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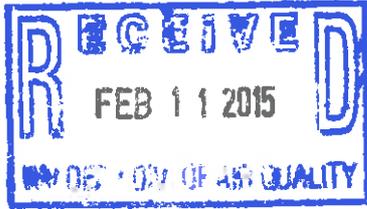
# JAY-BEE OIL & GAS, INC.

## APPLICATION FOR GENERAL PERMIT

**Doc Well Pad Production Facility  
Tyler County, West Virginia**



98 Vanadium Road  
Bridgeville, PA 15017  
(412) 221-1100



# **APPLICATION FOR G70-A GENERAL PERMIT**

**Jay-Bee Oil & Gas, Inc.**

**Doc Well Pad Production Facility**

**Tyler County, West Virginia**

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**SECTION I**

**Application Form**



WEST VIRGINIA  
 DEPARTMENT OF ENVIRONMENTAL PROTECTION  
 DIVISION OF AIR QUALITY  
 601 57<sup>th</sup> Street, SE  
 Charleston, WV 25304  
 Phone: (304) 926-0475 • www.dep.wv.gov/daq

**APPLICATION FOR GENERAL PERMIT REGISTRATION**  
 CONSTRUCT, MODIFY, RELOCATE OR ADMINISTRATIVELY UPDATE  
 A STATIONARY SOURCE OF AIR POLLUTANTS

- CONSTRUCTION     MODIFICATION     RELOCATION     CLASS I ADMINISTRATIVE UPDATE  
 CLASS II ADMINISTRATIVE UPDATE

**CHECK WHICH TYPE OF GENERAL PERMIT REGISTRATION YOU ARE APPLYING FOR:**

- |  |  |
|--|--|
| <input type="checkbox"/> G10-D – Coal Preparation and Handling                                   | <input type="checkbox"/> G40-C – Nonmetallic Minerals Processing                             |
| <input type="checkbox"/> G20-B – Hot Mix Asphalt   | <input type="checkbox"/> G50-B – Concrete Batch  |
| <input type="checkbox"/> G30-D – Natural Gas Compressor Stations                                 | <input type="checkbox"/> G60-C – Class II Emergency Generator                                |
| <input type="checkbox"/> G33-A – Spark Ignition Internal Combustion Engines                      | <input type="checkbox"/> G65-C – Class I Emergency Generator                                 |
| <input type="checkbox"/> G35-A – Natural Gas Compressor Stations (Flare/Glycol Dehydration Unit) | <input checked="" type="checkbox"/> G70-A – Class II Oil and Natural Gas Production Facility |

**SECTION I. GENERAL INFORMATION**

1. Name of applicant (as registered with the WV Secretary of State's Office): <b>Jay-Bee Oil &amp; Gas, Inc.</b>	2. Federal Employer ID No. (FEIN): <b>55-073-8862</b>
3. Applicant's mailing address: <b>3570 Shields Hill Rd Cairo, WV 26337</b>	4. Applicant's physical address: <b>3570 Shields Hill Rd Cairo, WV 26337</b>

If Applicant is a subsidiary corporation, please provide the name of parent corporation.

N/A

**WV BUSINESS REGISTRATION.** Is the applicant a resident of the State of West Virginia?  YES     NO

IF YES, provide a copy of the Certificate of Incorporation/ Organization / Limited Partnership (one page) including any name change amendments or other Business Registration Certificate as Attachment A.

IF NO, provide a copy of the Certificate of Authority / Authority of LLC / Registration (one page) including any name change amendments or other Business Certificate as Attachment A.

**SECTION II. FACILITY INFORMATION**

7. Type of plant or facility (stationary source) to be constructed, modified, relocated or administratively updated (e.g., coal preparation plant, primary crusher, etc.): <b>Natural Gas Well Pad Production Facility</b>	8a. Standard Industrial Classification Classification (SIC) code: <b>1311</b>	AND	8b. North American Industry System (NAICS) code: <b>211111</b>
9. DAQ Plant ID No. (for existing facilities only):	10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only):  _____		

**A: PRIMARY OPERATING SITE INFORMATION**

<p>11. Facility name of primary operating site:  <b>Loc Well Pad Production Facility</b></p>	<p>12A. Address of primary operating site:                  Mailing: <u>None</u> Physical: _____</p>	
<p>13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO                  → IF YES, please explain: <b>Applicant has a lease agreement with the land owner for installation of the Well Pad and associated equipment</b></p> <p>→ IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.</p>		
<p>14A → For <b>Modifications or Administrative Updates</b> at an existing facility, please provide directions to the present location of the facility from the nearest state road;                  → For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a <b>MAP as Attachment F.</b></p> <p><u>From Middlebourne, proceed south/east on State Route 18 (Main Street) out of town. Proceed approximately 5.8 miles to the junction with CR 1/3 (Indian Creek Road) on the left. From WV 18 and Indian Creek (CR13) intersection, take Indian Creek Rd east for 4.4 miles. Turn left onto lease road, follow north for 0.2 miles to well pad entrance.</u></p>		
<p>15A. Nearest city or town:  <b>Middlebourne</b></p>	<p>16A. County:  <b>Tyler</b></p>	<p>17A. UTM Coordinates:                  Northing (KM): <u>4366.6418</u>                  Easting (KM): <u>519.9415</u>                  Zone: <u>17</u></p>
<p>18. Briefly describe the proposed new operation or change (s) to the facility:  <b>Natural gas production and separation of liquids.</b></p>		<p>19A. Latitude &amp; Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):                  Latitude: <u>39.449105</u>                  Longitude: <u>-80.768234</u></p>

**B: 1<sup>ST</sup> ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits)**

<p>11B. Name of 1<sup>st</sup> alternate operating site:                  _____                  _____</p>	<p>12B. Address of 1<sup>st</sup> alternate operating site:                  Mailing: _____ Physical: _____</p>
<p>13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input type="checkbox"/> YES <input type="checkbox"/> NO                  → IF YES, please explain: _____</p> <p>→ IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.</p>	

14B. → For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;  
 → For **Construction or Relocation** permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP as Attachment F**.

\_\_\_\_\_

\_\_\_\_\_

15B. Nearest city or town:

16B. County:

17B. UTM Coordinates:

Northing (KM): \_\_\_\_\_

Easting (KM): \_\_\_\_\_

Zone: \_\_\_\_\_

19B. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):

Latitude: \_\_\_\_\_

Longitude: \_\_\_\_\_

18B. Briefly describe the proposed new operation or change (s) to the facility:

**C: 2<sup>ND</sup> ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits):**

11C. Name of 2<sup>nd</sup> alternate operating site:

12C. Address of 2<sup>nd</sup> alternate operating site:

Mailing: \_\_\_\_\_ Physical: \_\_\_\_\_

13C. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site?  
 → IF YES, please explain: \_\_\_\_\_

YES  NO

→ IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14C. → For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;  
 → For **Construction or Relocation** permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP as Attachment F**.

\_\_\_\_\_

\_\_\_\_\_

15C. Nearest city or town:

16C. County:

17C. UTM Coordinates:

Northing (KM): \_\_\_\_\_

Easting (KM): \_\_\_\_\_

Zone: \_\_\_\_\_

19C. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):

Latitude: \_\_\_\_\_

Longitude: \_\_\_\_\_

18C. Briefly describe the proposed new operation or change (s) to the facility:

<p>20. Provide the date of anticipated installation or change:</p> <p><u>5 / 15 / 15</u></p> <p>If this is an <b>After-The-Fact</b> permit application, provide the date upon which the proposed change did happen: :</p> <p>____ / ____ / ____</p>	<p>21. Date of anticipated Start-up if registration is granted:</p> <p><u>5/ 20 / 15</u></p>
<p>22. Provide maximum projected <b>Operating Schedule</b> of activity/activities outlined in this application if other than 8760 hours/year. (Note: anything other than 24/7/52 may result in a restriction to the facility's operation).</p> <p>Hours per day <u>24</u> Days per week <u>7</u> Weeks per year <u>52</u> Percentage of operation <u>100</u></p>	

### SECTION III. ATTACHMENTS AND SUPPORTING DOCUMENTS

23. Include a check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR22 and 45CSR13).
24. Include a **Table of Contents** as the first page of your application package.
- All of the required forms and additional information can be found under the Permitting Section (General Permits) of DAQ's website, or requested by phone.
25. Please check all attachments included with this permit application. Please refer to the appropriate reference document for an explanation of the attachments listed below.

- ATTACHMENT A : CURRENT BUSINESS CERTIFICATE
- ATTACHMENT B: PROCESS DESCRIPTION
- ATTACHMENT C: DESCRIPTION OF FUGITIVE EMISSIONS
- ATTACHMENT D: PROCESS FLOW DIAGRAM
- ATTACHMENT E: PLOT PLAN
- ATTACHMENT F: AREA MAP
- ATTACHMENT G: EQUIPMENT DATA SHEETS AND REGISTRATION SECTION APPLICABILITY FORM
- ATTACHMENT H: AIR POLLUTION CONTROL DEVICE SHEETS
- ATTACHMENT I: EMISSIONS CALCULATIONS
- ATTACHMENT J: CLASS I LEGAL ADVERTISEMENT
- ATTACHMENT K: ELECTRONIC SUBMITTAL
- ATTACHMENT L: GENERAL PERMIT REGISTRATION APPLICATION FEE
- ATTACHMENT M: SITING CRITERIA WAIVER
- ATTACHMENT N: MATERIAL SAFETY DATA SHEETS (MSDS)
- ATTACHMENT O: EMISSIONS SUMMARY SHEETS
- OTHER SUPPORTING DOCUMENTATION NOT DESCRIBED ABOVE (Equipment Drawings, Aggregation Discussion, etc.)

Please mail an original and two copies of the complete General Permit Registration Application with the signature(s) to the DAQ Permitting Section, at the address shown on the front page of this application. Please **DO NOT** fax permit applications. For questions regarding applications or West Virginia Air Pollution Rules and Regulations, please refer to the website shown on the front page of the application or call the phone number also provided on the front page of the application.

**SECTION IV. CERTIFICATION OF INFORMATION**

This General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of a Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, Emission Inventory, Certified Emission Statement, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. Any administratively incomplete or improperly signed or unsigned Registration Application will be returned to the applicant.

**FOR A CORPORATION (domestic or foreign)**

I certify that I am a President, Vice President, Secretary, Treasurer or in charge of a principal business function of the corporation

**FOR A PARTNERSHIP**

I certify that I am a General Partner

**FOR A LIMITED LIABILITY COMPANY**

I certify that I am a General Partner or General Manager

**FOR AN ASSOCIATION**

I certify that I am the President or a member of the Board of Directors

**FOR A JOINT VENTURE**

I certify that I am the President, General Partner or General Manager

**FOR A SOLE PROPRIETORSHIP**

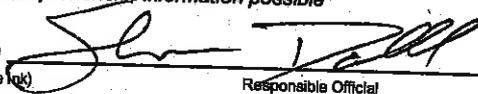
I certify that I am the Owner and Proprietor

I hereby certify that (please print or type) \_\_\_\_\_ is an Authorized Representative and in that capacity shall represent the interest of the business (e.g., Corporation, Partnership, Limited Liability Company, Association Joint Venture or Sole Proprietorship) and may obligate and legally bind the business. If the business changes its Authorized Representative, a Responsible Official shall notify the Director of the Office of Air Quality immediately, and/or,

I hereby certify that all information contained in this General Permit Registration Application and any supporting documents appended hereto is, to the best of my knowledge, true, accurate and complete, and that all reasonable efforts have been made to provide the most comprehensive information possible

Signature

(please use blue ink)



Responsible Official

2-6-2015

Date

Name & Title Shane Dowell, Office Manager

(please print or type)

Signature

(please use blue ink)

Authorized Representative (if applicable)

Date

Applicant's Name \_\_\_\_\_

Phone & Fax

304/628-3119

Phone

304/628-3119

Fax

Email

sdowell@jaybeoil.com

## General Permit G70-A Registration Section Applicability Form

General Permit G70-A was developed to allow qualified applicants to seek registration for a variety of sources. These sources include natural gas well affected facilities, storage tanks, natural gas-fired compressor engines (RICE), natural gas producing units, natural gas-fired in-line heaters, pneumatic controllers, heater treaters, tank truck loading, glycol dehydration units, completion combustion devices, flares, enclosed combustion devices, and vapor recovery systems. All registered facilities will be subject to Sections 1.0, 2.0, 3.0, and 4.0.

General Permit G70-A allows the registrant to choose which sections of the permit they are seeking registration under. Therefore, please mark which additional sections that you are applying for registration under. If the applicant is seeking registration under multiple sections, please select all that apply. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

Section 5	Natural Gas Well Affected Facility	<input type="checkbox"/>
Section 6	Storage Vessels*	<input checked="" type="checkbox"/>
Section 7	Gas Producing Units, In-Line Heaters, Heater Treaters, and Glycol Dehydration Reboilers	<input checked="" type="checkbox"/>
Section 8	Pneumatic Controllers Affected Facility(NSPS, Subpart OOOO)	<input checked="" type="checkbox"/>
Section 9	<i>Reserved</i>	<input type="checkbox"/>
Section 10	Natural gas-fired Compressor Engine(s) (RICE)**	<input type="checkbox"/>
Section 11	Tank Truck Loading Facility ***	<input checked="" type="checkbox"/>
Section 12	Standards of Performance for Storage Vessel Affected Facilities (NSPS, Subpart OOOO)	<input checked="" type="checkbox"/>
Section 13	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (NSPS, Subpart JJJJ)	<input type="checkbox"/>
Section 14	Control Devices not subject to NSPS, Subpart OOOO	<input checked="" type="checkbox"/>
Section 15	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (40CFR63, Subpart ZZZZ)	<input checked="" type="checkbox"/>
Section 16	Glycol Dehydration Units	<input type="checkbox"/>
Section 17	Dehydration Units With Exemption from NESHAP Standard, Subpart HH § 63.764(d) (40CFR63, Subpart HH)	<input type="checkbox"/>
Section 18	Dehydration Units Subject to NESHAP Standard, Subpart HH and Not Located Within an UA/UC (40CFR63, Subpart HH)	<input type="checkbox"/>
Section 19	Dehydration Units Subject to NESHAP Standard, Subpart HH and Located Within an UA/UC (40CFR63, Subpart HH)	<input type="checkbox"/>

\* Applicants that are subject to Section 6 may also be subject to Section 12 if the applicant is subject to the NSPS, Subpart OOOO control requirements or the applicable control device requirements of Section 14.

\*\* Applicants that are subject to Section 10 may also be subject to the applicable RICE requirements of Section 13 and/or Section 15.

\*\*\* Applicants that are subject to Section 11 may also be subject to control device requirements of Section 14.

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**ATTACHMENT A**

**Business Registration**

Attachment A

Attached Current WV Business Certificate

**WEST VIRGINIA  
STATE TAX DEPARTMENT  
BUSINESS REGISTRATION  
CERTIFICATE**

ISSUED TO:  
**JAY-BEE OIL & GAS INC  
RR 1 BOX 5  
GAIRO, WV 26337-9701**

**BUSINESS REGISTRATION ACCOUNT NUMBER 10434424**

This certificate is issued on: **06/11/2010**

This certificate is issued by  
the West Virginia State Tax Commissioner  
in accordance with W.Va. Code § 11-2-2.

The person or organization identified on this certificate is authorized  
to conduct business in the State of West Virginia at the location(s) above.

This certificate is not transferrable and must be displayed at the location for which issued.

This certificate shall be maintained until cessation of the business for which the certificate of registration was granted, or until it is suspended, revoked, or cancelled by the Tax Commissioner.

