cargo tank. Significant turbulence and vapor/liquid contact occur during the splash

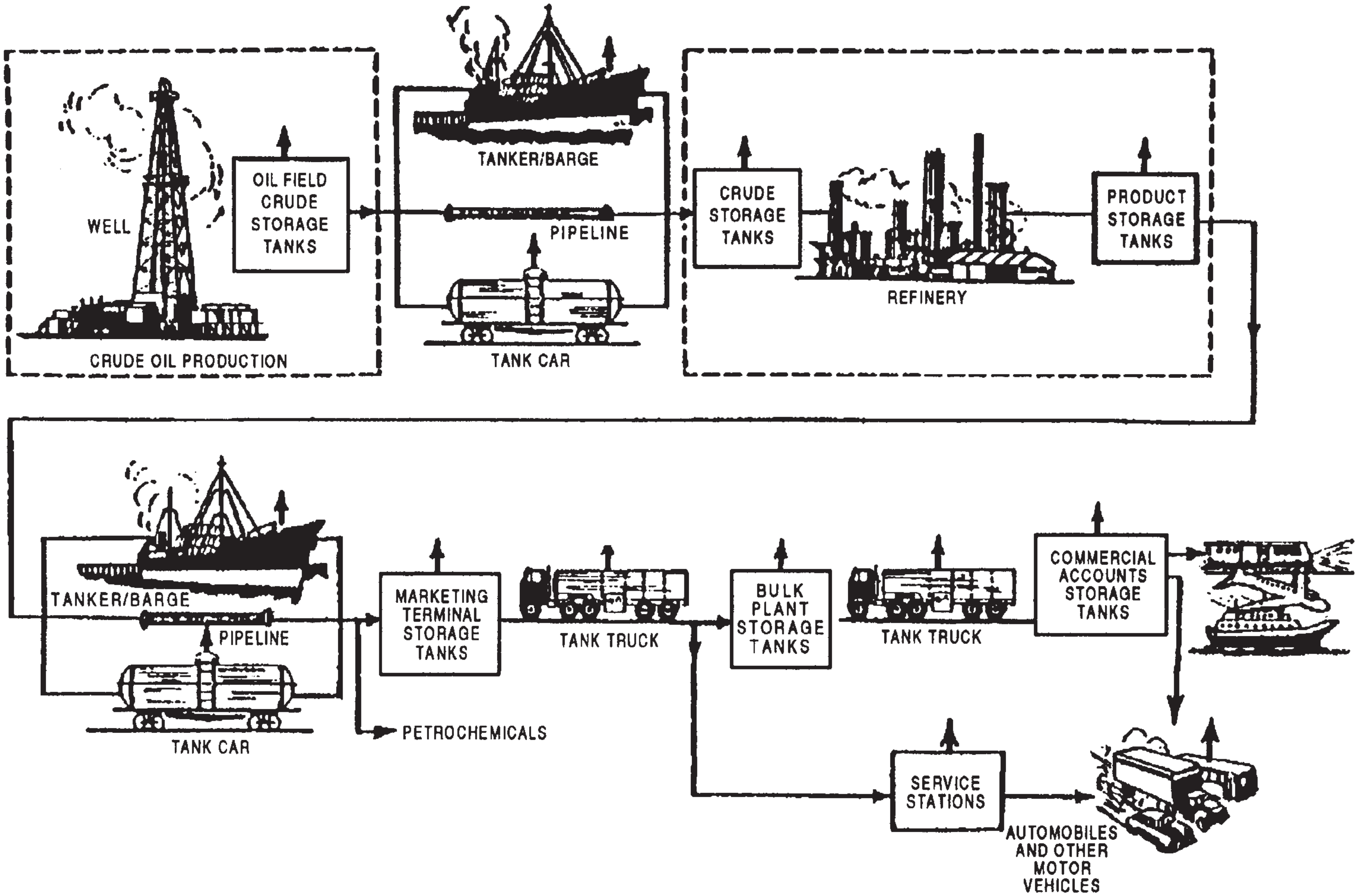


Figure 5.2-1. Flow sheet of petroleum production, refining, and distribution systems.
(Points of organic emissions are indicated by vertical arrows.)

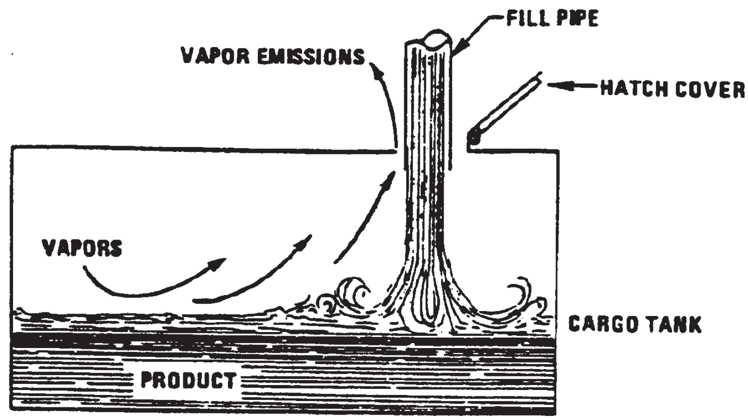


Figure 5.2-2. Splash loading method.

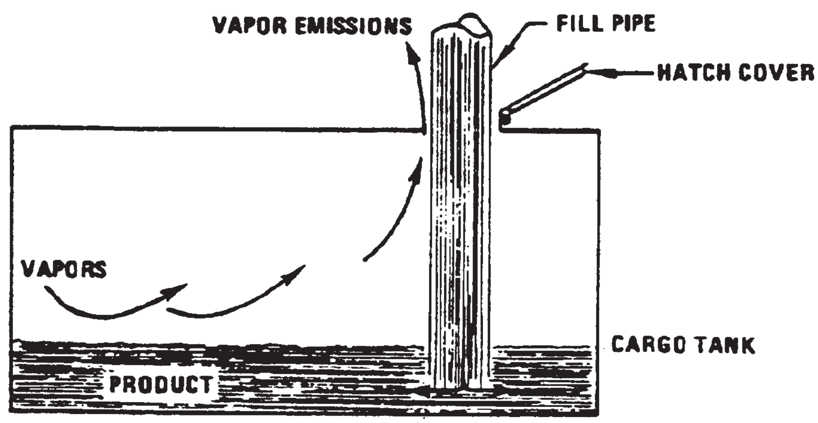


Figure 5.2-3. Submerged fill pipe.

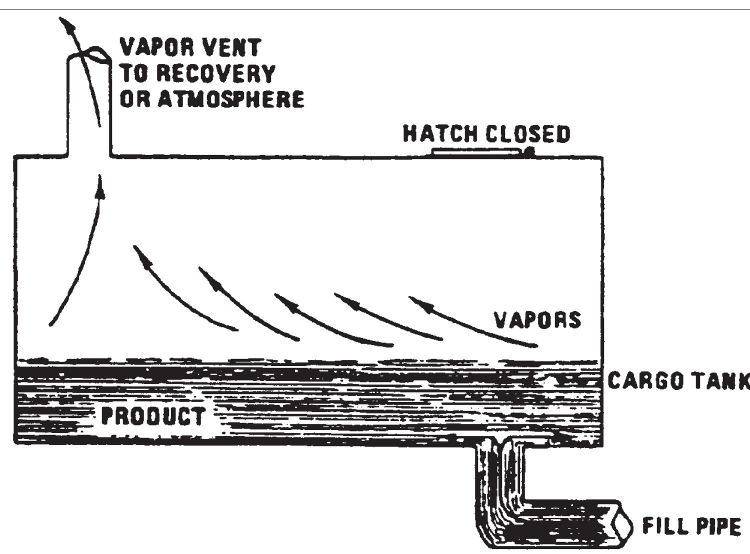


Figure 5.2-4. Bottom loading.

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:

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

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)

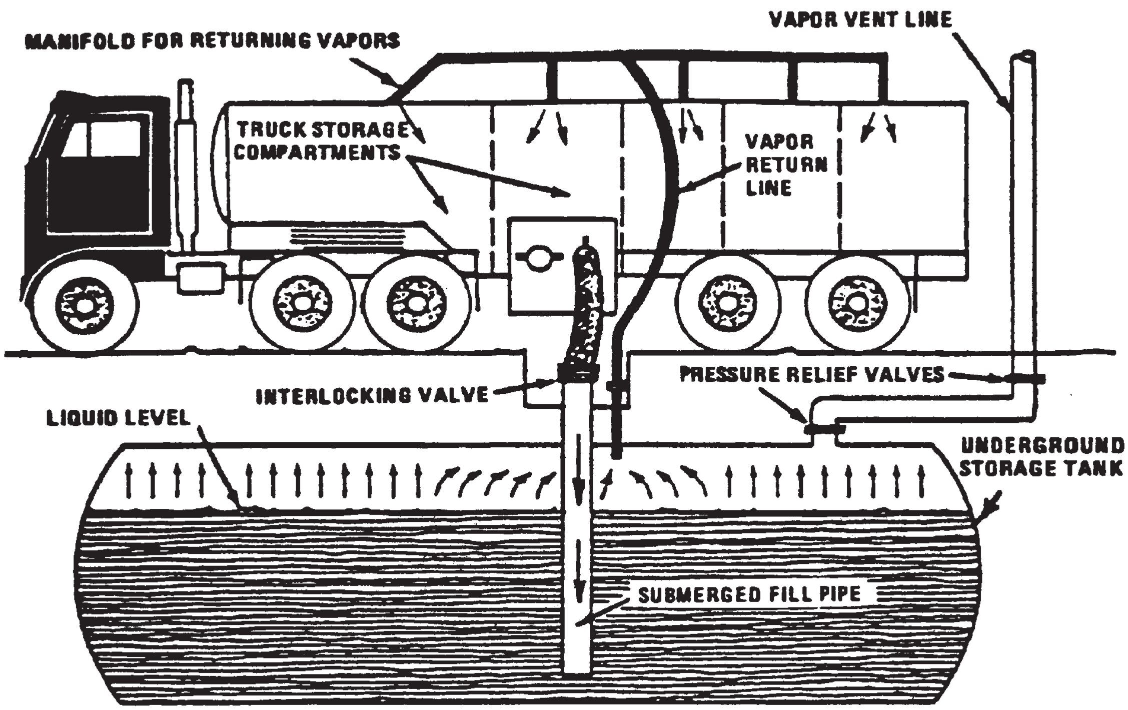


Figure 5.2-5. Tank truck unloading into a service station underground storage tank and practicing "vapor balance" form of emission control.

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].

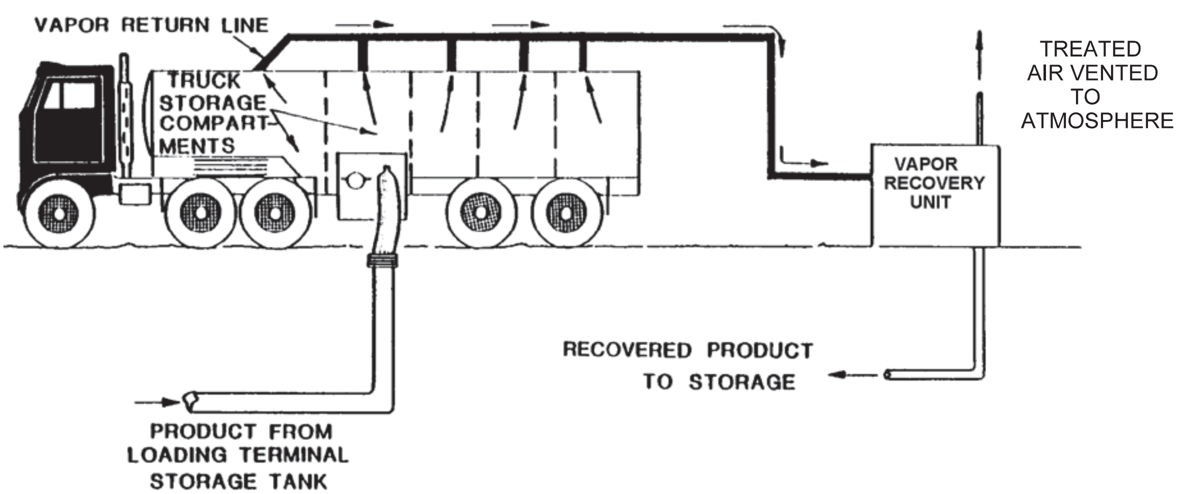


Figure 5.2-6. Tank truck loading with vapor recovery.

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:

$$C_L = C_A + C_G \tag{2}$$

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

$$\begin{aligned} L_B &= 0.70\ [0.31 + (0.20)\ (4.6) + (0.01)\ (4.6)\ (2)] \\ &\quad + 0.30\ [0.31 + (0.20)\ (4.6) + (0.01)\ (4.6)\ (15)] \\ &= 1.5\ \text{lb}/10^3\ \text{gal} \end{aligned}$$

Total ballasting emissions are:

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

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 Rate | |
|---|---|---|
| Emission Source | 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]

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

where:

$E_R$ = refueling emissions, mg/L
$\Delta T$ = 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.

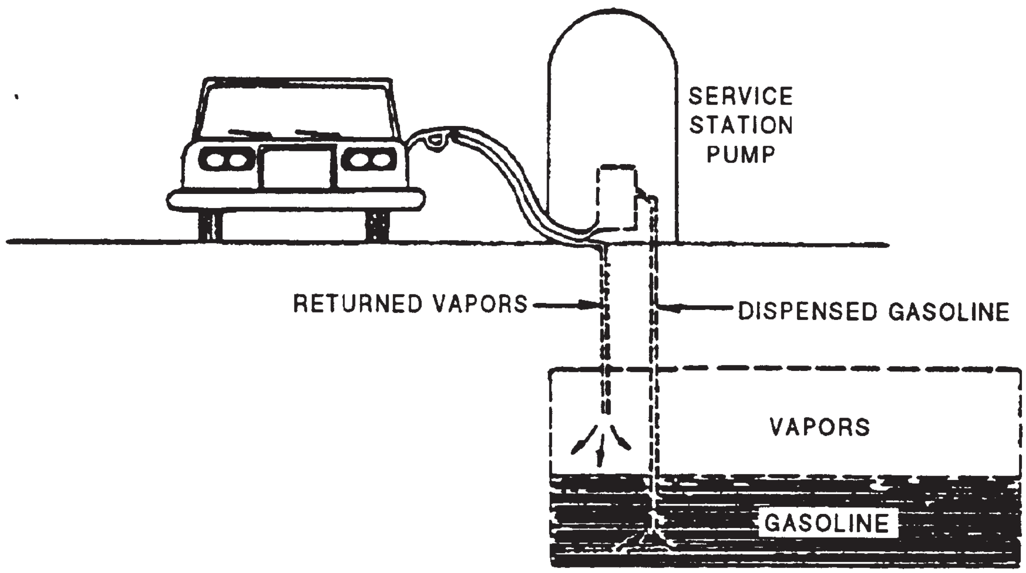


Figure 5.2-7. Automobile refueling vapor recovery system.

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MOBILE ANALYTICAL LABORATORIES, INC.
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432-337-4744

********************************************************************************

10/21/13 GAS EXTENDED SULFUR ANALYSIS LAB NO. 18490

DCP MIDSTREAM
LINAM RANCH
FUEL GAS

| | ppm |
|---|---|
| Hydrogen Sulfide | ND |
| Carbonyl Sulfide | ND |
| Methyl Mercaptan | ND |
| Ethyl Mercaptan | ND |
| Dimethyl Sulfide | ND |
| Carbon Disulfide | ND |
| I-Propyl Mercaptan | ND |
| T-Butyl Mercaptan | ND |
| N-Propyl Mercaptan | ND |
| Methyl Ethyl Sulfide | ND |
| S-Butyl Mercaptan/Thiophene | ND |
| I-Butyl Mercaptan | ND |
| Diethyl Sulfide | ND |
| N-Butyl Mercaptan | ND |
| Dimethyl Disulfide | ND |
| 3-Methyl Thiophene | ND |
| 2-Methyl Thiophene | ND |
| Dimethyl Thiophene | ND |
| Diethyl Disulfide | ND |
| Trimethyl Thiophene | ND |
| Undetermined Organic Sulfur | ND |
| | ND |

Test Methods: H2S by ASTM D4084, Other Sulfur compounds by Capillary GC with SCD Detector ASTM D5504.