Change in name or change of location of the person or organization of the business and a new certificate shall be required.

**TRAVELING/STREET VENDORS:** Must carry a copy of this certificate in every vehicle operated by them.  
**CONTRACTORS, DRILLING OPERATORS, TIMBER LOGGING OPERATIONS:** Must have a copy of this certificate displayed at every job site within West Virginia.

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SCANNED  
JUN 11 10

DO NOT  
REMOVE

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# **ATTACHMENT B**

## **Process Description**

**Jay-Bee Oil & Gas, Incorporated**  
**Doc Well Pad Production Facility**  
**Attachment B**  
**Process Description**

Natural gas and Produced Fluids (condensate and water) will be received from three wells on this location at approximately 2500 psi and pass through Gas Processing Units (one per well) to avoid ice formation during subsequent pressure drops. These materials will then pass through a three-way separator where gas, condensate and water are separated. The gas will be routed to a gathering pipeline owned and operated by others.

Both the condensate and Produced Water will be accumulated in six 210 BBL tanks (three for Condensate and three for Produced Water), pending truck transportation by others. The Condensate will be transported to a regional processing facility and the Produced Water a regional disposal facility. Flash, working and breathing losses from these tanks will be routed to a Vapor Recovery Unit (VRU) with the captured vapors routed back to the raw gas discharge line.

A capture and control efficiency of 95% is being claimed for the VRU.

A Process Flow Diagram depicting these features is provided in Attachment D.

There are no gas-fired compressor engines, other than a single engine for the vapor recovery unit (VRU), or dehydration units proposed for this facility.

All natural gas fired equipment (GPUs) use natural gas produced at the site as fuel.

40 CFR 60, Subpart OOOO requires that VOC emissions from each "storage vessel affected facility" installed after April 12, 2013 (GROUP 2) must be controlled by at least 95% by April 15, 2014 when the VOC uncontrolled emissions exceed 6 tpy. As described in 40 CFR 60.5365(e), *the determination may take into account requirements under a legally and practically enforceable limit in an operating permit or other requirement established under a Federal, State, local or tribal authority*. The control systems proposed in this application will reduce VOC emissions from the tanks described above to rates well below the 6 tpy limit and operation of these controls will become part of the permit. Thus, the tanks at this facility will not be regulated under 40 CFR 60, Subpart OOOO.

## Emission Units Table

(includes all emission units and air pollution control devices  
that will be part of this permit application review, regardless of permitting status)

Emission Unit ID <sup>1</sup>	Emission Point ID <sup>2</sup>	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type <sup>3</sup> and Date of Change	Control Device <sup>4</sup>
HTR-1	1E	Gas Processing Unit	Pending Permit	1.5 MMBTU/Hr	NEW	None
HTR-2	2E	Gas Processing Unit	Pending Permit	1.5 MMBTU/Hr	NEW	None
HTR-3	3E	Gas Processing Unit	Pending Permit	1.5 MMBTU/Hr	NEW	None
T01	4E	Condensate Tank	Pending Permit	210 BBL	NEW	VRU-1
T02	4E	Condensate Tank	Pending Permit	210 BBL	NEW	VRU-1
T03	4E	Condensate Tank	Pending Permit	210 BBL	NEW	VRU-1
T04	4E	Produced Water Tank	Pending Permit	210 BBL	NEW	VRU-1
T05	4E	Produced Water Tank	Pending Permit	210 BBL	NEW	VRU-1
T06	4E	Produced Water Tank	Pending Permit	210 BBL	NEW	VRU-1
TL-1	5E	Condensate Truck Loading	Pending Permit	30,000 BBL/Yr.	NEW	None
TL-2	6E	Produced Water Loading	Pending Permit	63,600 BBL/Yr.	NEW	None
CE-1	7E	VRU Driver	Pending Permit	84 Hp	NEW	1C
TEG-1	8E	Thermoelectric Generator	Pending Permit	4.4 KW/Hr	NEW	None
---	---	Fugitive VOC Emissions -- Fittings and Connections	Pending Permit	N/A	NEW	None
---	---	Haul Roads	Pending Permit	6 Trucks per day max.	NEW	None

<sup>1</sup> For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S,... or other appropriate designation.

<sup>2</sup> For Emission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation.

<sup>3</sup> New, modification, removal

<sup>4</sup> For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

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**ATTACHMENT C**

**Description of Fugitive Emissions**

**Jay-Bee Oil & Gas, Inc.**  
**Doc Well Pad Production Facility**  
**Attachment C**  
**Fugitive Emissions Data**

**Equipment Fugitive Emissions**

As noted in the process description, Jay Bee plans to install various equipment at its Grumpy Well Pad Production Facility. This equipment will contain a variety of piping containing natural gas and separated liquids under pressure. During the normal course of operation minor leaks from valves, pressure release devices and various fittings associated with this piping may occur. The number of valves, flanges, etc. has been revised to reflect the inclusion of additional equipment that will be installed with this modification. A new potential emission rate of 0.75 tpy of VOCs and 22.4 tpy CO<sub>2e</sub> has been estimated.

Estimates of these emissions are included in the calculations (Attachment N) and summarized on the form included in this section. These calculations are based on emission factors accepted by the American Petroleum Institute and EPA.

**Pigging Emission Estimates**

There will be no pigging operations in association with this planned facility.

**Facility Blowdown Emission Estimates**

There will be one gas compressor at this facility, utilized as a Vapor Recovery Unit (VRU). This device will require blowdowns to allow for routine maintenance. The volume of natural gas released per blowdown event from this unit and associated inlet separator and piping is estimated at 64.4 cubic feet at STP (see attached calculations from vendor). There will be a maximum of 16 blow downs per year for this VRU. Thus, there is a potential for 1030 cubic feet of gas emitted from blowdowns per year.

The specific gravity of this gas at STP is 2.412 (see the Tank Breathing Vapor Report in the calculations). With the density of air at STP being 0.0806 pounds per cubic foot, the mass of gas released per year is 200 pounds (1030 cf x 0.0806 x 2.412). As the percentage of VOCs in the gas (by weight) is 99.6 percent (again see Tank Breathing Vapor report in the calculations), the VOC (non-methane/non-ethane) emissions from blowdown operations are estimated at approximately 199 lbs or 0.10 tons per year. HAPs (almost exclusively n-hexane) are estimated to be 6.76 percent of the mass of the blowdown emissions or 13.5 lb/yr (200 x 0.0676) or 0.01 tpy. As the methane concentration in this gas is less than 0.01% (by weight), methane emissions will be less than 0.02 pounds per year. Even using a GHG factor of 25, methane emissions from blowdowns in CO<sub>2e</sub> will be less than 0.01 tons CO<sub>2e</sub> (0.02 x 25[GHG factor] /2000).

**Storage Tank and Haul Road Fugitive Emissions**

Produced Fluids (water and condensate) received by this facility will be accumulated in six 400-BBL tanks (three condensate and three water) prior to off-site shipment. Emissions from these tanks were determined by using flash gas measurements from pressurized condensate produced at an area Jay-Bee well pad and working/breathing losses using AP-42 methods using condensate vapor data from this same condensate. Uncontrolled emission from these tanks were determined to be 592.6 tons per year of VOCs. These vapors are routed to the VRU a minimum efficiency of 95%. Emission calculations, including times when the VRU is not available are presented in Attachment I.

Emissions from these sources are summarized in the following fugitive emissions form and the calculations are included in the emissions summary in Attachment N.

## FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

### APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS

1.) Will there be haul road activities?

Yes       No

If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.

2.) Will there be Storage Piles?

Yes       No

If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.

3.) Will there be Liquid Loading/Unloading Operations?

Yes       No

If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.

4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation?

Yes       No

If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.

5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)?

Yes       No

If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.

6.) Will there be General Clean-up VOC Operations?

Yes       No

If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.

7.) Will there be any other activities that generate fugitive emissions?

Yes       No

If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.

If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY		All Regulated Pollutants - Chemical Name/CAS <sup>1</sup>	Maximum Potential Uncontrolled Emissions <sup>2</sup>		Maximum Potential Controlled Emissions <sup>3</sup>		Est. Method Used <sup>4</sup>
			lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads							
Unpaved Haul Roads		PM	16.53	1.33	16.53	1.33	EE
Loading/Unloading Operations		VOCs	12.42	1.86	12.42	1.86	EE
		Total HAPs	0.85	0.13	0.85	0.13	EE
Equipment Leaks		VOCs	Does Not Apply	0.75	Does Not Apply	0.75	EE
		Total HAPs	Does Not Apply	0.03	Does Not Apply	0.03	EE
Blowdowns		VOCs	N/A	0.10	N/A	0.10	EE
		Total HAPs	N/A	0.01	N/A	0.01	EE
Other:							

<sup>1</sup> List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS<sub>2</sub>, VOCs, H<sub>2</sub>S, Inorganics, Lead, Organics, O<sub>3</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, SO<sub>3</sub>, all applicable Greenhouse Gases (including CO<sub>2</sub> and methane), etc. DO NOT LIST H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, and Noble Gases.

<sup>2</sup> Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

<sup>3</sup> Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

<sup>4</sup> Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

GRSC VRCZ, 3 Stage (Notes assumed ideal gas behavior and used OD for volume calc)  
 ENTER the following values

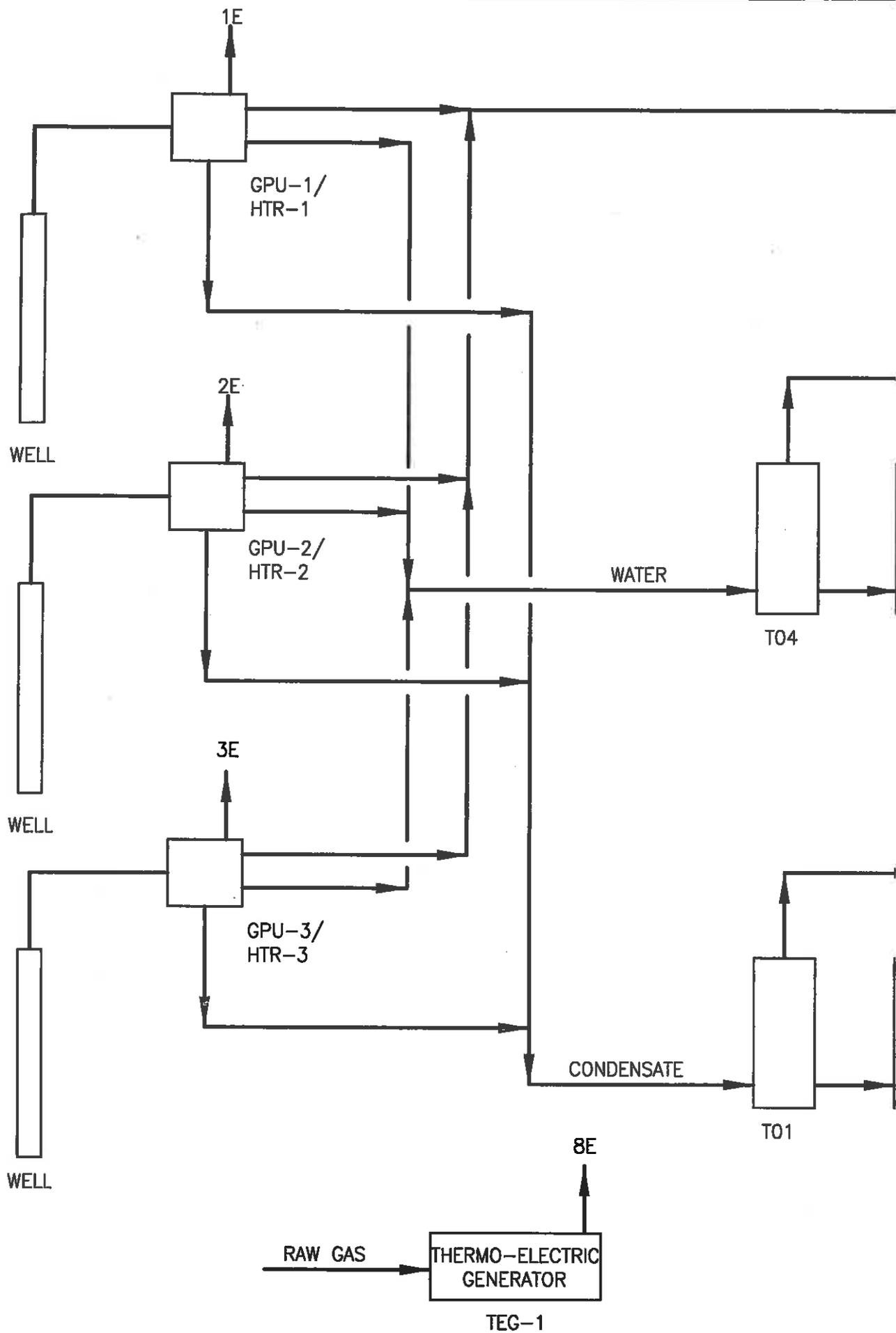
Discharge Pressure, psig 300 Suction Temperature, F 60  
 Discharge Temperature, F 130