Sampled: 10/14/13 BY: SR
ND = NONE DETECTED ( < 0.1 PPM)

Distribution:
Mr. Jon Bebbington

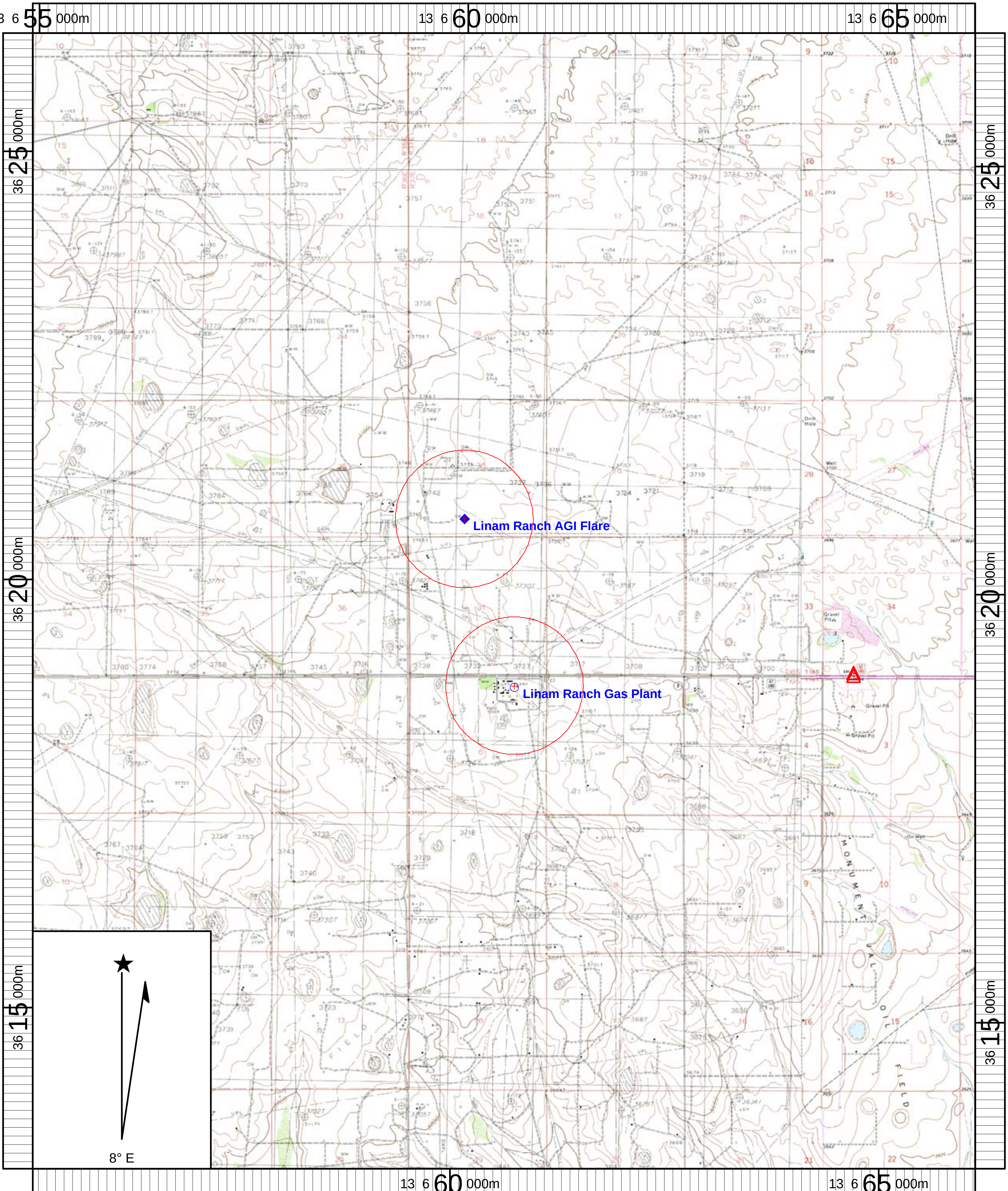
# Section 8

## 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 facility map is included in this section.




Name: MONUMENT NORTH
Date: 8/11/2008
Scale: 1 inch equals 4545 feet

Location: 13 0660523 E 3619841 N
Caption: Site Location
DCP Linam Ranch Gas Plant
DCP Linam Ranch AGI Flare

# 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")

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☑ **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.

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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.

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N/A – This application is being submitted under 20.2.70 NMAC.

# Section 10

## Written Description of the Routine Operations of the Facility

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**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.

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Linam Ranch Plant is a natural gas processing plant permitted to process up to 225 MM standard cubic feet of natural gas per day. The natural gas processed at Linam Ranch is mostly methane, but contains other hydrocarbons heavier than methane that can be condensed into liquids in the plant. The gas also contains impurities including water, hydrogen sulfide, and carbon dioxide.

The plant consists of an Inlet Receiving System, Amine Treater, Acid Gas Injection well, Sulfur Recovery Unit, Inlet Compression and Dehydration System, Cryogenic/Turbo Expander Plant with external Propane Refrigeration, Residue Compression, and Product Sales for Residue Gas, NGL Liquids, Stabilized Oil, Slop Oil, and Molten Liquid Sulfur. Additionally, the Fuel Gas Systems, Instrument and Starting Air Systems, Steam Systems, Cooling Towers, ESD Flare, Acid Gas Flare, Acid Gas Injection Flare and Drain Systems are supporting units that aid the processes. Processing operations involve chemical reaction processes, thermodynamic processes and physical processes. The chemical reactions that take place are exothermic in nature; that is, they generate heat.

**Amine (DGA) Treating**:
Amine treating is used to remove $H_2S$ and $CO_2$ from the gas. This is known as the gas sweetening process. Amine treating is an exothermic chemical reaction process. The treating solution is made up DGA (Diglycolamine) in water solution. This aqueous mixture is regenerated and reused. Lean DGA solution is pumped to the top of the Contactor (trayed tower) and allowed to flow downward. Sour inlet gas is fed into the bottom of the Contactor and flows upward.

As lean DGA solution flows down through the Contactor, it comes into contact with the sour gas. The sour gas contains $H_2S$ and $CO_2$, which react with the amine to form an amine sulfide complex and carbonate, i.e., the amine absorbs the $H_2S$ and CO2 and is known as sour (rich) amine. The remaining gas is known as sweet gas and leaves the Contactor containing less than 4 ppm of $H_2S$.

Rich DGA solution leaves the bottom of the Contactor and is fed into a flash tank so any absorbed hydrocarbons can be flashed out of the liquid prior to amine regeneration. Due to weak chemical bonds between the sour gas components and the DGA, $H_2S$ and $CO_2$ can be stripped from the amine by heating up the amine at low pressures. Rich amine is fed into a stripper column known as a Still, which is operated at low pressure and high temperature. 45 # Steam is used to supply heat to the Still reboiler. $H_2S$, and $CO_2$, known as "acid gases", with small amounts of hydrocarbons and water vapors exit the top of the Still and normally routed to the Acid Gas Injection (AGI) well system. Alternately, during maintenance or upsets of the AGI system, the acid gas stream may be routed to the sulfur plant (SRU). The Lean DGA is now regenerated and leaves the stripper column to be cooled and recirculated to the Contactor.

**Acid Gas Injection (AGI) System**

Acid gas from the Amine Treating system routed to the AGI well located approximately 1 ½ miles north of the main Linam Ranch facility for injection into sub-surface strata. The acid gas consists of electrically-driven compressors, tanks and ancillary devices. During normal operation of the AGI system, a low volume of gas is flared at the AGI flare. Under upset conditions that require depressurization of the AGI system, the acid gas contained within the system may be flared.