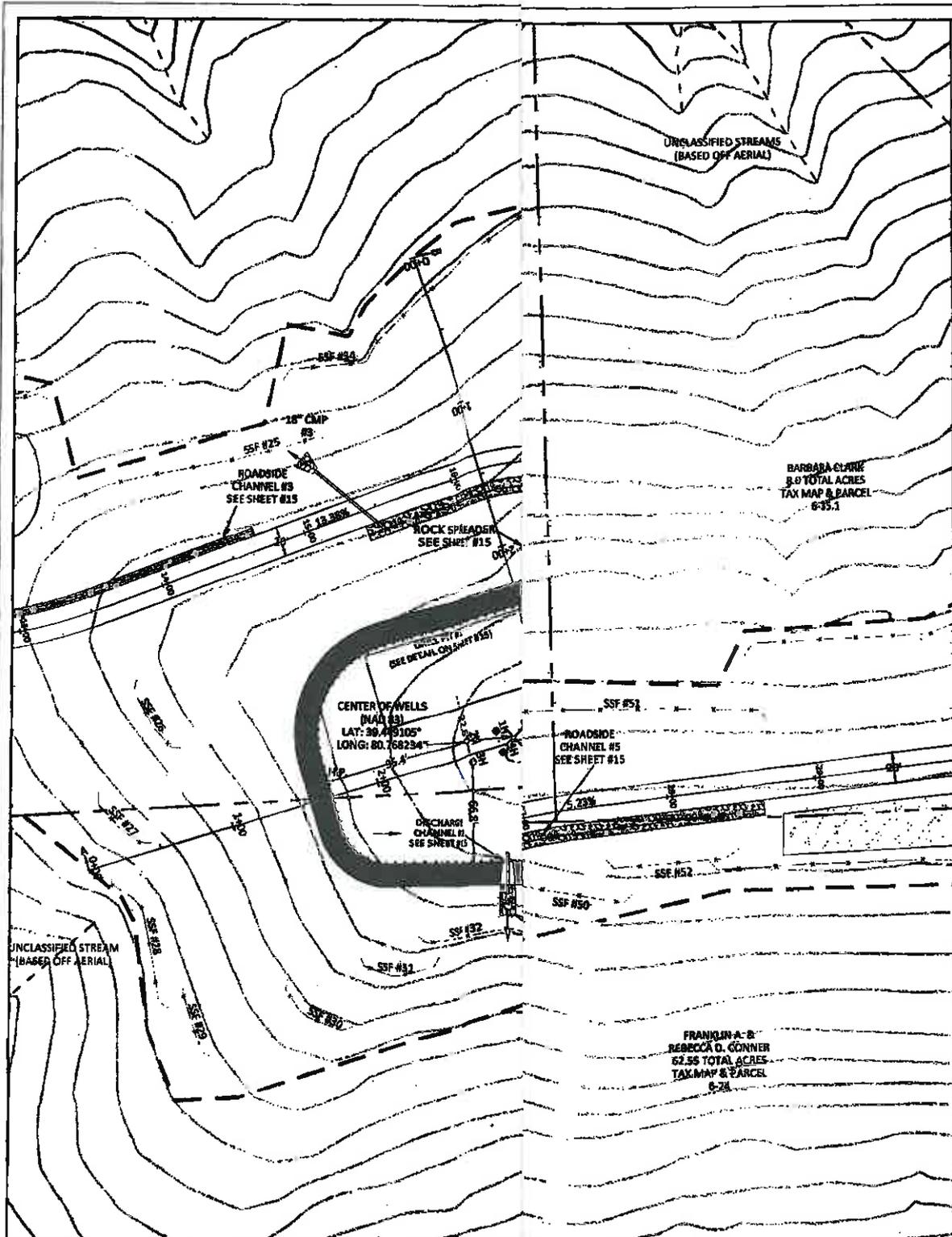
Cylinder	Stage, in	Height, in	Total Discharge Volume, ft <sup>3</sup>	Estimated Discharge Volume, ft <sup>3</sup>	Temperature, °F	Pressure, psig	Calculated Miles
1st Stage Cylinder	0.50	3.00	1.125	0.00	519	100	0.001
2nd Stage Cylinder	2.25	3.00	1.125	0.00	719	100	0.000
3rd Stage Cylinder	4.00	3.00	1.125	0.00	719	300	0.001
<b>Subtotal, K. Discharge Volume</b>							
1st Stage Scrubber	12.00	60.00	6780		519	1	0.011
2nd Stage Scrubber	8.00	48.00	2413		589	100	0.025
3rd Stage Scrubber	8.00	48.00	2413		589	199	0.047
<b>Total Scrubber Volume, ft<sup>3</sup></b>							
1st Stage Cooler Section	24	643	66	677	739	100	0.006
2nd Stage Cooler Section	24	643	66	588	739	199	0.009
3rd Stage Cooler Section	24	643	66	707	739	300	0.016
<b>Total Cooler Volume, ft<sup>3</sup></b>							
1st Stage Piping	4.00	200	2813		739	100	0.021
2nd Stage Piping	3.00	97	403		739	199	0.006
3rd Stage Piping	2.00	330	1037		739	300	0.024
Bypass	0.00	0	0		589	300	0.000
<b>Total Estimated Moles of Gas Discharged to Atmosphere per Blowdown =</b>							<b>0.17</b>
<b>Total Estimated Volume of Blowdown Gas, ft<sup>3</sup> @ STP (68F, 14.7 psia) =</b>							<b>64.4</b>

---

**ATTACHMENT D**

**Process Flow Diagram**





**BOORD, BENCHEK and ASSOC., INC.**  
 Engineering, Surveying, Construction,  
 and Mining Services  
 Southpointe, PA 15317 Phone: 724-746-1055

**E&S CONTROL LAYOUT**

THIS DOCUMENT WAS PREPARED BY:  
**BOORD, BENCHEK AND ASSOC., INC.**  
 FOR: JAY BEE OIL & GAS, L.L.C.

DATE:  
**FEBRUARY 2014**  
 DOC WELL PAD  
 McELROY DISTRICT,  
 TYLER COUNTY, WV



- LEGEND**
- - - - - SUPER SILT FENCE (SSF)
  - - - - - 18" CMP/OUTLET PROTECTION
  - - - - - EXISTING 2' CONTOURS
  - - - - - EXISTING 10' CONTOURS
  - - - - - PROPOSED 2' CONTOURS
  - - - - - PROPOSED 10' CONTOURS
  - - - - - PROJECT BOUNDARY (22.8 ACRES)
  - - - - - TREE LINE
  - - - - - PROPERTY LINE
  - - - - - EXISTING ROAD
  - - - - - WATERCOURSE
  - - - - - EXISTING ELECTRIC LINE
  - - - - - EXISTING UTILITY POLE
  - - - - - EXISTING FENCE LINE
  - - - - - ORANGE SAFETY FENCE
  - - - - - PROPOSED WELL
  - - - - - TOE BENCH
  - - - - - FLOW ARROW

- GENERAL NOTES FOR WV:**
1. CONTRACTOR TO RELOCATE OVERHEAD/UNDERGROUND UTILITY LINES, AS REQUIRED FOR CLEARANCE.
  2. SEE DETAILS ON SHEET #14 FOR TOE BONDING BENCH, DETAIL SHEET #15 FOR SSF AND PIPE CROSS.
  3. ALL DISTURBED AREAS INCLUDING TOPSOIL PILES SEED AND MULCHED.
  4. CONTRACTOR TO CHIP ALL BRUSH AND UNMARKED TIMBER AND STUMPS AND PLACE IN DESIGNATED PILES.
  5. CHIP PILES TO BE REMOVED FROM SITE BY CONTRACTOR.
  6. ALL TIMBER TO BE PLACED IN DESIGNATED PILES, TIMBER PERPENDICULAR TO SLOPES.
  7. BOUNDARIES AS SHOWN TAKEN FROM DEEDS, TA AND FIELD LOCATIONS. A FULL BOUNDARY SURVEY EXPRESSED NOR IMPLIED.
  8. FILL SHALL BE PLACED IN UNIFORM 11 INCH LIFTS COMPACTED WITH APPROPRIATE EQUIPMENT TO A PROCTOR DENSITY OF 95%.



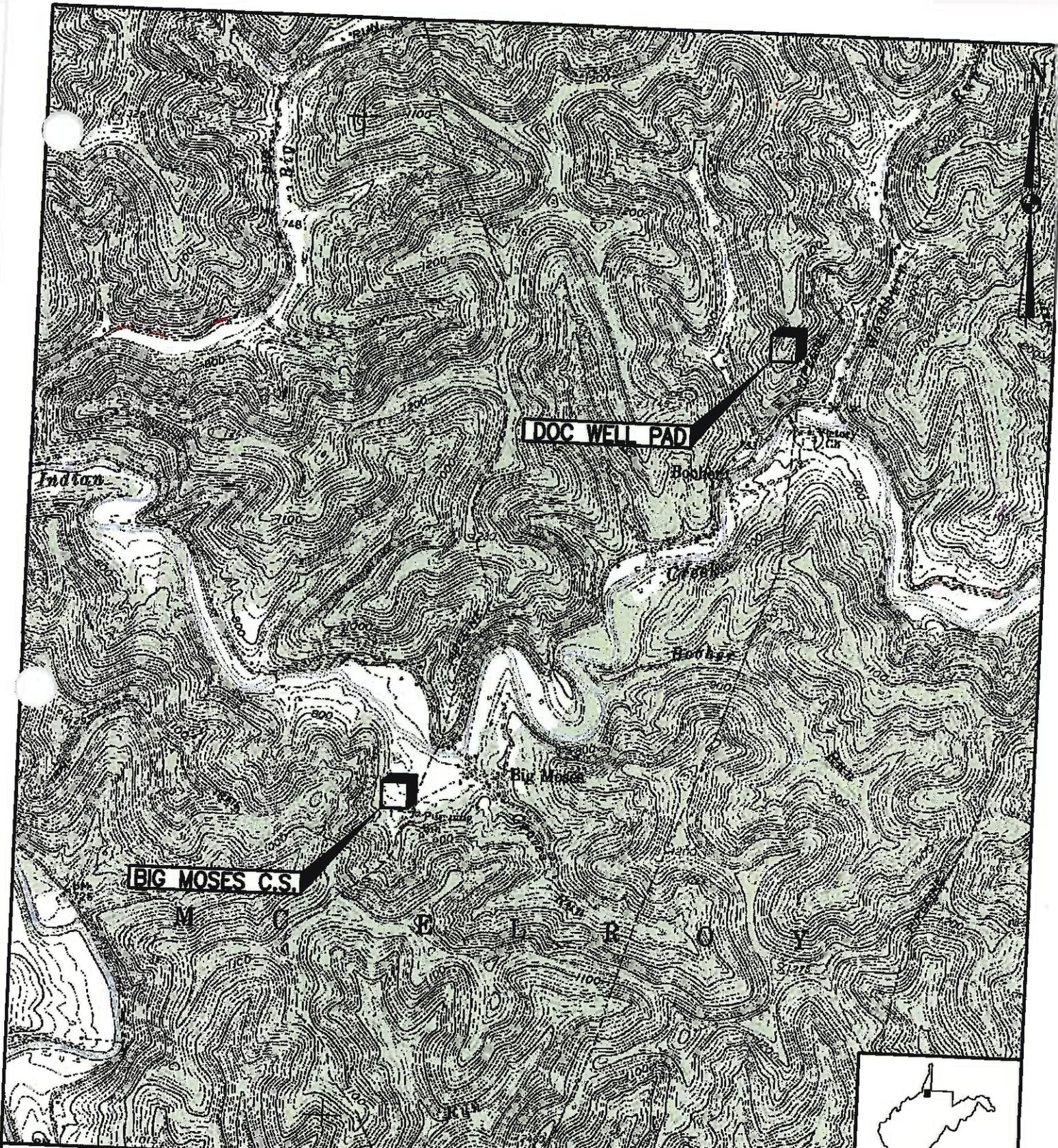
SHEET #6

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**ATTACHMENT F**

**Area Map**



REFERENCE: USGS 7.5' QUADRANGLE MAP OF: SHIRLEY, WEST VIRGINIA; DATED 1961, PHOTOREVISED 1989.

DRAWN BY DJF  
 DATE 1/21/15  
 CHECKED BY RAD  
 SET JOB NO. 214054  
 SET DWG FILE DOCm01.dwg  
 DRAWING SCALE 1"=2000'



98 Vanadium Road Bridgeville, PA 15017 (412) 221-1100

JAY-BEE OIL & GAS, INC.  
 DOC WELL PAD PRODUCTION FACILITY  
 TYLER COUNTY, WEST VIRGINIA  
 SITE LOCATION MAP

DRAWING NO. FIGURE 1  
 REV. 0

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# **ATTACHMENT G**

## **Equipment Data Sheets and Registration Section Applicability Form**

## NATURAL GAS WELL AFFECTED FACILITY DATA SHEET

*Complete this data sheet if you are the owner or operator of a gas well affected facility for which construction, modification, or reconstruction commenced after August 23, 2011. This form must be completed for natural gas well affected facilities regardless of when flowback operations occur (or have occurred).*

Please provide the API number(s) for each NG well at this facility:	
047-095-02168	
047-095-02190	
047-095-02191	

*Note: This is the same API well number(s) provided in the well completion notification and as provided to the WVDEP, Office of Oil and Gas for the well permit. The API number may be provided on the application without the state code (047).*

*Every oil and gas well permitted in West Virginia since 1929 has been issued an API (American Petroleum Institute) number. This API is used by agencies to identify and track oil and gas wells.*

*The API number has the following format: 047-001-00001*

*Where,*

*047 = State code. The state code for WV is 047.*

*001 = County Code. County codes are odd numbers, beginning with 001 (Barbour) and continuing to 109 (Wyoming).*

*00001 = Well number. Each well will have a unique well number.*

## NATURAL GAS-FIRED COMPRESSOR ENGINE (RICE) EMISSION UNIT DATA SHEET

Emission Unit (Source) ID No. <sup>1</sup>		CE-1					
Emission Point ID No. <sup>2</sup>		7E					
Engine Manufacturer and Model		Cummins G5.9					
Manufacturer's Rated bhp/rpm		84 @ 1800					
Source Status <sup>3</sup>		NS					
Date Installed/Modified/Removed <sup>4</sup>		Upon Receipt of Permit					
Engine Manufactured/Reconstruction Date <sup>5</sup>		3/19/2012					
Is this engine subject to 40CFR60, Subpart JJJJ?		Yes					
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60, Subpart JJJJ? (Yes or No) <sup>6</sup>		Yes					
Is this engine subject to 40CFR63, Subpart ZZZZ? (yes or no)		No					
Engine, Fuel and Combustion Data	Engine Type <sup>7</sup>	RB4S					
	APCD Type <sup>8</sup>	NSCR					
	Fuel Type <sup>9</sup>	RG					
	H <sub>2</sub> S (gr/100 scf)	<1					
	Operating bhp/rpm	84 @ 1800					
	BSFC (Btu/bhp-hr)	7914					
	Fuel throughput (ft <sup>3</sup> /hr)	526.4					
	Fuel throughput (MMft <sup>3</sup> /yr)	4.62					
	Operation (hrs/yr)	8760					
Reference <sup>10</sup>	Potential Emissions <sup>11</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
AP	NO <sub>x</sub>	0.19	0.81				
AP	CO	0.37	1.62				
AP	VOC	0.05	0.21				
AP	SO <sub>2</sub>	<0.001	<0.01				
AP	PM <sub>10</sub>	0.013	0.06				
AP	Formaldehyde	0.017	0.08				
AP	Total HAPs	0.024	0.11				
AP	CO <sub>2e</sub>	89	391				
MRR <sup>12</sup>	Proposed Monitoring:	Engine Hours and Fuel Consumption					
	Proposed Recordkeeping:	Engine Hours and Fuel Consumption					
	Proposed Reporting	Calculated Emissions					

**Instructions for completing the Engine Emission Unit Data Sheet:**

- 1 Enter the appropriate Emission Unit (Source) identification number for each natural gas-fueled reciprocating internal combustion compressor/generator engine located at the production pad. Multiple compressor engines should be designated CE-1<sub>S</sub>, CE-2<sub>S</sub>, etc. or other appropriate designation. Generator engines should be designated GE-1<sub>S</sub>, GE-2<sub>S</sub>, etc. or other appropriate designation. If more than three (3) engines exist, please use additional sheets.
- 2 For Emission Points, use the following numbering system: 1E, 2E, etc. or other appropriate designation.
- 3 Enter the Source Status using the following codes: NS = Construction of New Source (installation); ES = Existing Source; MS = Modification of Existing Source; and RS = Removal of Source
- 4 Enter the date (or anticipated date) of the engine's installation (construction of source), modification or removal.
- 5 Enter the date that the engine was manufactured, modified or reconstructed.
- 6 Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart JJJJ. If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance according to 40CFR§60.4243a(2)(i) through (iii), as appropriate. **Provide a manufacturer's data sheet for all engines being registered and a manufacturer's EPA certification of conformity sheet.**
- 7 Enter the Engine Type designation(s) using the following codes: LB2S = Lean Burn Two Stroke, RB4S = Rich Burn Four Stroke, and LB4S = Lean Burn Four Stroke.
- 8 Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes: NSCR = Rich Burn & Non-Selective Catalytic Reduction, PSC = Rich Burn & Prestratified Charge, SCR = Lean Burn & Selective Catalytic Reduction, or CAT = Lean Burn Catalytic Oxidation
- 9 Enter the Fuel Type using the following codes: PQ = Pipeline Quality Natural Gas, or RG = Raw Natural Gas
- 10 Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this Compressor/Generator Data Sheet(s). Codes: MD = Manufacturer's Data, AP = AP-42 Factors, GR = GRI-HAPCalc™, or OT = Other \_\_\_\_\_ (please list)
- 11 Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the Emissions Summary Sheet as Attachment O.
- 12 Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the operation of this engine operation and associated air pollution control device. Include operating ranges and maintenance procedures required by the manufacturer to maintain the warranty.