**Waste Heat Recovery Units and Boilers:**
The Linam Ranch Plant (Volcano) Heat Recovery Unit is used to produce high pressure 250# steam from the Residue Turbine Exhaust. Additionally, two (2) fuel gas Fired Boilers producing 250# steam are available. This 250# steam is used primarily to operate the various Steam Driven Turbines throughout the plant. Some of the 250# Steam is used to supply heat for the stabilizer reboiler.
**Cooling Water System:**

The cooling water system is a thermodynamic process that provides cooling for process and utility services. Water is circulated from the South Cooling Tower to various heat exchangers and then back to the cooling tower. The North Cooling Tower is a 'Bay Tower' with cooling water circulated over exposed process coils.

To minimize corrosion, scaling, and fouling of plant equipment, chemicals are added to the cooling water. This chemical addition also helps control microbiological growth in the Cooling Towers, since these systems are open to the atmosphere and microbiological growth can be a problem.

**Stabilized Product System:**
The stabilized product system is a heat added process, which is used to reduce the vapor pressure of inlet condensate, and closed drain liquids. Inlet liquids are sent to the stabilizer feed tanks where their pressure is reduced to allow certain light hydrocarbons to flash off to the gathering system. From the stabilizer system feed tanks, the liquid condensate is fed to the stabilizer tower where the pressure is further reduced and the process is heated significantly to flash off more of the light hydrocarbons. Liquids are dumped to the stabilized condensate storage tanks and are pumped to a sales pipeline or shipped by truck.

Units TK-VRU and TK-VRUTMP are a combined group of 9 tanks with integrated vapor recovery units (VRU). The VRUs at the facility are inherent to the process and design of the facility. The VRUs are designed to recover vapors and return the vapors back into the low pressure gathering system.

**Molecular Sieve Dehydration (Mole Sieve):**
Process gas is dehydrated to prevent hydrate formation in the turbo expander process unit. Molecular sieve dehydration is a solid bed adsorption process used to remove moisture from the inlet gas.
There are four packed towers in the Linam Ranch system. Three towers are dehydrating gas while the other is being regenerated. The towers are packed with a molecular sieve desiccant. The Linam Ranch mole sieve is a Type 4A sieve (pore size) and does not slip minor amounts of $H_2S$. This trace contaminant of $H_2S$ and Water Vapor are released from the mole sieve in the regeneration cycle.
The mole sieve is a crystalline aluminosilicate material selected for its ability to adsorb water. Water is removed from the gas due to a weak bonding reaction between the solid mole sieve desiccant and water. The bonding action generates only a small amount of heat. Fresh molecular sieve can adsorb about 10% of its weight in water.

Sweet gas compressed to about 660 psig flows from the top of the mole sieve packed tower to the bottom of the tower. As the gas flows downward, the mole sieve adsorbs water and other trace contaminants. The moisture content of the mole sieve is monitored and once it becomes saturated, it must be regenerated. Regeneration of a tower is accomplished by passing hot (450°F+)-residue gas through the tower from the bottom to the top of the tower. The hot gas breaks the water/desiccant weak bond and absorbs the free water and removes it from the tower.

The regeneration (regen) gas is cooled downstream of the desiccant beds so absorbed water will condense and drop out of the regen gas stream. After the water is separated from the regen gas in a separator, the gas is further cooled in the Regeneration Gas Propane Chiller Unit to remove additional water vapors and then is compressed to the Residue Compression System and thence the gas goes to the residue gas sales stream.

**Cryogenic / TurboExpander Plant:**
The purpose of the Cryogenic Plant is to recover the natural gas liquids (NGL) from the Plant feed gas. The NGL product is composed of ethane and heavier hydrocarbons when the plant is operated in ethane recovery mode and the residue gas is mostly methane. The plant can also be operated in an ethane rejection mode where most of the ethane will be rejected from the NGL product and into the residue gas stream.

The inlet gas passes through the Dehydration Outlet Filters to remove solid particles that can potentially plug downstream equipment. The inlet gas is then split into two streams. The first stream goes to the Inlet Gas Chiller and the second goes to the Demethanizer Reboiler. The main inlet gas stream enters the Inlet Gas Chiller, which is a multiple stream, brazed aluminum plate-fin exchanger. Physically, the exchanger is combined with the Reflux Condenser. The inlet gas is cooled to -60 °F by cross exchanging with the residue gas, and with propane refrigerant. The other portion of the inlet gas stream enters the Demethanizer Reboiler, which is a multiple stream, brazed aluminum plate-fin exchanger. The inlet gas is cooled to -76 °F by cross exchanging with the Demethanizer bottom liquid product, reboiling the Demethanizer liquids, and heating the liquid stream from the Expander Inlet Separator. The chilled inlet gas stream is then combined with the inlet gas from the outlet of the Inlet Gas Chiller.

The combined stream enters the Expander Inlet Separator where the condensed liquids are separated from the vapors. The vapors flow to the Turbo Expander and the liquid flows to the Liquid Gas Exchanger. The gas enters the Turbo Expander and the pressure is let down isentropically to about 170 psig. The energy released from the expansion, 2150 BHP, is used to drive the Booster Compressor. The expansion process cools the gas to -150 °F. In the event that the Turbo Expander/Booster Compressor is removed from service, flow can be bypassed around the unit by using the J-T valve to throttle the pressure. After the Turbo Expander, the inlet gas enters the Demethanizer. The liquid from the Expander Inlet Separator flows through the Liquid Gas Exchanger to the Cold Gas Separator.

In the Cold Gas Separator, the vapor is separated from the liquid. The liquid flows to the Demethanizer and the vapors flow to the Reflux Condenser. In the Reflux Condenser, the vapors from the Cold Gas Separator are condensed to provide reflux at the top section of the Demethanizer using cold residue gas from the overhead of the Demethanizer. The exchanger is a brazed aluminum plate-fin exchanger and is physically attached to the Inlet Gas Chiller.

The Demethanizer accomplishes the separation of the inlet gas into the residue gas and NGL product that meets the required specifications. The residue gas leaves as column overhead and is composed mostly of methane. In the ethane rejection mode the residue gas will contain an increased amount of ethane and propane. The NGL product, which is composed of ethane and heavier hydrocarbons, leaves as the column bottoms. During ethane rejection most of the Demethanizer reboiler passes will be bypassed and the Demethanizer Trim Reboiler will be the operational reboiler. The Demethanizer Trim Reboiler is a once through reboiler using condensing 45# steam. From the Demethanizer the residue gas flows to the Reflux Condenser and the NGL product flows to the Demethanizer Bottoms Transfer Pumps.
From the Demethanizer, the NGL is pumped by the Demethanizer Bottoms Pump to the NGL Product Heater. During ethane rejection the NGL bypasses the NGL Product Heater and goes directly to the NGL Storage Tank. The residue gas flows to the Reflux Condenser and the Inlet Gas Chiller where the residue gas is heated by the Inlet gas stream. During ethane rejection there will not be a vapor flow coming from the Cold Gas Separator, but the residue gas will still flow through the Reflux Condenser.
The residue gas enters the Booster Compressor where it is compressed to 215 psig. The gas flows to the Booster Compressor Aftercooler, a forced draft air cooled exchanger. A side stream is taken off at the discharge of the Booster Compressor as warm regen gas that goes to the Regeneration Gas Heater. Downstream of the Booster Compressor Aftercooler part of the residue gas is taken for fuel gas to run the plant. Further downstream, past the existing Cooling Tower, a side stream is taken as cool regeneration gas to the Dehydrators with the remainder of the residue gas continuing on to the Residue Compression System.

**Propane Refrigeration System:**
The purpose of the Propane Refrigeration System is to provide the additional refrigeration required at the Inlet Gas Chiller to achieve high ethane recoveries at the cryogenic plant. The refrigeration system also supplies refrigeration duty to the Regen Gas Chiller to cool the regen gas to achieve the required water specification on the residue gas and to the Refrigeration Compressor Lube Oil Cooler. Refrigeration is supplied at -37 °F and at 18 °F for the Inlet Gas Chiller and at 40 °F for the Regen Gas Chiller.