## NATURAL GAS FIRED BOILER/LINE HEATER DATA SHEET

Source ID # <sup>1</sup>	Status <sup>2</sup>	Design Heat Input (mmBtu/hr) <sup>3</sup>	Hours of Operation (hrs/yr) <sup>4</sup>	Fuel Heating Value (Btu/scf) <sup>5</sup>	
HTR-1	NEW	1.5 MMBTU/Hr	8760	1263 BTU/scf (HHV)	
HTR-2	NEW	1.5 MMBTU/Hr	8760	1263 BTU/scf (HHV)	
HTR-3	NEW	1.5 MMBTU/Hr	8760	1263 BTU/scf (HHV)	
TEG-1	NEW	0.013 MMBTU/Hr	8760	1263 BTU/scf (HHV)	

1. Enter the appropriate Source Identification Numbers (Source ID #) for each boiler or line heater located at the compressor station. Boilers should be designated BLR-1, BLR-2, BLR-3, etc. Heaters or Line Heaters should be designated HTR-1, HTR-2, HTR-3, etc. Enter glycol dehydration unit Reboiler Vent data on the *Glycol Dehydration Unit Data Sheet*.
2. Enter the Status for each boiler or line heater using the following:  
 EXIST Existing Equipment  
 REM Equipment Removed  
 NEW Installation of New Equipment
3. Enter boiler or line heater design heat input in mmBtu/hr.
4. Enter the annual hours of operation in hours/year for each boiler or line heater.
5. Enter the fuel heating value in Btu/standard cubic foot.

## STORAGE TANK DATA SHEET

Source ID # <sup>1</sup>	Status <sup>2</sup>	Content <sup>3</sup>	Volume <sup>4</sup>	Dia <sup>5</sup>	Throughput <sup>6</sup>	Orientation <sup>7</sup>	Liquid Height <sup>8</sup>
T01	NEW	Condensate	400 BBL	12.0	630,000 gallons/yr	VERT	10 feet
T02	NEW	Condensate	400 BBL	12.0	630,000 gallons/yr	VERT	10 feet
T03	NEW	Condensate	400 BBL	12.0	630,000 gallons/yr	VERT	10 feet
T04	NEW	Produced Water	400 BBL	12.0	1,335,000 gallons/yr	VERT	10 feet
T05	NEW	Produced Water	400 BBL	12.0	1,335,000 gallons/yr	VERT	10 feet
T05	NEW	Produced Water	400 BBL	12.0	1,335,000 gallons/yr	VERT	10 feet

1. Enter the appropriate Source Identification Numbers (Source ID #) for each storage tank located at the compressor station. Tanks should be designated T01, T02, T03, etc.
2. Enter storage tank Status using the following:  
 EXIST Existing Equipment  
 REM Equipment Removed  
 NEW Installation of New Equipment
3. Enter storage tank content such as condensate, pipeline liquids, glycol (DEG or TEG), lube oil, etc.
4. Enter storage tank volume in gallons.
5. Enter storage tank diameter in feet.
6. Enter storage tank throughput in gallons per year.
7. Enter storage tank orientation using the following:  
 VERT Vertical Tank  
 HORZ Horizontal Tank
8. Enter storage tank average liquid height in feet.

**Attachment G  
EMISSIONS UNIT DATA SHEET  
BULK LIQUID TRANSFER OPERATIONS**

Furnish the following information for each new or modified bulk liquid transfer area or loading rack, as shown on the *Equipment List Form* and other parts of this application. This form is to be used for bulk liquid transfer operations such as to and from drums, marine vessels, rail tank cars, and tank trucks.

Identification Number (as assigned on <i>Equipment List Form</i> ):	
1. Loading Area Name: <b>Tank Un-Loading Area</b>	
2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply): <input type="checkbox"/> Drums <input type="checkbox"/> Marine Vessels <input type="checkbox"/> Rail Tank Cars <input checked="" type="checkbox"/> Tank Trucks	
3. Loading Rack or Transfer Point Data:	
Number of pumps	1 (on truck)
Number of liquids loaded	2
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	1
4. Does ballasting of marine vessels occur at this loading area? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Does not apply	
5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point: <b>None</b>	
6. Are cargo vessels pressure tested for leaks at this or any other location? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If YES, describe:	

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):				
Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	1	1	1	1
days/month	30	30	30	30
days/year	340	340	340	340

8. Bulk Liquid Data (add pages as necessary):				
Pump ID No.	N/A	N/A		
Liquid Name	Condensate	Produced Water		
Max. daily throughput (1000 gal/day)	1.05	2.10		
Max. annual throughput (1000 gal/yr)	1,260	2,670		
Loading Method <sup>1</sup>	SUB	SUB		
Max. Fill Rate (gal/min)	30	30		
Average Fill Time (min/loading)	40	40		
Max. Bulk Liquid Temperature (°F)	70	70		
True Vapor Pressure <sup>2</sup>	7.45 psia			
Cargo Vessel Condition <sup>3</sup>	U	U		
Control Equipment or Method <sup>4</sup>	None	None		
Minimum control efficiency (%)	N/A			
Maximum Emission Rate	Loading (lb/hr)	12.42	N/A	
	Annual (lb/yr)	3727	N/A	
Estimation Method <sup>5</sup>	AP-42	N/A		
<sup>1</sup> BF = Bottom Fill    SP = Splash Fill    SUB = Submerged Fill				
<sup>2</sup> At maximum bulk liquid temperature				
<sup>3</sup> B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)				

<sup>4</sup> List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*): CA = Carbon Adsorption  
 Condensation  
 Refrigeration-Absorption  
 CRC = Compression-Refrigeration-Condensation  
 O = other (describe)

LOA = Lean Oil Adsorption  
 CO =  
 SC = Scrubber (Absorption)  
 TO = Thermal Oxidation or Incineration  
 VB = Dedicated Vapor Balance (closed system)

CRA = Compressor-

<sup>5</sup> EPA = EPA Emission Factor as stated in AP-42  
 MB = Material Balance  
 TM = Test Measurement based upon test data submittal  
 O = other (describe)

**9. Proposed Monitoring, Recordkeeping, Reporting, and Testing**

Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

<p><b>MONITORING</b>          Truck load-outs per month and volume of liquid removed each load-out</p>	<p><b>RECORDKEEPING</b>          Truck load-outs per month and volume of liquid removed each load-out</p>
<p><b>REPORTING</b>          Truck load-outs per month and volume of liquid removed each load-out</p>	<p><b>TESTING</b>          None</p>

**MONITORING.** PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS

**RECORDKEEPING.** PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY

THE MONITORING.

**REPORTING.** PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

**TESTING.** PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty N/A

---

**ATTACHMENT H**

**Air Pollution Control Device Sheets**



USA Compression Partners, LLC

# Unit Information Sheet

Date: May 27, 2014  
Unit #: 6041  
Customer: To Be Determined

To:

Lease Location: To Be Determined

Please find the below information for the USA Compression unit number listed above:

Package Information	
Compressor Manufacturer:	Arrow
Compressor Model:	VRC2
Compressor Serial Number:	12095
Compressor Cylinders:	6.5" x 4.0" x 2.25"
Driver Manufacturer:	Cummins
Driver Model:	G5.9
Rated HP & Speed	84 HP @ 1800 RPM
Driver Type:	4-stroke Rich Burn
Engine Serial Number:	73364060
Engine Manufacturing Date:	3/19/2012
Engine Catalyst Model:	VXC-1408-04-HSG
Engine Catalyst Element:	VX-RE-08XC
Engine AFR Model:	AFR-1RD-10-TK2
Engine Stack Height:	9' 5"
Engine Stack Diameter:	4"
Operating Information	
Suction Pressure:	N/A psig
Discharge Pressure:	N/A psig
Design Capacity:	N/A MSCFD
Gas Specific Gravity:	N/A

Emission Output information included in the attached catalyst specification sheet.

**MIRATECH Emissions Control Equipment Specification Summary**
**Engine Data**

Proposal Number: TJ-14-0081 Rev(1)

Number of Engines: 1  
 Application: Gas Compression  
 Engine Manufacturer: Cummins  
 Model Number: G 5.9  
 Power Output: 84 bhp  
 Lubrication Oil: 0.6 wt% sulfated ash or less  
 Type of Fuel: Natural Gas  
 Exhaust Flow Rate: 430 acfm (cfm)  
 Exhaust Temperature: 1,078°F

**System Details**

Housing Model Number: VXC-1408-04-HSG  
 Element Model Number: VX-RE-08XC  
 Number of Catalyst Layers: 1  
 Number of Spare Catalyst Layers: 1  
 System Pressure Loss: 3.0 inches of WC (Fresh)  
 Sound Attenuation: 28-32 dBA insertion loss  
 Exhaust Temperature Limits: 750 – 1250°F (catalyst inlet); 1350°F (catalyst outlet)

**NSCR Housing & Catalyst Details**

Model Number: VXC-1408-04-XC1  
 Material: Carbon Steel  
 Approximate Diameter: 14 inches  
 Inlet Pipe Size & Connection: 4 inch FF Flange, 150# ANSI standard bolt pattern  
 Outlet Pipe Size & Connection: 4 inch FF Flange, 150# ANSI standard bolt pattern  
 Overall Length: 53 inches  
 Weight Without Catalyst: 152 lbs  
 Weight Including Catalyst: 162 lbs  
 Instrumentation Ports: 1 inlet/1 outlet (1/2" NPT)

**Emission Requirements**

Exhaust Gases	Engine Outputs (g/ bhp-hr)	Reduction (%)	Warranted Converter Outputs (g/ bhp-hr)	Requested Emissions Targets
NOx	11.41	91%	1.00	1.00 g/bhp-hr
CO	14.64	86%	2.00	2.00 g/bhp-hr
NMNEHC	0.22	0%	0.70	0.70 g/bhp-hr
CH <sub>2</sub> O	0.08	0%	1.00	1.00 g/bhp-hr
Oxygen	0.5%			

MIRATECH warrants the performance of the converter, as stated above, per the MIRATECH General Terms and Conditions of Sale.



# Engine Performance Data

**Cummins Inc**

Columbus, Indiana 47202-3005  
<http://www.cummins.com>

Industrial

**G5.9**

FR 9961

**84 BHP (63 kW) @ 1800 RPM**  
**245 lb-ft (332 N-m) @ 1800 RPM**

Configuration  
**D491010CX02**

CPL Code  
**8655**

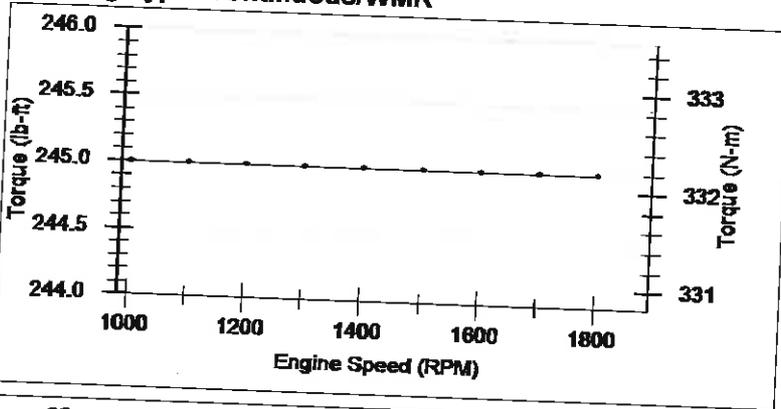
Revision  
**12-May-2011**

Compression Ratio: **10.5:1**  
 Fuel System: **Field Gas, Dry Processed Nat Gas**  
 Emission Certification: **Non-certified**

Displacement: **359 in3 (5.9 L)**  
 Aspiration: **Naturally Aspirated**

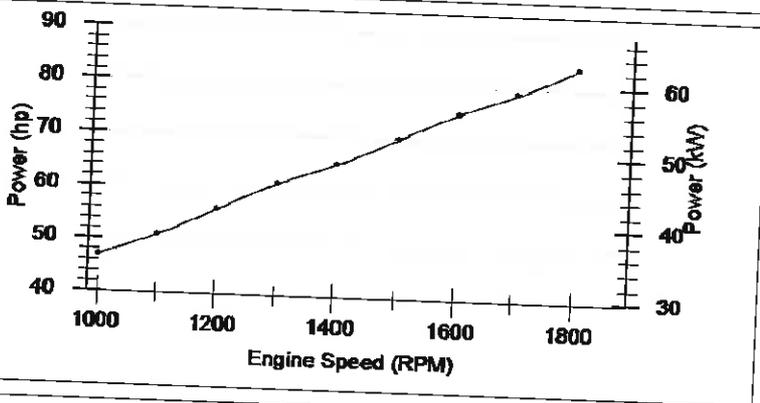
All data is based on the engine operating with fuel system, water pump, and 7 in H<sub>2</sub>O (1.74 kPa) inlet air restriction with 3.5 in (89 mm) inner diameter, and with 1 in Hg (3 kPa) exhaust restriction with 3 in (76 mm) inner diameter; not included are alternator, fan, optional equipment and driven components. Coolant flows and heat rejection data based on coolants as 50% ethylene glycol/50% water. All data is subject to change without notice.

## Rating Type: Continuous/WMR



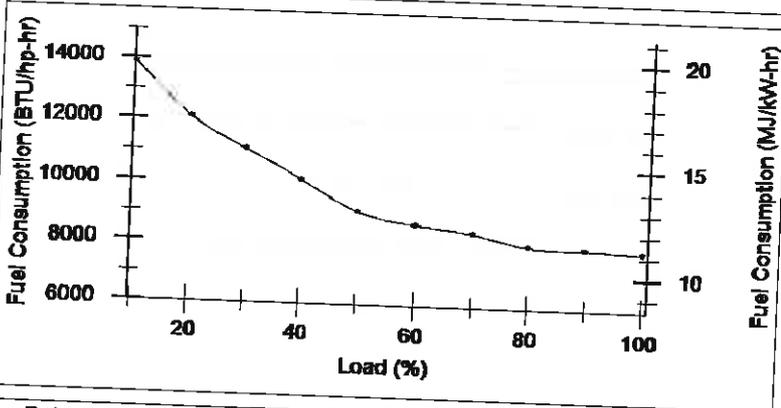
## Torque Output

RPM	lb-ft	N-m
1,000	245	332
1,100	245	332
1,200	245	332
1,300	245	332
1,400	245	332
1,500	245	332
1,600	245	332
1,700	245	332
1,800	245	332



## Power Output

RPM	hp	kW
1,000	47	35
1,100	51	38
1,200	56	42
1,300	61	45
1,400	65	48
1,500	70	52
1,600	75	56
1,700	79	59
1,800	84	63



## Fuel Consumption @ 1,800 RPM

hp	kW	% Load	BTU/hp-hr	MJ/kW-hr
84	63	100	7,914	11.2
76	57	90	7,987	11.3
67	50	80	8,056	11.4
59	44	70	8,452	11.96
50	37	60	8,689	12.29
42	31	50	9,094	12.87
34	25	40	10,083	14.27
25	19	30	11,069	15.66
17	13	20	12,116	17.14
8	6	10	13,889	19.65

Data represents gross engine capabilities obtained and corrected in accordance with SAE J1995 using dry processed natural gas fuel with 905 BTU per standard cubic foot lower heating value. Deration may be required due to altitude, temperature and type of fuel. Consult Cummins Customer Engineering for operation above this altitude.

**STATUS FOR CURVES AND DATA: Limited-(measured data)**  
 TOLERANCE: Within +/- 5 %

**CHIEF ENGINEER:**  
 Alfred S Weber

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**Intake Air System**

Maximum allowable air temperature rise over ambient at Intake Manifold (Naturally Aspirated Engines) or Turbo Compressor inlet (Turbo-charged Engines): (This parameter impacts emissions, LAT and/or altitude capability)

15 delta deg F                      8.3 delta deg C

**Cooling System**

Maximum coolant temperature for engine protection controls

215 deg F                      102 deg C

Maximum coolant operating temperature at engine outlet (max. top tank temp):

212 deg F                      100 deg C

**Exhaust System**

Maximum exhaust back pressure:

2 in-Hg                      7 kPa

Recommended exhaust piping size (inner diameter):

3 in                      76 mm

**Lubrication System**

Nominal operating oil pressure

@ minimum low idle

10 psi                      69 kPa

@ maximum rated speed

50 psi                      345 kPa

Minimum engine oil pressure for engine protection devices

@ minimum low idle

10 psi                      69 kPa

**Fuel System**

Maximum fuel inlet pressure:

1 psi                      5 kPa

**Performance Data**

Engine low idle speed:

900 RPM

Maximum low idle speed:

1,800 RPM

Minimum low idle speed:

800 RPM

Engine high idle speed

1,800 RPM

Governor break speed:

Maximum torque available at closed throttle low idle speed:

50 lb-ft                      68 N-m

	100% Load		75% Load		50% Load	
	1,800 RPM		1,800 RPM		1,800 RPM	
Engine Speed	1,800 RPM		1,800 RPM		1,800 RPM	
Output Power	84 hp	63 kW	63 hp	47 kW	42 hp	31 kW
Torque	245 lb-ft	332 N-m	184 lb-ft	249 N-m	123 lb-ft	167 N-m
Intake Manifold Pressure	-1 in-Hg	-3 kPa	-5 in-Hg	-17 kPa	-9 in-Hg	-30 kPa
Inlet Air Flow	121 ft <sup>3</sup> /min	57 L/s	101 ft <sup>3</sup> /min	48 L/s	82 ft <sup>3</sup> /min	39 L/s
Exhaust Gas Flow	430 ft <sup>3</sup> /min	203 L/s	360 ft <sup>3</sup> /min	170 L/s	292 ft <sup>3</sup> /min	138 L/s
Exhaust Gas Temperature	1,078 deg F	581 deg C	999 deg F	537 deg C	902 deg F	483 deg C
Heat Rejection to Coolant	3,824 BTU/min	67 kW	3,244 BTU/min	57 kW	2,596 BTU/min	46 kW
Heat Rejection to Ambient	1,194 BTU/min	21 kW	784 BTU/min	14 kW	613 BTU/min	11 kW
Heat Rejection to Exhaust	2,523 BTU/min	44 kW	1,916 BTU/min	34 kW	1,371 BTU/min	24 kW
Fuel Consumption	7,914 BTU/hp-hr	11 MJ/kW-hr	8,214 BTU/hp-hr	12 MJ/kW-hr	9,094 BTU/hp-hr	13 MJ/kW-hr
Air Fuel Ratio (dry)	16.52 vol/vol		16.51 vol/vol		16.52 vol/vol	
Ignition timing (BTDC)	26 deg	26 deg	26 deg	26 deg	26 deg	26 deg
Total Hydrocarbons	1.48 g/hp-hr		1.3 g/hp-hr		1.62 g/hp-hr	
VOC ppm w/o Catalyst						
VOC ppm with Catalyst						
NOx	11.41 g/hp-hr	15.3 g/kW-hr	13.7 g/hp-hr	18.37 g/kW-hr	12.85 g/hp-hr	17.23 g/kW-hr
NOx ppm w/o Catalyst						
NOx ppm with Catalyst						
CO	14.64 g/hp-hr	19.63 g/kW-hr	0.82 g/hp-hr	1.1 g/kW-hr	1.38 g/hp-hr	1.85 g/kW-hr
CO ppm w/o Catalyst						
CO ppm with Catalyst						
CO <sub>2</sub>	449 g/hp-hr	602 g/kW-hr	489 g/hp-hr	656 g/kW-hr	540 g/hp-hr	724 g/kW-hr
O <sub>2</sub>	0.45 %		1.66 %		3.67 %	

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**Cranking System (Cold Starting Capability)**

Unaided Cold Start:

Minimum cranking speed

250 RPM

Cold starting aids available

Block Heater, Oil Pan Heater

Maximum parasitic load at 10 deg F @

**Noise Emissions**

Top

89.9 dBa

Right Side

90.1 dBa

Left Side

89.8 dBa

Front

90.5 dBa

Exhaust noise emissions

103.1 dBa

Estimated Free Field Sound Pressure Level at 3.28ft (1m) and Full-Load Governed Speed  
(Excludes Noise from Intake, Exhaust, Cooling System and Driven Components)

**Aftercooler Heat Rejection - Heat Load on Aftercooler**  
BTU/min (kW)

		Ambient Temp deg F (deg C)					
		120 (49)	110 (43)	100 (38)	90 (32)	80 (27)	70 (21)
Altitude ft (m)	0 (0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
	1000 (305)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
	2000 (610)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
	3000 (914)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
	4000 (1219)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
	5000 (1524)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
	6000 (1829)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
	7000 (2134)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
	8000 (2438)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
	9000 (2743)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
	10000 (3048)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)

End of Report

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# Gas/Site Analysis & Engine Selection/Derate

Cummins Stationary Natural Gas Engines

Date: 4/10/2014

Industrial

G5.9

Available FR Number(s)  
From Selection:  
FR9936, FR9961

NG  
84 HP (63 kW) @1800 RPM &  
10.5:1 Compression Ratio

Catalyst Fuel Rating  
Industrial Continuous

### Engine (as entered by user)

Application:  
Fuel Type:  
Engine:  
Fuel Rating:  
Compression Ratio:  
RPM:  
HP (Natural Gas):  
HP (Propane):

Industrial  
NG  
G5.9  
Catalyst  
10.5:1  
1800  
84 HP (63 kW)  
NA HP (NA kW)

### Site (as entered by user)

Ambient Air Temperature:  
Relative Humidity:  
Altitude:  
Cooling Fan Load:  
Generator Efficiency:  
Vapor Pressure (Calculated from Site Conditions Entered):  
Dew Point (Calculated from Site Conditions Entered):  
Dry Barometer (Calculated from Site Conditions Entered):

90° F  
30%  
1200 ft  
8 HP  
93%  
0.427 inHg  
54.4° F  
28.22 inHg

### Derate (Natural Gas)

Advertised NG Rating:  
Engine Derate Due to Site Altitude and Temperature:  
Engine Derate Due to Gas Composition:  
Derate Due to Low BTU Fuel:  
Derate Due to Methane Number:  
Total Power Available (%) After All Applicable Derates:  
Total Site Derate due to Altitude, Temperature, and Gas Composition:  
Total Available Horsepower from Selected Engine Running on Specified Fuel Composition at Specified Site (includes 8 HP reduction for cooling fan load):

84 HP (63 kW)  
2%  
  
0%  
0%  
98% of rated  
2 HP (1 kW)  
  
74 HP (55 kW)



The sample percentage for "Name Sample" is 99.991%. Results are based on the input sample normalized to 100%.

### Derate (Propane)

Advertised Propane Rating:  
Engine Derate Due to Site Altitude and Temperature:  
Total Power Available (%) After All Applicable Derates:  
Total Site Derate due to Altitude and Temperature:  
Total Available Horsepower from Selected Engine Running on Propane at Specified Site (includes 8 HP reduction for cooling fan load):

NA HP (NA kW)  
NA%  
NA% of rated  
NA HP (NA kW)  
  
NA HP (NA kW)

### Intake Manifold Requirements for Turbocharged Engines

Maximum Allowed Intake Manifold Temperature for Selected Engine is na °F with a Maximum Aftercooler Water Inlet (CAC air inlet) of na °F based on FR9936

### Factory Set Points

Engine Speed Target:  
Spark Plug Gap:  
Excess Oxygen Target-PV:  
Propane Engine Timing Target:  
Propane Gas over air Press at Carb Low:  
Propane Gas Press at Sec Reg Target:  
Excess Oxygen Target-NG:  
  
Natural Gas Engine Timing Target:  
Natural Gas over air Press at Carb Target:  
Natural Gas Press at Sec Reg Target:

#### Factory Supplied

1800 rpm  
0.020 in  
na %O2  
na °BTDC  
na inH2O  
na inH2O  
0.45% O<sub>2</sub>

#### Recommended



NOTICE: A Change to Ignition Timing is Recommended Due to Methane Number of Fuel

#### Factory: 26 °BTDC

5 inH2O  
15 inH2O

Recommended Timing: 25 ° BTDC

FR9936 Created/Revised On: 4/30/2013. Data Files Updated On: 12/12/2013

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**Gas Sample Analysis**



The sample percentage for "Name Sample" is 99.991%. Results are based on the input sample normalized to 100%.

Sample Name: Name Sample

Gas Compound:

Volume Fraction % (User Input)

Mass Fraction % (Calculated)

Methane:		
Ethane:	77.09	59.36
Propane:	14.83	21.41
i-Butane:	4.97	10.51
n-Butane:	0.82	1.72
i-Pentane:	1.21	3.98
n-Pentane:	0.27	0.92
n-Hexane:	0.26	0.91
n-Heptane:	0.15	0.62
n-Octane:	0.04	0.2
n-Nonane:	0.02	0.09
n-Decane:	0	0
Hydrogen:	0	0.02
Hydrogen Sulfide (H <sub>2</sub> S):	0	0
Carbon Dioxide:	0 ppm	0 ppm
Carbon Monoxide:	0.15	0.32
Nitrogen:	0	0
Oxygen:	0.39	0.53
	0	0

Total Percent: (Sample Input Percentage: 99.991%)

Normalized Percentage: 100%

Performance Parameters:

Standard Units

Metric Units

Lower Heating Value (LHV): Standard Conditions (60F/14.696psia)	by volume	1140.6 Btu/scf	42.5 MJ/scm
	by mass	20776 Btu/lbm	48.326 MJ/kg
Higher Heating Value (HHV): Standard Conditions (60F/14.696psia)	by volume	1257.5 Btu/scf	46.85 MJ/scm
	by mass	22906 Btu/lbm	53.280 MJ/kg
Methane Number:		56.1	56.1
Specific Gravity (SG):		0.7193	0.7193
Wobbe Index :	LHV/N SG	1345 Btu/scf	50.11 MJ/scm
	HV/N SG	1483 Btu/scf	55.24 MJ/scm
Molecular Weight:		20.83 g/mol	20.83 g/mol
Specific Heat (Cp):		0.473 BTU/lbm-R	1.979 kJ/kg-K
Specific Heat Ratio (Cp/Cv):		1.253	1.253
Ideal Gas Density:		0.0549 lbm/ft3	0.8788 kg/m3 std
H/C Ratio:		3.492	3.492
Gas Constant (R <sub>GAS</sub> ):		95.3 BTU/lbm-°R	399.1 kJ/kg-°K
Stoich Air Fuel Ratio (Dry):		16.54	16.54

Fuel Flow Data

BTU/HP-HR:	
Maximum Fuel Flow (SCFH):	7914 583

Maximum Fuel Flow Calculation is Based on 100% Continuous Rating of 84 HP at 1800 RPM and 10.5:1 Compression Ratio from FR9936

Gas Regulator Details

The Industrial G5.9 uses a Maxitrol Regulator

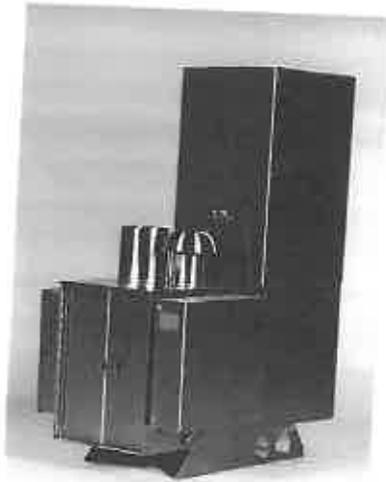
Notes:

FR Differences for Selected Engine		
Description of FR Differences for Selected Engine		
	FR9936	FR9961
Exhaust Manifold	Dry	Wet
Exhaust Stack Temp High	1300	1220

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# Model 5120 Thermoelectric Generators



Global Thermoelectric's Model 5120 Thermoelectric Generator contains no moving parts. It is a reliable, low maintenance source of DC electrical power for any application where regular utilities are unavailable or unreliable.

## Power Specifications

Power Rating at 20°C  
120 Watts at 6.7 Volts  
108 Watts at 12 Volts  
108 Watts at 24 Volts  
108 Watts at 48 Volts

## Electrical

Adjustment:	6.7V	up to 11 Volts
	12V	12 - 18 Volts
	24V	24 - 30 Volts
	48V	48 - 60 Volts

Reverse current protection included.

Output: Terminal block which accepts up to 8 AWG wire. Opening for 3/4" conduit in the base of the cabinet.

## Fuel

Natural Gas:	8.8 m <sup>3</sup> /day (311 Sft <sup>3</sup> /day) of Std. 1000 BTU/Sft <sup>3</sup> (37.7 MJ/SM <sup>3</sup> ) gas max 115 mg/Sm <sup>3</sup> (~170 ppm) H <sub>2</sub> S max 120 mg/Sm <sup>3</sup> H <sub>2</sub> O max 1% free O <sub>2</sub>
Propane:	11.4 l/day (3.0 US gal/day)
Max. Supply Pressure:	172 kPa (25 psi)
Min. Supply Pressure:	69 kPa (10 psi)
Fuel Connection:	1/4" MNPT

## Environmental

Ambient Operation Temperature: Max. 45°C (115°F) Min. -40°C (-40°F).

Operating Conditions: Unsheltered operation

Please contact Global for operating conditions below -40°C or above +45°C.