**Water Wash System:**
A 200-MMscfd Water Wash System is operating at the facility. The process makes use of the existing utilities including electrical power, steam, cooling water, plant and acid gas flare(s), and instrument air. All heat trace are sourced from the 40# steam system. A stand-alone Reverse Osmosis water treatment system was installed as part of this project to provide make-up water for the Water Wash System <u>and</u> replacement Boilers. Waste water from the Still Reflux Accumulator and Still Bottoms are dumped to the existing water holding tanks (referred to as the "A" Tanks). Vapors from the Still Inlet Surge Tank and Reflux Accumulator discharge to the low pressure gathering system or to the existing plant flare if the gathering system is inaccessible. NGL from the Still Inlet Surge Tank and Reflux Accumulator are dumped to a battery of existing holding tanks (referred to as the "B" Tanks). In general, lighter than air releases are vented to the atmosphere and heavier than air releases are vented to the Plant Flare. Blanket gas to the Still Inlet and Bottoms Surge Tanks are sourced from the Residue System.

# 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)**:**
Please see Table 2-A for a more detailed description of sources located at the facility.

**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)

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**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**

C. **Netting [is required, and analysis is attached to this document.] OR [is not required (project is not significant)] OR [Applicant is submitting a PSD Major Modification and chooses not to net.]**

D. **BACT** is **[not required for this modification, as this application is a minor modification.] OR [required, as this application is a major modification. List pollutants subject to BACT review and provide a full top down BACT determination.]**

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

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N/A – This application is being submitted under 20.2.70 NMAC.

# 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/

## Example of a Table for STATE REGULATIONS:

| STATE REGU-LATIONS CITATION | Title | Applies? Enter Yes or No | Unit(s) or Facility | JUSTIFICATION: (You may delete instructions or statements that do not apply in the justification column to shorten the document.) |
|---|---|---|---|---|
| 20.2.1 NMAC | General Provisions | Yes | Facility | General Provisions apply to Notice of Intent, Construction, and Title V permit applications. |
| 20.2.3 NMAC | Ambient Air Quality Standards NMAAQS | Yes | Facility | 20.2.3 NMAC is a SIP approved regulation that limits the maximum allowable concentration of Total Suspended Particulates, Sulfur Compounds, Carbon Monoxide and Nitrogen Dioxide. The facility meets maximum allowable concentrations of particulates, $SO_2$, $H_2S$, NOx, and CO under this regulation. |
| 20.2.7 NMAC | Excess Emissions | Yes | Facility | This regulation establishes requirements for the facility if operations at the facility result in any excess emissions. The owner or operator will operate the source at the facility having an excess emission, to the extent practicable, including associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing emissions. The facility will also notify the NMED of any excess emission per 20.2.7.110 NMAC. |
| 20.2.33 NMAC | Gas Burning Equipment - Nitrogen Dioxide | No | N/A | This facility does not have existing gas burning equipment having a heat input of greater than 1,000,000 million British Thermal Units per year per unit. The facility is not subject to this regulation and does not have emission sources that meet the applicability requirements under 20.2.33.108 NMAC. |
| 20.2.34 NMAC | Oil Burning Equipment: $NO_2$ | No | N/A | This facility does not have oil burning equipment having a heat input of greater than 1,000,000 million British Thermal Units per year per unit. The facility 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 | Yes | Facility | This facility is subject to the requirements of NMAC 2.35 for "New Natural **Gas Processing** Plants for which a modification commenced on or after July 1, 1974". This facility meets the requirements established under 20.2.35.100.A-D NMAC. |
| 20.2.37 and 20.2.36 NMAC | Petroleum Processing Facilities and Petroleum Refineries | N/A | N/A | **These regulations were repealed by the Environmental Improvement Board. If you had equipment subject to 20.2.37 NMAC before the repeal, your combustion emission sources are now subject to 20.2.61 NMAC.** |
| 20.2.38 NMAC | Hydrocarbon Storage Facility | Yes | TK-VRU and TK-VRUTMP | This regulation could apply to storage tanks at petroleum production facilities, processing facilities, tanks batteries, or hydrocarbon storage facilities. |
| 20.2.39 NMAC | Sulfur Recovery Plant - Sulfur | No | N/A | This regulation establishes sulfur emission standards for sulfur recovery plants which are not part of petroleum or natural gas processing facilities. This regulation does not apply as 20.2.35 NMAC applies. |
| 20.2.61.109 NMAC | Smoke & Visible Emissions | Yes | Facility | 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). **This facility was subject to the repealed regulation 20.2.37 NMAC; therefore it is now subject to 20.2.61 NMAC.** |
| 20.2.70 NMAC | Operating Permits | Yes | Facility | This regulation establishes requirements for obtaining an operating permit. This facility is a major source of NOx, CO, and VOC and complies by operating under Title V Permit P094-M2. |
| 20.2.71 NMAC | Operating Permit Fees | Yes | Facility | This regulation establishes a schedule of operating permit emission fees. The facility is subject to 20.2.70 NMAC and is therefore subject to requirements of this regulation. |
| 20.2.72 NMAC | Construction Permits | Yes | Facility | This regulation establishes the requirements for obtaining a construction permit. The facility is a stationary source that has potential emission rates great 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. The facility has a construction permit (NSR Permit) 0039-M7 to meet the requirements of this regulation. |

| **STATE REGU-LATIONS CITATION** | **Title** | **Applies? Enter Yes or No** | **Unit(s) or Facility** | **JUSTIFICATION: (You may delete instructions or statements that do not apply in the justification column to shorten the document.)** |
|---|---|---|---|---|
| 20.2.73 NMAC | NOI & Emissions Inventory Requirements | Yes | Facility | This regulation establishes emission inventory requirements. The facility meets the applicability requirements of 20.2.73.300 NMAC. The facility will meet all applicable reporting requirements under 20.2.73.300.B.1 NMAC. |
| 20.2.74 NMAC | Permits – Prevention of Significant Deterioration (PSD) | Yes | Facility | This regulation establishes requirements for obtaining a PSD permit. This facility is a major source for PSD purposes and is in compliance with the applicable requirements of this regulation. |
| 20.2.75 NMAC | Construction Permit Fees | No | N/A | This regulation establishes the guidelines and requirements for construction permitting fees. This facility is subject to 20.2.72 NMAC and is in turn subject to 20.2.75 NMAC. This facility is exempt from annual fees under this part (20.2.75.11.E NMAC) as it is subject to fees pursuant to 20.2.71 NMAC. |
| 20.2.77 NMAC | New Source Performance | Yes | 2, 4A, 28, 29, 30, 31 32B, 34, 36, 37, FUG, AM-10, TK-VRU and TK-VRUTMP | The facility is subject to this regulation as this is a stationary source which is subject to the requirements of 40 CFR Part 60, as amended through January 15, 2017. The following regulations apply:<br>• Subpart A<br>o Unit 2<br>o Unit 4A<br>• Subpart Dc<br>o 34, 36, and 37<br>• Subpart GG<br>o 29-31<br>o 32B<br>• Subpart Kb<br>o TK-VRU<br>o TK-VRUTMP<br>• Subpart KKK<br>o FUG<br>• Subpart KKKK<br>o 28<br>• Subpart OOOO<br>o Equipment added in NSR 0039-M6<br>o 28<br>o AM-10 |
| 20.2.78 NMAC | Emission Standards for HAPS | Yes (Potentially) | Facility | This regulation applies to all sources subject to a 40 CFR 60 regulation, as amended through January 15, 2017. Although this standard does not apply to this facility under routine operating conditions, in the case of asbestos demolition, Subpart M would apply. |
| 20.2.79 NMAC | Permits – Nonattainment Areas | No | N/A | This regulation establishes the requirements for obtaining a nonattainment area permit. The facility 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 facility follow good engineering practice. |
| 20.2.82 NMAC | MACT Standards for source categories of HAPS | Yes | 6-11, 28, 34, 36, 37, DH-10 | This regulation established state authority to implement MACT Standards for source categories of HAPs. This regulation applies to all sources emitting hazardous air pollutants, which are subject to the requirements of 40 CFR Part 63, as amended through January 15, 2017. The following regulations apply:<br>• Subpart HH<br>o DH-10<br>• Subpart YYYY<br>o 28<br>• Subpart ZZZZ<br>o 6-11<br>• Subpart DDDDD<br>o 34, 36, and 37 |