## Materials of Construction

Cabinet:	304 SS
Cooling Type:	Natural Convection
Fuel System:	Brass, Aluminum & SS

## Standard Features

- Automatic Spark Ignition (SI)
- Automatic Fuel Shut-off (SO)
- Fuel Filter
- Low Voltage Alarm Contacts (VSR)
- Volt & Amp Meter

## Optional Features

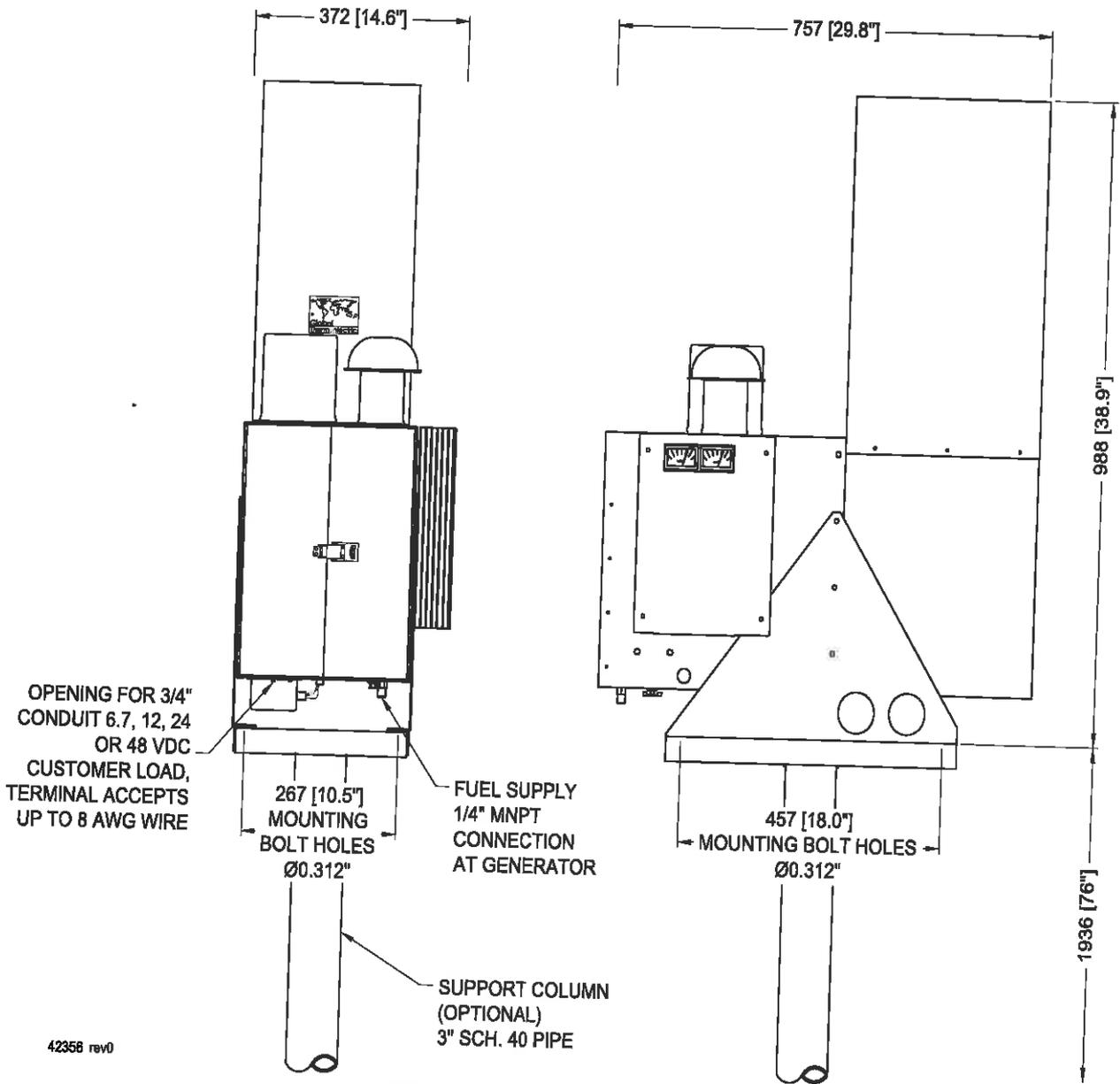
- Cathodic Protection Interface
- Pole Mount or bench stand
- Corrosive Environmental Fuel System
- Flame Arrestor
- Marine Service

Note: Specifications shown are for standard configurations. Global Thermoelectric's Integrated Systems Engineering Department is available to design custom voltages, fuel supply systems and non-standard operating temperatures.



# Typical Installation

Rev 01-12



42358 rev0

**NOTES:**

1. GENERATOR WEIGHT: 60 kg [132 lb]
2. DIMENSIONS IN mm [INCHES].



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Model 5120 Thermoelectric Generator

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**ATTACHMENT I**

**Emissions Calculations**

Jay-Bee Oil & Gas, Inc.

Doc Well Pad Production Facility  
Tyler County, WV

Source	Description	NOx lb/hr	CO lb/hr	CO2e lb/hr	VOC lb/hr	SO2 lb/hr	PM lb/hr	n-Hexane lb/hr	benzene lb/hr	formaldehyde lb/hr	Total HAPs lb/hr
CE-1	VRU Compressor <sup>4</sup>	0.19	0.37	89.4	0.05	0.000	0.013		0.001	0.017	0.024
HTR-1	GPU #1	0.15	0.13	181.2	0.01	0.001	0.011	0.003	0.002	0.000	0.003
HTR-2	GPU #2	0.15	0.13	181.2	0.01	0.001	0.011	0.003	0.000	0.000	0.012
HTR-3	GPU #3	0.15	0.13	181.2	0.01	0.001	0.011	0.003	0.000	0.000	0.003
TEG-1	Thermoelectric Generator	0.00	0.00	1.6	0.00	0.000	0.000	0.000	0.000	0.000	0.003
---	Blowdowns <sup>1</sup>										
T01-T04	Condensate Tanks + Water Tanks <sup>2</sup>			N/A	N/A					0.000	0.000
TL-1 + TL-2	Truck Loading <sup>3</sup>			23.9	6.76			0.210			
---	Truck Traffic Fugitive Dust				12.42						0.22
---	Fittings Fugitive Emissions						16.53				0.850
<b>Total</b>		<b>0.64</b>	<b>0.75</b>	<b>663</b>	<b>19.42</b>	<b>0.00</b>	<b>16.58</b>	<b>0.22</b>	<b>0.00</b>	<b>0.02</b>	<b>1.11</b>

Source	Description	NOx tpy	CO tpy	CO2e tpy	VOC tpy	SO2 tpy	PM tpy	n-Hexane TPY	benzene tpy	formaldehyde tpy	Total HAPs tpy
CE-1	VRU Compressor <sup>4</sup>	0.81	1.62	391	0.21	0.002	0.06		0.00	0.07	0.11
HTR-1	GPU #1	0.66	0.55	794	0.04	0.004	0.05	0.01	0.00	0.00	0.01
HTR-2	GPU #2	0.66	0.55	794	0.04	0.004	0.05	0.01	0.00	0.00	0.01
HTR-3	GPU #3	0.66	0.55	794	0.04	0.004	0.05	0.01	0.00	0.00	0.01
TEG-1	Thermoelectric Generator	0.01	0.00	7	0.00	0.000	0.00	0.00	0.00	0.00	0.01
---	Blowdowns <sup>1</sup>			0	0.10					0.00	0.00
T01-T04	Condensate Tanks + Water Tanks <sup>2</sup>										
TL-1 + TL-2	Truck Loading <sup>3</sup>			150	42.50			1.31			1.38
---	Truck Traffic Fugitive Dust				1.86						0.13
---	Fittings Fugitive Emissions						1.33				
<b>Total</b>		<b>2.79</b>	<b>3.28</b>	<b>2,952</b>	<b>45.53</b>	<b>0.01</b>	<b>1.54</b>	<b>1.35</b>	<b>0.00</b>	<b>0.08</b>	<b>1.65</b>

<sup>1</sup> See Attachment C for Blowdown Calculations

<sup>2</sup> Condensate and water tank emissions will be controlled by a VRU at 95%. This entry represents the un-controlled 5% Emissions

<sup>3</sup> This represents un-captured truck loading emissions.

<sup>4</sup> Emission presented herein for VOCs and Formaldehyde represent un-controlled Mfg. specs. + 15%. The Catalyst Warranty

**Jay-Bee Oil & Gas, LLC**  
ENGINE EMISSIONS

**Doc Well Pad Production Facility**  
**Tyler County, WV**

Controlled Emission Rates

**Source CE-1**  
**Flash Gas Compressor**

**Engine Data:**

Engine Manufacturer	Cummins		
Engine Model	G5.9		
Type (Rich-burn or Low Emission)	Rich Burn		
Aspiration (Natural or Turbocharged)	Natural		
Manufacturer Rating	84	hp	
Speed at Above Rating	1,800	rpm	
Configuration (In-line or Vee)	In-line		
Number of Cylinders	6		
Engine Bore	4.020	inches	
Engine Stroke	4.720	inches	
Engine Displacement	359	cu. in.	
Engine BMEP	103	psi	
Fuel Consumption (HHV)	7,914	Btu/bhp-hr	

**Emission Rates:**

	g/bhp-hr	lb/hr	tons/year	g/hr	lb/day	AP-42 4stroke rich lb/mmbtu	
Oxides of Nitrogen, NOx	1.000	0.19	0.81	84	4.44		
Carbon Monoxide CO	2.000	0.37	1.62	168	8.89		
VOC (NMNEHC)	0.253	0.05	0.21	21	1.12		
CO2	449	83	364	37,716	1,996		
CO2e		89	391				
<b>Total Annual Hours of Operation</b>	<b>8,760</b>						
SO2						0.0006	
PM2.5		0.0004	0.0017			0.0095	
PM (Condensable)		0.0063	0.0277			0.00991	
CH4		0.0066	0.0289			0.0022	Factor From 40 CFR 98, Table C-2
N2O		0.1262	0.5529			0.0002	Factor From 40 CFR 98, Table C-2
acrolein		0.0115	0.0503			0.00263	
acetaldehyde		0.0017	0.0077			0.00279	
formaldehyde		0.0019	0.0081				
benzene	0.092	0.0170	0.0746				
toluene		0.0011	0.0046				
ethylbenzene		0.0004	0.0016			0.00158	
xylene s		2E-05	0.0001			0.000558	
methanol		0.0001	0.0006			2.48E-05	
total HAPs		0.002	0.0089			0.000195	
		0.0242	0.1062			0.00306	

Comment  
453.59 grams = 1 pound  
2,000 pounds = 1 ton

Per Mfg.

**Exhaust Parameters:**

Exhaust Gas Temperature	1,078	deg. F
Exhaust Gas Mass Flow Rate		lb/hr
Exhaust Gas Mass Flow Rate	430	acfm
Exhaust Stack Height	96	inches
	8.00	feet
Exhaust Stack Inside Diameter	4	inches
	0.333	feet
Exhaust Stack Velocity	82.1	ft/sec
	4,927.4	ft/min

## Jay-Bee Oil & Gas, LLC

**Doc Well Pad Production Facility  
Tyler County, WV**

### Potential Emission Rates

#### Source HTR-1

Burner Duty Rating	1500.0 Mbtu/hr
Burner Efficiency	98.0 %
Gas Heat Content (HHV)	1263.0 Btu/scf
Total Gas Consumption	29086.0 scfd
H2S Concentration	0.000 Mole %
Hours of Operation	8760

NOx	0.1501	lbs/hr	0.657	TPY
CO	0.1261	lbs/hr	0.552	TPY
CO2	180.1	lbs/hr	788.7	TPY
CO2e	181	lbs/hr	794	tpy
VOC	0.0083	lbs/hr	0.036	TPY
SO2	0.0009	lbs/hr	0.004	TPY
H2S	0.0000	lbs/hr	0.000	TPY
PM10	0.0114	lbs/hr	0.050	TPY
CHOH	0.0001	lbs/hr	0.000	TPY
Benzene	0.0000	lbs/hr	0.000	TPY
N-Hexane	0.0027	lbs/hr	0.012	TPY
Toluene	0.0000	lbs/hr	0.000	TPY
Total HAPs	0.0028	lbs/hr	0.012	TPY

#### AP-42 Factors Used

NOx	100 Lbs/MMCF
CO	84 Lbs/MMCF
CO <sub>2</sub>	120,000 Lbs/MMCF
VOC	5.5 Lbs/MMCF
PM	7.6 Lbs/MMCF
SO <sub>2</sub>	0.6 Lbs/MMCF
CH <sub>4</sub>	2.3 Lbs/MMCF
N <sub>2</sub> O	2.2 Lbs/MMCF
HCOH	0.075 Lbs/MMCF
Benzene	0.0021 Lbs/MMCF
n-Hexane	1.8 Lbs/MMCF
Toluene	0.0034 Lbs/MMCF

Global Warming Potential = 1

Global Warming Potential = 25

Global Warming Potential = 310

## Jay-Bee Oil & Gas, LLC

**Doc Well Pad Production Facility  
Tyler County, WV**

### Potential Emission Rates

#### Source HTR-2

Burner Duty Rating	1500.0 Mbtu/hr
Burner Efficiency	98.0 %
Gas Heat Content (HHV)	1263.0 Btu/scf
Total Gas Consumption	29086.0 scfd
H2S Concentration	0.000 Mole %
Hours of Operation	8760

NOx	0.1501	lbs/hr	0.657	TPY
CO	0.1261	lbs/hr	0.552	TPY
CO2	180.1	lbs/hr	788.7	TPY
CO2e	181	lbs/hr	794	tpy
VOC	0.0083	lbs/hr	0.036	TPY
SO2	0.0009	lbs/hr	0.004	TPY
H2S	0.0000	lbs/hr	0.000	TPY
PM10	0.0114	lbs/hr	0.050	TPY
CHOH	0.0001	lbs/hr	0.000	TPY
Benzene	0.0000	lbs/hr	0.000	TPY
N-Hexane	0.0027	lbs/hr	0.012	TPY
Toluene	0.0000	lbs/hr	0.000	TPY
Total HAPs	0.0028	lbs/hr	0.012	TPY

#### AP-42 Factors Used

NOx	100 Lbs/MMCF
CO	84 Lbs/MMCF
CO <sub>2</sub>	120,000 Lbs/MMCF
VOC	5.5 Lbs/MMCF
PM	7.6 Lbs/MMCF
SO <sub>2</sub>	0.6 Lbs/MMCF
CH <sub>4</sub>	2.3 Lbs/MMCF
N <sub>2</sub> O	2.2 Lbs/MMCF
HCOH	0.075 Lbs/MMCF
Benzene	0.0021 Lbs/MMCF
n-Hexane	1.8 Lbs/MMCF
Toluene	0.0034 Lbs/MMCF

**Global Warming Potential = 1**

**Global Warming Potential = 25**

**Global Warming Potential = 310**

**Jay-Bee Oil & Gas, LLC**

**Doc Well Pad Production Facility  
Tyler County, WV**

**Potential Emission Rates**

**Source HTR-3**

Burner Duty Rating	1500.0 Mbtu/hr
Burner Efficiency	98.0 %
Gas Heat Content (HHV)	1263.0 Btu/scf
Total Gas Consumption	29086.0 scfd
H2S Concentration	0.000 Mole %
Hours of Operation	8760

NOx	0.1501	lbs/hr	0.657	TPY
CO	0.1261	lbs/hr	0.552	TPY
CO2	180.1	lbs/hr	788.7	TPY
CO2e	181	lbs/hr	794	tpy
VOC	0.0083	lbs/hr	0.036	TPY
SO2	0.0009	lbs/hr	0.004	TPY
H2S	0.0000	lbs/hr	0.000	TPY
PM10	0.0114	lbs/hr	0.050	TPY
CHOH	0.0001	lbs/hr	0.000	TPY
Benzene	0.0000	lbs/hr	0.000	TPY
N-Hexane	0.0027	lbs/hr	0.012	TPY
Toluene	0.0000	lbs/hr	0.000	TPY
Total HAPs	0.0028	lbs/hr	0.012	TPY

**AP-42 Factors Used**

NOx	100 Lbs/MMCF
CO	84 Lbs/MMCF
CO <sub>2</sub>	120,000 Lbs/MMCF
VOC	5.5 Lbs/MMCF
PM	7.6 Lbs/MMCF
SO <sub>2</sub>	0.6 Lbs/MMCF
CH <sub>4</sub>	2.3 Lbs/MMCF
N <sub>2</sub> O	2.2 Lbs/MMCF
HCOH	0.075 Lbs/MMCF
Benzene	0.0021 Lbs/MMCF
n-Hexane	1.8 Lbs/MMCF
Toluene	0.0034 Lbs/MMCF

**Global Warming Potential = 1**

**Global Warming Potential = 25**

**Global Warming Potential = 310**

## Jay-Bee Oil & Gas, LLC

### Grumpy Well Pad Production Facility Tyler County, WV

#### Potential Emission Rates

#### Source TEG-1

Burner Duty Rating	13.0 Mbtu/hr
Burner Efficiency	98.0 %
Gas Heat Content (HHV)	1263.0 Btu/scf
Total Gas Consumption	252.1 scfd
H2S Concentration	0.000 Mole %
Hours of Operation	8760

NOx	0.0013	lbs/hr	0.006	TPY
CO	0.0011	lbs/hr	0.005	TPY
CO2	1.6	lbs/hr	6.8	TPY
CO2e	2	lbs/hr	7	tpy
VOC	0.0001	lbs/hr	0.000	TPY
SO2	0.0000	lbs/hr	0.000	TPY
H2S	0.0000	lbs/hr	0.000	TPY
PM10	0.0001	lbs/hr	0.000	TPY
CHOH	0.0000	lbs/hr	0.000	TPY
Benzene	0.0000	lbs/hr	0.000	TPY
N-Hexane	0.0000	lbs/hr	0.000	TPY
Toluene	0.0000	lbs/hr	0.000	TPY
Total HAPs	0.0000	lbs/hr	0.000	TPY

#### AP-42 Factors Used

NOx	100 Lbs/MMCF
CO	84 Lbs/MMCF
CO <sub>2</sub>	120,000 Lbs/MMCF
VOC	5.5 Lbs/MMCF
PM	7.6 Lbs/MMCF
SO <sub>2</sub>	0.6 Lbs/MMCF
CH <sub>4</sub>	2.3 Lbs/MMCF
N <sub>2</sub> O	2.2 Lbs/MMCF
HCOH	0.075 Lbs/MMCF
Benzene	0.0021 Lbs/MMCF
n-Hexane	1.8 Lbs/MMCF
Toluene	0.0034 Lbs/MMCF

Global Warming Potential = 1

Global Warming Potential = 25

Global Warming Potential = 310

**Jay-Bee Oil & Gas, Inc.**  
FUGITIVE EMISSIONS

Grumpy Well Pad Production Facility  
Tyler County, WV

**Fugitive VOC Emissions**

Volatile Organic Compounds, NMNEHC from gas analysis:

Methane from gas analysis:

Carbon Dioxide from gas analysis:

Gas Density

18.40

59.35

0.32

0.0580

weight percent

weight percent

weight percent

lb/scf

Emission Source:	Number	Oil & Gas Production*	VOC %	VOC, lb/hr	VOC TPY	CO2 lb/Hr	CO2 TPY	CH4 lb/hr	CH4 TPY	CO2e
<b>Valves:</b>										
Gas/Vapor:	12	0.02700 scf/hr	18.4	0.003	0.015	0.000	0.000	0.011	0.0488	1.221
Light Liquid:	36	0.05000 scf/hr	100.0	0.104	0.457					0.000
Heavy Liquid (Oil):	-	0.00050 scf/hr	100.0	0.000	0.000					0.000
Low Bleed Pneumatic	3	1.39000 scf/hr	18.4	0.044	0.195	0.144	0.629	0.144	0.6285	16.342
<b>Relief Valves:</b>	18	0.04000 scf/hr	18.4	0.008	0.034	0.000	0.001	0.025	0.1085	2.714
<b>Open-ended Lines, gas:</b>	3	0.06100 scf/hr	18.4	0.002	0.009					0.000
<b>Open-ended Lines, liquid:</b>	-	0.05000 lb/hr	100.0	0.000	0.000					0.000
<b>Pump Seals:</b>										
Gas:	-	0.00529 lb/hr	18.4	0.000	0.000	0.000	0.000	0.000	0.0000	0.000
Light Liquid:	-	0.02866 lb/hr	100.0	0.000	0.000					0.000
Heavy Liquid (Oil):	-	0.00133 lb/hr	100.0	0.000	0.000					0.000
<b>Compressor Seals, Gas:</b>	1	0.01940 lb/hr	18.4	0.004	0.016	0.000	0.000	0.001	0.0029	0.073
<b>Connectors:</b>										
Gas:	6	0.00300 scf/hr	18.4	0.000	0.001	0.000	0.000	0.001	0.0027	0.068
Light Liquid:	6	0.00700 scf/hr	100.0	0.042	0.184					0.000
Heavy Liquid (Oil):	-	0.00030 scf/hr	100.0	0.000	0.000					0.000
<b>Flanges:</b>										
Gas:	36	0.00086 lb/hr	18.4	0.006	0.025	0.000	0.000	0.018	0.0805	2.012
Light Liquid:	18	0.00300 scf/hr	100.0	0.003	0.014					0.000
Heavy Liquid:		0.0009 scf/hr	100.0	0.000	0.000					0.000

**Fugitive Calculations:**

	lb/hr	t/y
VOC	0.172	0.754
CH4	0.056	0.243
CO2	0.000	0.002
CO2e	5.121	22.43

Notes: \*Factors are from 40 CFR 98, Table W-1A (scf/hr), where available. Remaining are API (lb/hr)

**Jay-Bee Oil & Gas, Inc.**  
**GAS ANALYSIS INFORMATION**

**Grumpy Well Pad Production Facility**  
**Tyler County, WV**

**Inlet Gas Composition Information:**

	Fuel Gas mole %	Fuel M.W. lb/lb-mole	Fuel S.G.	Fuel Wt. %	LHV, dry Btu/scf	HHV, dry Btu/scf	AFR vol/vol	VOC NM / NE	Z Factor	GPM
Nitrogen, N2	0.394	0.110	0.004	0.530			-		0.0039	
Carbon Dioxide, CO2	0.151	0.066	0.002	0.319			-		0.0015	
Hydrogen Sulfide, H2S	0.000	0.000	0.000	0.000	0.0	0.0	0.000		0.0000	
Helium, He	-	-	-	-			-		-	
Oxygen, O2	-	-	-	-			-		-	
Methane, CH4	77.080	12.366	0.427	59.350	701.0	778.5	7.346		-	
Ethane, C2H6	14.832	4.460	0.154	21.406	240.1	262.5	2.474		0.7693	
Propane	4.967	2.190	0.076	10.512	115.0	125.0	1.183	10.512	0.1471	3.945
Iso-Butane	0.616	0.358	0.012	1.718	18.5	20.0	0.191	1.718	0.0488	1.361
Normal Butane	1.210	0.703	0.024	3.375	36.4	39.5	0.375	3.375	0.0060	0.200
Iso Pentane	0.266	0.192	0.007	0.921	9.8	10.6	0.101	0.921	0.0117	0.379
Normal Pentane	0.262	0.189	0.007	0.907	9.7	10.5	0.100	0.907	0.0027	0.097
Hexane	0.158	0.136	0.005	0.654	7.0	7.5	0.072	0.654	0.0026	0.094
Heptane	0.064	0.064	0.002	0.308	3.3	3.5	0.034	0.308	0.0016	0.065
	100.000	20.836	0.719		1,140.7	1,257.6	11.875	18.396	0.9958	6.172

**Gas Density (STP) = 0.058**

Ideal Gross (HHV)	1,257.6
Ideal Gross (sat'd)	1,236.5
GPM	-
Real Gross (HHV)	1,263.0
Real Net (LHV)	1,145.6

Gas Data

GAS DATA INFORMATION

Specific Gravity of Air, @ 29.92 in. Hg and 60 -F, 28.9625  
 One mole of gas occupies, @ 14.696 psia & 32 -F, 359.2 cu ft. per lb-mole  
 One mole of gas occupies, @ 14.696 psia & 60 -F, 379.64 cu ft. per lb-mole

Hydrogen Sulfide (H2S) conversion chart:

0 grains H2S/100 scf	=	0.00000 mole % H2S
		0.0 ppmv H2S
0 mole % H2S	=	0 grains H2S/100 scf
		0.0 ppmv H2S
0 ppmv H2S	=	0.000 grains H2S/100 scf
		0.00000 mole % H2S

Ideal Gas at 14.696 psia and 60°F

		MW lb/mol	Specific Gravity	Lb per Cu Ft	Cu Ft per Lb	LHV, dry Btu/scf	HHV, dry Btu/scf	LHV Btu/lb	HHV Btu/lb	cu ft of air / 1 cu ft of gas	Z factor
Nitrogen	N2	28.013	0.9672	0.0738	13.552	0	0	0	0	0	0.9997
Carbon Dioxide	CO2	44.010	1.5196	0.1159	8.626	0	0	0	0	0	0.9964
Hydrogen Sulfide	H2S	34.076	1.1766	0.0898	11.141	587	637	6,545	7,100	7.15	0.9846
Water	H2O	18.000	0.6215	0.0474	21.091	0	0	0	0	0	1.0006
Oxygen	O2	31.999	1.1048	0.0843	11.864	0	0	0	0	0	0.9992
Methane	CH4	16.043	0.5539	0.0423	23.664	909.4	1,010.0	21,520	23,879	9.53	0.9980
Ethane	C2H6	30.070	1.0382	0.0792	12.625	1,618.7	1,769.6	20,432	22,320	16.68	0.9919
Propane	C3H8	44.097	1.5226	0.1162	8.609	2,314.9	2,516.1	19,944	21,661	23.82	0.9825
Iso-Butane	C4H10	58.124	2.0069	0.1531	6.532	3,000.4	3,251.9	19,629	21,257	30.97	0.9711
Normal Butane	C4H10	58.124	2.0069	0.1531	6.532	3,010.8	3,262.3	19,680	21,308	30.97	0.9667
Iso Pentane	C5H12	72.151	2.4912	0.1901	5.262	3,699.0	4,000.9	19,478	21,052	38.11	1.0000
Normal Pentane	C5H12	72.151	2.4912	0.1901	5.262	3,706.9	4,008.9	19,517	21,091	38.11	1.0000
Hexane	C6H14	86.178	2.9755	0.2270	4.405	4,403.8	4,755.9	19,403	20,940	45.26	0.9879
Heptane	C7H16	100.205	3.4598	0.2639	3.789	5,100.0	5,502.5	22,000	23,000	52.41	0.9947

Real Gas at 14.696 psia and 60°F

		MW lb/mol	Specific Gravity	Lb per Cu Ft	Cu Ft per Lb	LHV, dry Btu/scf	HHV, dry Btu/scf	LHV Btu/lb	HHV Btu/lb	cu ft of air / 1 cu ft of gas	Gal/Mole
Nitrogen	N2	28.013	0.9672	0.0738	13.552	0	0	0	0	0	4.1513
Carbon Dioxide	CO2	44.010	1.5196	0.1159	8.626	0	0	0	0	0	6.4532
Hydrogen Sulfide	H2S	34.076	1.1766	0.0898	11.141	621	672	6,545	7,100	7.15	5.1005
Water	H2O	18.000	0.6215	0.0474	21.091						3.8376
Oxygen	O2	31.999	1.1048	0.0843	11.864	0	0	0	0	0	3.3605
Methane	CH4	16.043	0.5539	0.0423	23.664	911	1,012	21,520	23,879	9.53	6.4172
Ethane	C2H6	30.070	1.0382	0.0792	12.625	1,631	1,783	20,432	22,320	16.68	10.126
Propane	C3H8	44.097	1.5226	0.1162	8.609	2,353	3,354	19,944	21,661	23.82	10.433
Iso-Butane	C4H10	58.124	2.0069	0.1531	6.532	3,101	3,369	19,629	21,257	30.97	12.386
Normal Butane	C4H10	58.124	2.0069	0.1531	6.532	3,094	3,370	19,680	21,308	30.97	11.937
Iso Pentane	C5H12	72.151	2.4912	0.1901	5.262	3,709	4,001	19,478	21,052	38.11	13.86
Normal Pentane	C5H12	72.151	2.4912	0.1901	5.262	3,698	4,009	19,517	21,091	38.11	13.713
Hexane	C6H14	86.178	2.9755	0.2270	4.405	4,404	4,756	19,403	20,940	45.26	15.566
Heptane	C7H16	100.205	3.4598	0.2639	3.789	5,101	5,503	22,000	23,000	52.41	17.468

16.3227  
17.468

**Attachment I  
FUGITIVE EMISSIONS FROM UNPAVED HAULROADS**

*UNPAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)*

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)	10	3
p =	Number of days per year with precipitation >0.01 in.	157	157

Item Number	Description	Number of Wheels	Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Produced Water Tanker Truck	18	27	10	0.76	2	424	None	0
2	Condensate Tanker Truck	18	27	10	0.76	1	200	None	0
3									
4									
5									
6									
7									
8									

**Source:** AP-42 Fifth Edition – 13.2.2 Unpaved Roads

$$E = k \times 5.9 \times (s + 12) \times (S + 30) \times (W + 3)^{0.7} \times (w + 4)^{0.5} \times ((365 - p) + 365) = \text{lb/Vehicle Mile Traveled (VMT)}$$

Where:

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)	10	3
S =	Mean vehicle speed (mph)	10	10
W =	Mean vehicle weight (tons)	27	27
w =	Mean number of wheels per vehicle	18	18
p =	Number of days per year with precipitation >0.01 in.	157	157

For lb/hr:  $[\text{lb} \div \text{VMT}] \times [\text{VMT} \div \text{trip}] \times [\text{Trips} \div \text{Hour}] = \text{lb/hr}$

For TPY:  $[\text{lb} \div \text{VMT}] \times [\text{VMT} \div \text{trip}] \times [\text{Trips} \div \text{Hour}] \times [\text{Ton} \div 2000 \text{ lb}] = \text{Tons/year}$

**SUMMARY OF UNPAVED HAULROAD EMISSIONS**

Item No.	PM				PM-10			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1	11.02	1.17	11.02	1.17	1.49	0.16	1.49	0.16
2	5.51	0.16	5.51	0.16	0.74	0.07	0.74	0.07
3								
4								
5								
6								
7								
8								
<b>TOTALS</b>	16.53	1.33	16.53	1.33	1.56	0.23	1.56	0.23

## FUGITIVE EMISSIONS FROM PAVED HAULROADS

*INDUSTRIAL PAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)*

I =	Industrial augmentation factor (dimensionless)	
n =	Number of traffic lanes	
s =	Surface material silt content (%)	
L =	Surface dust loading (lb/mile)	

Item Number	Description	Mean Vehicle Weight (tons)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	None						
2							
3							
4							
5							
6							
7							
8							

**Source:** AP-42 Fifth Edition – 11.2.6 Industrial Paved Roads

$$E = 0.077 \times I \times (4 + n) \times (s + 10) \times (L + 1000) \times (W + 3)^{0.7} =$$

lb/Vehicle Mile Traveled (VMT)

Where:

I =	Industrial augmentation factor (dimensionless)	
n =	Number of traffic lanes	
s =	Surface material silt content (%)	
L =	Surface dust loading (lb/mile)	
W =	Average vehicle weight (tons)	

For lb/hr:  $[I \div VMT] \times [VMT \div trip] \times [Trips \div Hour] =$  lb/hr

For TPY:  $[I \div VMT] \times [VMT \div trip] \times [Trips \div Hour] \times [Ton \div 2000 lb] =$  Tons/year

### SUMMARY OF PAVED HAULROAD EMISSIONS

Item No.	Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY
1				
2				
3				
4				
5				
6				
7				
8				
<b>TOTALS</b>				

**Jay-Bee Oil & Gas, Incorporated**  
**Doc Well Pad Production Facility**  
**Condensate and Produced Water Tank Emissions**

Utilizing direct measurements of the Gas to Oil (GOR) ratio and flash gas composition from a nearby Jay-Bee well pad, the attached calculation spreadsheet was used to determine uncontrolled VOC and HAP emissions from the Condensate tanks of 580.3 tpy and 19.0 tpy respectively for the maximum annual throughput of 30,000 BBL/Yr. In a similar manner, emissions from the Produced Water tanks were projected to be 12.3 tpy of VOCs and 0.40 tpy of HAPs. Thus, total uncontrolled tank emissions are projected to be 592.6 tpy of VOCs and 19.4 tpy of HAPs. As emissions from these tanks are anticipated to be continuous, this is equivalent to 135.3 pounds per hour VOCs and 4.4 pounds per hour HAPs.