## 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 facility meets all applicable national ambient air quality standards for $NO_x$, CO, $SO_2$, $H_2S$, $PM_{10}$, and $PM_{2.5}$ under this regulation. |
| NSPS 40 CFR 60, Subpart A | General Provisions | Yes | 2, 4A, 28, 29, 30, 31 32B, 34, 36, 37, FUG, AM-10, TK-VRU and TK-VRUTMP | This regulation defines general provisions for relevant standards that have been set under this part. The facility is subject to this regulation because the following subparts apply:<br>• Subpart A<br>  o Unit 2<br>  o Unit 4A<br>• Subpart Dc<br>  o 34, 36, and 37<br>• Subpart GG<br>  o 29-31<br>  o 32B<br>• Subpart Kb<br>  o TK-VRU<br>  o TK-VRUTMP<br>• Subpart KKK<br>  o FUG<br>• Subpart KKKK<br>  o 28<br>• Subpart OOOO<br>  o Equipment added in NSR 0039-M6<br>  o 28<br>  o AM-10 |
| 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 facility 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. There are no steam generating units that commenced construction, modification, or reconstruction after June 19, 1984, and that have a heat input capacity greater than 100 MMBtu/hr at the facility. |
| 40 CFR 60.40c, Subpart Dc | Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units | Yes | 34, 36, and 37 | This regulation establishes standards of performance for small industrial-commercial-institutional steam generating units. Units 34, 36, and 37 will be installed or modified after June 9, 1989 with a heat input capacity greater than or equal to 10 MMbtu/hr but less than 100 MMbtu/hr. The units will only burn natural gas and therefore will not be subject to performance tests, reporting requirements, or emission limits under this regulation. The facility will follow all record keeping requirements for these units. |

| FEDERAL REGU-LATIONS CITATION | Title | Applies? Enter Yes or No | Unit(s) or Facility | JUSTIFICATION: |
|---|---|---|---|---|
| NSPS<br>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 standards of performance for petroleum liquids for which construction, reconstruction, or modification commenced after May 18, 1978, and prior to July 23, 1984. The tanks at the facility commenced construction after the July 23, 1984 regulation date and are therefore not subject to this regulation.<br><br>Note: The two (2) Condensate Tanks controlled by the VRU which have a capacity of 1,500 bbl were built by 1954, thus they are also exempted from this regulation. |
| NSPS<br>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 | Yes | TK-VRU, TK-VRUTMP | This facility has storage vessels with a capacity greater than or equal to 75 cubic meters ($m^3$) that are used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984. However TK39-41, TK44-48 and TK53,54 are pressure vessels and pursuant to§60.110b(d)(2) are not subject to this subpart.<br><br><u>TK-VRU and TK-VRUTMP</u><br>As discussed under Section 10 of this permit application, this facility operates a combine group of nine (9) tanks that ranges from 210 to 1,500 bbl (33.39 to 238.5 $m^3$) that are part of the vapor recovery units. From these nine tanks, two tanks, one of 210 bbl and one of 400 bbl, have capacity lower than the threshold of 75 $m^3$, thus they are exempted to comply with this regulation.<br><br>The five (5) 750 bbl tanks are covered under this regulations since they were installed after July 23, 1984, implementation date, and they have a capacity equivalent to 119.2 $m^3$.<br><br>The remainder two (2) 1,500 bbl tanks were installed in 1954 and are also covered with this regulation since these tanks used to be pressurized tanks that were modified to be atmospheric tanks after the date this rule was implemented.<br><br>Note: The VRUs at the facility are inherent to the process and design of the facility. The VRUs are designed to recover vapor and return the vapors back into the low pressure gathering system. The tanks that meet this capacity and date of construction date are subject to this regulations and compliant with this subpart because VOC emissions are routed to a VRU with 95% efficiency. |
| NSPS<br>40 CFR 60.330 Subpart GG | **Stationary Gas Turbines** | Yes | 29, 30, 31 and 32B | This regulation establishes standards of performance for certain stationary gas turbines. The turbines at Linam Ranch all have heat inputs greater than the 10 MMBtu/hour were installed on after the October 3, 1977 applicability date and prior to February 18, 2005. |
| NSPS<br>40 CFR 60, Subpart KKK | Leaks of VOC from **Onshore Gas Plants** | Yes | Facility | Linam Ranch is an affected facility as it is an onshore natural gas processing plant that commenced construction, reconstruction, or modification after January 20, 1984. 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 (definied in § 60.631) within a process unit is an affected facility. A compressor station, dehydration unit, sweetening unit, underground storage tank, field gas gathering system, or liquefied natural gas unit is covered by this subpart if it is located at an onshore natural gas processing plant. If the unit is not located at the plant site, then it is exempt from the provisions of this subpart.<br>Linam Ranch has instituted a Leak Detection and Repair program and submits reports twice annually. |

| FEDERAL REGU-LATIONS CITATION | Title | Applies? Enter Yes or No | Unit(s) or Facility | JUSTIFICATION: |
|---|---|---|---|---|
| NSPS 40 CFR Part 60 Subpart LLL | Standards of Performance for **Onshore Natural Gas Processing**: $SO_2$ Emissions | Yes | Facility | 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.<br>The sweetening units produce acid gas that is completely re-injected into geologic strata or that is otherwise not released to the atmosphere; pursuant to §60.640(e) the sweetening units are not subject to this subpart. |
| 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 | Equipment leaks associate with equipment added in NSR 0039-M6, 28, AM-10 | This regulation establishes emission standards and compliance schedule 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. The following are equipment constructed after August 23, 2011 and subject to this regulation: Turbine (Unit 28), and equipment leaks associated with the equipment added in NSR 0039-M6R1.<br>The acid gas from the amine unit (sweetening unit) at the facility is completely injected into oil or gas-bearing geological strata (AGI wells) and is not subject to 60.5405 through 60.5407, 60.5410(g), and 60.5423 of this subpart [per NSPS OOOO 60.5365(g)(4)]. When the acid gas flare is used during planned SSM and, the acid gas is not sent to the AGI wells, the facility is subject to $SO_2$ standards for the amine unit. Since the flare will be used as a control device during planned SSM, the flare is subject to NSPS 60.18. The facility will comply with this regulation upon startup.<br>The pneumatic devices located at the facility are not continuous bleed and therefore will not have applicable requirements under this regulation.<br>The tanks are subject to NSPS Kb and are therefore not subject to this regulation. |
| NSPS 40 CFR Part 60 Subpart OOOOa | Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015 | No | N/A | This regulation establishes standards of performance for crude oil and natural gas production, transmission and distribution. The facility does not have any affected units that have been modified or reconstructed on or after **September 18, 2015.** |
| NSPS 40 CFR 60 Subpart IIII | Standards of performance for Stationary Compression Ignition Internal Combustion Engines | No | N/A | This regulation establishes standards of performance for stationary compression ignition internal combustion engines. All engines at this facility commenced construction prior to July 11, 2005. This regulation does not apply. |
| NSPS 40 CFR Part 60 Subpart JJJJ | Standards of Performance for Stationary Spark Ignition Internal Combustion Engines | No | N/A | This regulation establishes standards of performance for stationary spark ignition internal combustion engines. All engines at this facility commenced construction prior to June 12, 2006. This regulation does not apply. |
| NSPS 40 CFR Part 60 Subpart KKKK | Standards of Performance for **Stationary Combustion Turbines** | Yes | 28 | This regulation establishes standards of performance for new stationary gas turbines. Unit 28 is subject to this regulation as the unit commenced construction after February 18, 2005. |

| FEDERAL REGU-LATIONS CITATION | Title | Applies? Enter Yes or No | Unit(s) or Facility | JUSTIFICATION: |
|---|---|---|---|---|
| NSPS 40 CFR 60 Subpart TTTT | Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units | No | N/A | This facility does not have any affected equipment; therefore, this subpart does not apply. |
| NSPS 40 CFR 60 Subpart UUUU | Emissions Guidelines for Greenhouse Gas Emissions and Compliance Times for Electric Utility Generating Units | No | N/A | This facility does not have any affected equipment; therefore, this subpart does not apply. |
| NSPS 40 CFR 60, Subparts WWW, XXX, Cc, and Cf | Standards of performance for Municipal Solid Waste (MSW) Landfills | No | N/A | This facility does not have any affected equipment; therefore, this subpart does not apply. |
| NESHAP 40 CFR 61 Subpart A | General Provisions | Yes (Potentially) | Facility | This part applies to the owner or operator of any stationary source for which a standard is prescribed under this part. There is one potentially applicable NESHAP. (See discussion of 40 CFR 61, part M below.) |
| NESHAP 40 CFR 61 Subpart E | National Emission Standards for **Mercury** | No | N/A | The provisions of this subpart are applicable to those stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge. This subpart does not apply. |
| NESHAP 40 CFR 61 Subpart M | National Emission Standards for **Asbestos** | Yes (Potentially) | Facility | Although this standard does not apply to this facility under routine operating conditions, in the case of **asbestos** demolition, Subpart M would apply. |
| 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 facility 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 facility. The facility is not subject to this regulation. |
| MACT 40 CFR 63, Subpart A | General Provisions | Yes | 6-11, 28, 34, 36, 37, DH-10 | This regulation defines general provisions for relevant standards that have been set under this part. 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 following subparts apply:<br>• Subpart HH<br>o DH-10<br>• Subpart YYYY<br>o 28<br>• Subpart ZZZZ<br>o 6-11<br>• Subpart DDDDD<br>o 34, 36, and 37 |
| MACT 40 CFR 63.760 Subpart HH | **Oil and Natural Gas Production Facilities** | Yes | DH-10 | This regulation establishes national emission standards for hazardous air pollutants from oil and natural gas production facilities. The glycol contactor added to the dehydration process to regulate moisture with the existing regenerator gas system and is subject to Subpart HH but exempt from requirements due to emissions less than 1.0 Mg/yr benzene.<br><br>According to current estimates, the storage tanks do not meet the definition of "storage vessels with the potential for flash emissions" since the gas-to-oil-ratio (GOR) is less than 0.31 $m^3/l$ (40 CFR 63.761). If the GOR of the storage tanks changes at the facility and the tanks are later determined to meet the definition of "storage vessels with the potential for flash emissions" given in Subpart HH, DCP will comply with applicable requirements. |

| FEDERAL REGU-LATIONS CITATION | Title | Applies? Enter Yes or No | Unit(s) or Facility | JUSTIFICATION: |
|---|---|---|---|---|
| MACT 40 CFR 63 Subpart HHH | National Emission Standards for Hazardous Air Pollutants From Natural Gas Transmission and Storage Facilities | No | N/A | This subpart applies to owners and operators of natural gas transmission and storage facilities that transport or store natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company), and that are major sources of hazardous air pollutants (HAP) emissions as defined in §63.1271. This facility is not a natural gas transmission and storage facility as defined in this subpart. This regulation does not apply. |
| MACT 40 CFR 63 Subpart YYYY | NESHAP for Stationary Combustion Turbines | Yes | 28 | This subpart sets national emission standards for new stationary combustion turbines. Units 29, 30, 31 and 32B are existing units and pursuant to§63.6090(b)(4) have no requirements under this subpart or subpart A.<br>Unit 28 is a new or reconstructed gas-fired combustion turbine. Pursuant to §63.6095(d), this unit is subject to the initial notification requirements set forth in §63.6145 but need not comply with any other requirement of Subpart YYYY until final action on compliance by the EPA is taken. |
| MACT 40 CFR 63 Subpart DDDDD | National Emission Standards for Hazardous Air Pollutants for Major Industrial, Commercial, and Institutional Boilers & Process Heaters | Yes | 34, 36, and 37 | The facility is a major source of HAPS. Units 34, 36 and 37 will be subject to MACT 40 CFR 63 Subpart DDDDD as they will be constructed after the June 4, 2010 applicability date. The boilers will be combusting natural gas and will have the following compliance requirement in MACT DDDDD:<br><br>Per 63.7540 (a)(10) - Tune up every year (except for boilers and process heaters with continuous oxygen trim system which conduct a tune-up every 5 years).<br><br>Units 34, 36, and 37 do not have emission limits under this regulation.<br><br>DCP will comply with all applicable MACT DDDDD requirements. |
| 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 facility does not have any affected equipment; therefore, this subpart does not apply. |
| MACT 40 CFR 63 Subpart ZZZZ | National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (**RICE MACT**) | Yes | 6-11 | This regulation defines national emissions standards for HAPs for stationary Reciprocating Internal Combustion Engines. These engines are subject to MACT ZZZZ but have no requirements as they are existing 2 stroke lean burn engines which are less than 500 horsepower located at a major source of HAPs [§63.6600(c)] |
| 40 CFR 64 | **Compliance Assurance Monitoring** | Yes | AM-10 | The sulfur recovery unit (Unit 5) has been removed and is no longer subject to CAM.<br><br>The amine unit (Unit AM-10) is a controlled major source and is subject to CAM.<br><br>Units TK-VRU and TK-VRUTMP are a combined group of 9 tanks with integrated vapor recovery units (VRU). The VRUs at the facility are inherent to the process and design of the facility and are not subject to CAM. The VRUs are designed to recover vapors and return the vapors back into the low pressure gathering system. |

| FEDERAL REGU-LATIONS CITATION | Title | Applies? Enter Yes or No | Unit(s) or Facility | JUSTIFICATION: |
|---|---|---|---|---|
| 40 CFR 68 | **Chemical Accident Prevention** | Yes | Facility | This facility has quantities of materials regulated by this requirement that are in excess of the triggering threshold. A RMP has been submitted to and approved by the EPA on 6/29/2015 |
| Title IV – Acid Rain 40 CFR 72 | **Acid Rain** | No | N/A | This part establishes the acid rain program. This part does not apply because the facility is not covered by this regulation [40 CFR Part 72.6]. |
| Title IV – Acid Rain 40 CFR 73 | **Sulfur Dioxide** Allowance Emissions | No | N/A | This part establishes the acid rain program. This part does not apply because the facility is not covered by this regulation. |
| Title IV-Acid Rain 40 CFR 75 | **Continuous Emissions Monitoring** | No | N/A | This part establishes the acid rain program. This part does not apply because the facility is not covered by this regulation. |
| Title IV – Acid Rain 40 CFR 76 | **Acid Rain** Nitrogen Oxides **Emission Reduction Program** | No | N/A | This facility has quantities of materials regulated by this requirement that are in excess of the triggering threshold. A RMP has been submitted to and approved by the EPA on 6/29/2015 |
| Title VI – 40 CFR 82 | Protection of **Stratospheric Ozone** | Yes | Facility | DCP owns appliances containing CFCs and is therefore subject to this requirement. DCP uses only certified technicians for the maintenance, service, repair and disposal of appliances and maintains the appropriate records for this requirement.<br><br>Note: Disposal definition in 82.152: Disposal means the process leading to and including: (1) The discharge, deposit, dumping or placing of any discarded appliance into or on any land or water; (2) The disassembly of any appliance for discharge, deposit, dumping or placing of its discarded component parts into or on any land or water; or (3) The disassembly of any appliance for reuse of its component parts. “Major maintenance, service, or repair means” any maintenance, service, or repair that involves the removal of any or all of the following appliance components: compressor, condenser, evaporator, or auxiliary heat exchange coil; or any maintenance, service, or repair that involves uncovering an opening of more than four (4) square inches of “flow area” for more than 15 minutes. |
| CAA Section 112(r) | Chemical Accident Prevention Provisions | Yes | Facility | Linam Ranch is subject to the chemical accident prevention provisions of the Clean Air Act. |

# Section 14

## Operational Plan to Mitigate Emissions

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

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☑ **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.

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DCP Operating Company, LP has developed an Operational Plan to Mitigate Source Emission during Malfunction, Startup or Shutdown as required by 20.2.72.203.A.5 NMAC. This plan is available at the project site for evaluation and review.

# Section 15

## Alternative Operating Scenarios

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

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**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.

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**Scenario A**

This is the primary operating scenario. Under Scenario A of one (1) of the four (4) HBAs is operating at any given time, while simultaneously being allowed to operate all other equipment at the facility at maximum capacity without limits on the hours of operation.

**Scenario B**

This is the alternative operating scenario. Under Scenario B, two (2) of the four (4) HBAs would operate when one of the TLA engines is down. In order to preserve the PSD netting result for $NO_x$ and VOC, the number of hours this scenario is allowed to run is up to 3,400 hours in any rolling 12-month period.

If DCP exceeds this threshold, DCP must perform an updated PSD netting analysis for these pollutants to show that the SERs were not exceeded based on actual hours of operation in each rolling 12-month period.

The following formula shall be used to calculate tons per year emissions for each HBA and TLA. The sum of each of the HBA and TLA emissions calculated by the formula is then compared to the limits shown in Table 2-E of this application. The sum should be less than or equal to these limits to demonstrate that the SERs for NOx and VOC were not exceeded.

Formula to calculate emissions for NOx and VOC, in tons, for a given HBA or TLA unit over a rolling 12-month period:

$$\frac{[\text{Permit Limit (lb/hr)}] \times [\text{Rolling 12-month hours of operation (hr)}] \times [\text{Actual power (hp)} \div \text{Permitted power (hp)}]}{2000 \text{ (lb/ton)}}$$

Then, for $NO_x$ and VOC, calculate the sum:

Unit 6 + Unit 7 + Unit 8 + Unit 9 +Unit 10 + Unit 11 = Total All Units

Then, compare the sum "Total All Units" for each pollutant to the corresponding tons per year limit shown in Table 2-E.

# 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.

This application is being submitted under 20.2.70 NMAC. Modeling is not required for Title V applications.

# 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 |
|---|---|---|
| 6 | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A201.B | 10/17/2017<br>12/11/2018<br>3/26/2019 |
| 7 | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A201.B | 12/11/2018<br>3/26/2019 |
| 8 | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A201.B | 2/19/2014<br>Unit out of service |
| 9 | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A201.B | 4/10/2013<br>Unit out of service |
| 10 | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A201.B | 3/1/2017<br>12/11/2018<br>3/26/2019 |
| 11 | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A201.B | 10/19/2017<br>12/11/2018<br>2019 test date TBD |
| 28 | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A205.A | 2/20/2017<br>3/21/2018<br>3/13/2019 |
| 29 | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A205.A | 2/20/2017<br>3/20/2018<br>3/20/2019 |
| 30 | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A205.A | 3/1/2017<br>8/20/2018<br>3/20/2019 |
| 31a | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A205.A | 3/1/2017<br>3/20/2018<br>3/20/2019 |
| 32b | Tested using portable emission analyzer in accordance with NSR Permit 0039-M7 Condition A205.A | 10/19/2017<br>10/10/2018<br>2019 test date 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.

The sulfur recovery unit (Unit 5) has been removed and is no longer subject to CAM.

The amine unit (Unit AM-10) is a controlled major source and is subject to CAM. A CAM plan for the AGI system (the AGI flare and AGI well) which controls the amine unit is attached to this section.

Units TK-VRU and TK-VRUTMP are a combined group of 9 tanks with integrated vapor recovery units (VRU). The VRUs at the facility are inherent to the process and design of the facility and are not subject to CAM. The VRUs are designed to recover vapors and return the vapors back into the low pressure gathering system.

### 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.

Based on information and belief formed after reasonable inquiry, DCP believes that the Linam Ranch Gas Plant is in compliance with each applicable requirement identified in Section 13. In the event that DCP should discover new information affecting the compliance status of the facility, DCP will make appropriate notifications and/or take corrective actions.

## 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.

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The facility will continue to be in compliance with requirements for which it is in compliance at the time of this permit application and will comply with other applicable requirements as they come into effect during the permit term.

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## 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.

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Compliance certification will be submitted annually, as required by Title V Permit P094-R2, Condition B112(D).

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## 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).

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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.)

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No 40 CFR 82 requirements apply to this facility.

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## 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**.

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No compliance plan is required.

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## 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.

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The RMP was submitted to EPA on 8/31/2010 (electronic submittal) and approved by EPA on 8/31/2010.

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## 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.)

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Yes, 20.6 kilometers from Texas.

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## 19.9 - Responsible Official

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

| | |
|---|---|
| R.O. : | Randy C. DeLaune |
| R.O. Title: | VP Operations Services |
| R.O. Address: | 5718 Westheimer, Suite 1900, Houston, TX 77057-7057 |
| R.O. Phone: | (713) 268-7488 |
| R.O. Email: | RCDeLaune@Dcpmidstream.com |

# Compliance Assurance Monitoring Plan

## I. Background

a. Emission Unit Description

The emission source covered by this Compliance Assurance Monitoring (CAM) Plan is the Amine Sweetening System equipped with an Acid Gas Injection (AGI) System to control $H_2S$ (and $CO_2$) emissions; the units that make up the Amine Sweetening System are the Amine Regeneration Still and the Amine Contactor.

b. Applicable Regulation, Emission Limitations, Monitoring Requirements

The Amine Sweetening System and AGI System are not subject to Federal regulation other than the CAM Rule at 40 CFR Part 64.

The Amine Sweetening System and AGI System do not have emission limits per se; the facility wide emission total for $H_2S$ (the air toxic designed to be controlled by the AGI System) is about 30.0 tons per year.

Monitoring for the Amine Sweetening System and AGI System includes monitoring the AGI compressor discharge pressure, metering the acid gas to the AGI System, and metering the acid gas routed to the acid gas flare.

c. Control Technology

Control technology employed the Amine Sweetening System is the Acid Gas Injection (AGI) System.

**II. Justification -** Proper operation of the AGI System results in zero emissions to the atmosphere. Proper operation of the system is verified by monitoring compressor discharge pressure. Compressor discharge pressure indicates that the acid gas from the Amine Sweetening System is being injected into the subterranean formation. Monitoring of this pressure can also indicate any problems with the injection well or injecting gas into the formation. A low compressor discharge pressure may indicate problems with the well or piping within the well. A high compressor discharge pressure may indicate difficulty injecting gas into the formation. Based on DCP's experience with this AGI System, the compressor pressure range represented in the Monitoring Plan is representative.

## III. Monitoring Plan

| | Indicator No. 1 | Other Monitoring/Verification |
|---|---|---|
| I. AGI Performance Indicator | Compressor discharge pressure (psig) | Metering of acid gas flow to the AGI System; metering of then acid gas flow to the Acid Gas Flare; Monthly sulfur reports submitted to the NMED. |
| II. Indicator Range* | 1000 – 2700 psig | DCP will investigate any excursion outside the specified range and perform corrective action as required. All information will be recorded and included in the required semi-annual Monitoring Report. |
| III. Performance Criteria | | |
| a. Data Representativeness | Pressure is to be measured by a pressure transducer | Proper operation of the pressure transducer is verified no less frequently than annually. |
| b. QA/QC Practices/Criteria | Pressure transducer operation is verified no less frequently than annually. | Inlet gas flow meters calibrated monthly. |
| c. Monitoring Frequency | Compressor discharge pressure is monitored once per calendar day. | AGI motor and compressor are maintained according to manufacturer's specifications. |
| d. Data Collection Procedures | Compressor discharge pressure is recorded once per calendar day. No observation is required on days when the AGI System is not operated. | Record any AGI System shutdowns. Report flaring of acid gas, as required. |
| e. Averaging Time | None; pressure will not vary outside the specified range. | N/A |

# Section 20

## Other Relevant Information

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**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.

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There is no other relevant information.

# Section 22: Certification

Company Name: DCP Operating Company, LP

I, Todd Allison, 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 10th day of April, 2019, upon my oath or affirmation, before a notary of the State of

New Mexico.

Todd Allison
*Signature

4-10-2019
Date

Todd Allison
Printed Name

Asset Director
Title

Scribed and sworn before me on this 10th day of April, 2019.

My authorization as a notary of the State of New Mexico expires on the

3rd day of March, 2021.

Dwan Ellison
Notary's Signature

April 10, 2019
Date

OFFICIAL SEAL
DWAN ELLISON
Notary Public State of New Mexico
My Commission Expires 3/3/2021

Dwan Ellison
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.