The largest component to the HAPs is Hexane. Using the process described above, potential uncontrolled n-Hexane emissions were determined to be 17.8 tons per year or 4.1 pounds per hour.

Methane will also be emitted at a maximum rate of 82.1 tpy from the condensate tanks and 1.74 tpy from the produced water tanks for a total of 83.8 tpy of Methane. Using the GHG factor of 25 for Methane, the CO<sub>2e</sub> uncontrolled emission rate is 83.8 x 25 or 2095 tpy. This is equivalent to 478 lb/hr of CO<sub>2e</sub>

During operation of the VRU, emissions will be controlled at a minimum of 95%. Actual control efficiency is anticipated to be much higher, but only 95% is claimed as allowed under the G70-A General Permit. Thus, when in operation, emissions will be controlled to 6.76 pounds per hour of VOCs (135.3 x 0.05) and 0.22 pounds per hour of HAPs (4.4 x 0.05). CO<sub>2e</sub> emissions will be controlled to 23.9 lb/hr while n-Hexane will be controlled to 0.21 pounds per hour.

The VRU is anticipated to be operated continuously, except for brief intervals for preventive maintenance (8 hours per month or 96 hours per year). Additionally, time must be allotted for potential equipment failures and emergency repairs. Thus, it is conservatively estimated that the VRU will not be available for 200 hours per year. Therefore, total annual potential tank emissions are calculated as follows:

VOCs

$$\begin{aligned} 6.76 \text{ lb/Hr (controlled)} \times (8760-200) &= 57,866 \text{ lb/yr} \\ 135.3 \text{ lb/hr (Un-controlled)} \times 200 &= 27,060 \text{ lb/yr} \\ &= 84,926 \text{ lb/yr or 42.5 tons per year} \end{aligned}$$

HAPs

$$\begin{aligned} 0.22 \text{ lb/Hr (controlled)} \times (8760-200) &= 1,883 \text{ lb/yr} \\ 4.4 \text{ lb/Hr (Un-controlled)} \times 200 &= 880 \text{ lb/yr} \\ &= 2,763 \text{ lb/yr or 1.38 tons per year} \end{aligned}$$

n-Hexane

$$0.21 \text{ lb/Hr (controlled)} \times (8760-200) = 1,798 \text{ lb/yr}$$

$$4.1 \text{ lb/Hr (Un-controlled)} \times 200 = 820 \text{ lb/yr}$$

$$= 2,618 \text{ lb/yr or 1.31 tons per year}$$

CO<sub>2e</sub>

$$23.9 \text{ lb/Hr (controlled)} \times (8760-200) = 204,584 \text{ lb/yr}$$

$$478 \text{ lb/Hr (Un-controlled)} \times 200 = 95,600 \text{ lb/yr}$$

$$= 300,184 \text{ lb/yr or 150.1 tons per year}$$

## Flash Emission Calculations - Produced Water

Using Gas-Water Ratio Method

### Un-Controlled

#### Site specific data

Gas-Water-ratio	=	5 scf/bbl Using GOW from comparable well pad
Throughput	=	63,600 bbl/yr
Stock tank gas molecular weight	=	39.56 g/mole

#### Conversions

1 lb	=	453.6 g
1 mole	=	22.4 L
1 scf	=	28.32 L
1 ton	=	2000 lb

#### Equations

$$E_{TOT} = Q \frac{(bbl)}{(yr)} \times R \frac{(scf)}{(bbl)} \times \frac{28.32(L)}{1(scf)} \times \frac{1(mole)}{22.4(L)} \times MW \frac{(g)}{(mole)} \times \frac{1(lb)}{453.6(g)} \times \frac{1(ton)}{2000(lb)}$$

- $E_{TOT}$  = Total stock tank flash emissions (TPY)
- $R$  = Measured gas-oil ratio (scf/bbl)
- $Q$  = Throughput (bbl/yr)
- $MW$  = Stock tank gas molecular weight (g/mole)

$$E_{spec} = E_{TOT} \times X_{spec}$$

- $E_{spec}$  = Flash emission from constituent
- $X_{spec}$  = Weight fraction of constituent in stock tank gas

## Flash Emissions

Constituent	TPY	
Total	17.5318	
<b>VOC</b>	<b>12.3019</b>	
Nitrogen	4.38E-03	
Carbon Dioxide	2.75E-02	
Methane	1.74E+00	
Ethane	3.46E+00	
Propane	4.54E+00	
Isobutane	1.23E+00	
n-Butane	2.83E+00	
2,2 Dimethylpropane	3.45E-02	
Isopentane	9.68E-01	
n-Pentane	1.02E+00	
2,2 Dimethylbutane	3.66E-02	
Cyclopentane	0.00E+00	
2,3 Dimethylbutane	5.31E-02	
2 Methylpentane	2.82E-01	
3 Methylpentane	1.68E-01	
n-Hexane	3.68E-01	HAP
Methylcyclopentane	2.68E-02	
Benzene	6.31E-03	HAP
Cyclohexane	3.80E-02	
2-Methylhexane	8.17E-02	
3-Methylhexane	8.03E-02	
2,2,4 Trimethylpentane	0.00E+00	
Other C7's	7.64E-02	
n-Heptane	1.18E-01	
Methylcyclohexane	7.35E-02	
Toluene	1.44E-02	HAP
Other C8's	1.20E-01	
n-Octane	4.00E-02	
Ethylbenzene	8.77E-04	HAP
M & P Xylenes	1.03E-02	HAP
O-Xylene	1.40E-03	HAP
Other C9's	4.98E-02	
n-Nonane	1.19E-02	
Other C10's	1.88E-02	
n-Decane	2.45E-03	
Undecanes (11)	2.63E-03	

$E_{TOT}$   
Sum of C3+

# Flash Emission Calculations

Using Gas-Oil Ratio Method

## Un-Controlled

### Site specific data

Gas-Oil-ratio = 500 scf/bbl Using Actual GOR from RPT-8  
 Throughput = 30,000 bbl/yr  
 Stock tank gas molecular weight = 39.56 g/mole

### Conversions

1 lb = 453.6 g  
 1 mole = 22.4 L  
 1 scf = 28.32 L  
 1 ton = 2000 lb

### Equations

$$E_{TOT} = Q \frac{(bbl)}{(yr)} \times R \frac{(scf)}{(bbl)} \times \frac{28.32(L)}{1(scf)} \times \frac{1(mole)}{22.4(L)} \times MW \frac{(g)}{(mole)} \times \frac{1(lb)}{453.6(g)} \times \frac{1(ton)}{2000(lb)}$$

- $E_{TOT}$  = Total stock tank flash emissions (TPY)
- R = Measured gas-oil ratio (scf/bbl)
- Q = Throughput (bbl/yr)
- MW = Stock tank gas molecular weight (g/mole)

$$E_{spec} = E_{TOT} \times X_{spec}$$

- $E_{spec}$  = Flash emission from constituent
- $X_{spec}$  = Weight fraction of constituent in stock tank gas

## Flash Emissions

Constituent	TPY	
Total	826.9700	
<b>VOC</b>	<b>580.2765</b>	
Nitrogen	2.07E-01	
Carbon Dioxide	1.30E+00	
Methane	8.21E+01	
Ethane	1.63E+02	
Propane	2.14E+02	
Isobutane	5.80E+01	
n-Butane	1.33E+02	
2,2 Dimethylpropane	1.63E+00	
Isopentane	4.57E+01	
n-Pentane	4.79E+01	
2,2 Dimethylbutane	1.73E+00	
Cyclopentane	0.00E+00	
2,3 Dimethylbutane	2.51E+00	
2 Methylpentane	1.33E+01	
3 Methylpentane	7.95E+00	
n-Hexane	1.74E+01	HAP
Methylcyclopentane	1.27E+00	
Benzene	2.98E-01	HAP
Cyclohexane	1.79E+00	
2-Methylhexane	3.85E+00	
3-Methylhexane	3.79E+00	
2,2,4 Trimethylpentane	0.00E+00	
Other C7's	3.61E+00	
n-Heptane	5.57E+00	
Methylcyclohexane	3.47E+00	
Toluene	6.78E-01	HAP
Other C8's	5.66E+00	
n-Octane	1.89E+00	
Ethylbenzene	4.13E-02	HAP
M & P Xylenes	4.88E-01	HAP
O-Xylene	6.62E-02	HAP
Other C9's	2.35E+00	
n-Nonane	5.62E-01	
Other C10's	8.85E-01	
n-Decane	1.16E-01	
Undecanes (11)	1.24E-01	

$E_{TOT}$   
Sum of C3+



FESCO, Ltd.  
1100 Fesco Avenue - Alice, Texas 78332

April 24, 2014

For: Jay-Bee Oil & Gas, Inc.  
1720 Route 22 East  
Union, New Jersey 07083

Date Sampled: 04/07/14

Date Analyzed: 04/21/14

Sample: RPT 8-1

Job Number: J42794

FLASH LIBERATION OF HYDROCARBON LIQUID		
	Separator HC Liquid	Stock Tank
Pressure, psig	340	0
Temperature, °F	65	70
Gas Oil Ratio (1)	----	500
Gas Specific Gravity (2)	----	1.387
Separator Volume Factor (3)	1.2987	1.000

STOCK TANK FLUID PROPERTIES	
Shrinkage Recovery Factor (4)	0.7700
Oil API Gravity at 60 °F	70.79
Reid Vapor Pressure, psi (5)	5.28

Quality Control Check			
Cylinder No.	Sampling Conditions	Test Samples	
		W-2408*	W-2423
Pressure, psig	340	299	297
Temperature, °F	65	66	66

(1) - Scf of flashed vapor per barrel of stock tank oil

(2) - Air = 1.000

(3) - Separator volume / Stock tank volume

(4) - Fraction of first stage separator liquid

(5) - Absolute pressure at 100 deg F

Analyst:                      M. G.

\* Sample used for flash study

Base Conditions: 14.85 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

April 23, 2014

FESCO, Ltd.  
1100 Fesco Ave. - Alice, Texas 78332

For: Jay-Bee Oil & Gas, Inc.  
1720 Route 22 East  
Union, New Jersey 07083

Sample: RPT 8-1

Gas Evolved from Hydrocarbon Liquid Flashed  
From 340 psig & 65 °F to 0 psig & 70 °F

Date Sampled: 04/07/14

Job Number: 42794.001

CHROMATOGRAPH EXTENDED ANALYSIS - SUMMATION REPORT - GPA 2286

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.036	
Carbon Dioxide	0.141	
Methane	24.485	
Ethane	25.943	6.993
Propane	23.253	6.457
Isobutane	4.773	1.574
n-Butane	10.980	3.489
2-2 Dimethylpropane	0.108	0.042
Isopentane	3.027	1.116
n-Pentane	3.175	1.160
Hexanes	2.378	0.988
Heptanes Plus	<u>1.701</u>	<u>0.761</u>
Totals	100.000	22.579

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity ----- 3.599 (Air=1)  
Molecular Weight ----- 102.69  
Gross Heating Value ----- 5488 BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity ----- 1.387 (Air=1)  
Compressibility (Z) ----- 0.9850  
Molecular Weight ----- 39.56  
Gross Heating Value  
Dry Basis ----- 2321 BTU/CF  
Saturated Basis ----- 2282 BTU/CF

\*Hydrogen Sulfide tested in laboratory by: Stained Tube Method (GPA 2377)  
Results: <0.013 Gr/100 CF, <0.2 PPMV or <0.001 Mol %

Base Conditions: 14.850 PSI & 60 Deg F

Analyst: MR  
Processor: AL  
Cylinder ID: ST# 20

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

**CHROMATOGRAPH EXTENDED ANALYSIS  
TOTAL REPORT - GPA 2286**

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.036		0.025
Carbon Dioxide	0.141		0.157
Methane	24.485		9.930
Ethane	25.943	6.993	19.719
Propane	23.253	6.457	25.920
Isobutane	4.773	1.574	7.013
n-Butane	10.980	3.489	16.132
2,2 Dimethylpropane	0.108	0.042	0.197
Isopentane	3.027	1.116	5.521
n-Pentane	3.175	1.160	5.791
2,2 Dimethylbutane	0.096	0.040	0.209
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.139	0.057	0.303
2 Methylpentane	0.738	0.309	1.808
3 Methylpentane	0.441	0.181	0.961
n-Hexane	0.964	0.400	2.100
Methylcyclopentane	0.072	0.025	0.153
Benzene	0.016	0.005	0.036
Cyclohexane	0.102	0.036	0.217
2-Methylhexane	0.184	0.086	0.466
3-Methylhexane	0.181	0.083	0.458
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.174	0.076	0.436
n-Heptane	0.266	0.124	0.674
Methylcyclohexane	0.169	0.068	0.419
Toluene	0.035	0.012	0.082
Other C8's	0.246	0.115	0.685
n-Octane	0.079	0.041	0.228
Ethylbenzene	0.002	0.001	0.005
M & P Xylenes	0.022	0.009	0.059
O-Xylene	0.003	0.001	0.008
Other C9's	0.089	0.046	0.284
n-Nonane	0.021	0.012	0.068
Other C10's	0.030	0.018	0.107
n-Decane	0.004	0.002	0.014
Undecanes (11)	<u>0.004</u>	<u>0.002</u>	<u>0.015</u>
Totals	100.000	22.579	100.000

**Computed Real Characteristics Of Total Sample:**

Specific Gravity	1.387	(Air=1)
Compressibility (Z)	0.9850	
Molecular Weight	39.56	
Gross Heating Value		
Dry Basis	2321	BTU/CF
Saturated Basis	2282	BTU/CF

May 2, 2014

FESCO, Ltd.  
1100 Fesco Ave. - Alice, Texas 78332

For: Jay-Bee Oil & Gas, Inc.  
1720 Route 22 East  
Union, New Jersey 07083

Sample: RPT 8-1  
Breathing Vapor  
From 0 psig & 70 °F to 0 psig & 100 °F

Date Sampled: 04/07/14

Job Number: 42794.011

**CHROMATOGRAPH EXTENDED ANALYSIS - SUMMATION REPORT - GPA 2286**

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.185	
Carbon Dioxide	0.018	
Methane	0.000	
Ethane	0.202	0.054
Propane	10.137	2.815
Isobutane	8.852	2.920
n-Butane	30.167	9.586
2-2 Dimethylpropane	0.370	0.142
Isopentane	15.123	5.574
n-Pentane	17.412	6.361
Hexanes	13.160	5.466
Heptanes Plus	<u>4.374</u>	<u>1.881</u>
Totals	100.000	34.799

**Computed Real Characteristics Of Heptanes Plus:**

Specific Gravity ----- 3.547 (Air=1)  
Molecular Weight ----- 98.01  
Gross Heating Value ----- 5251 BTU/CF

**Computed Real Characteristics Of Total Sample:**

Specific Gravity ----- 2.412 (Air=1)  
Compressibility (Z) ----- 0.9539  
Molecular Weight ----- 66.64  
Gross Heating Value  
Dry Basis ----- 3921 BTU/CF  
Saturated Basis ----- 3853 BTU/CF

\*Hydrogen Sulfide tested in laboratory by: Stained Tube Method (GPA 2377)

Results: <0.013 Gr/100 CF, <0.2 PPMV or <0.001 Mol %

Base Conditions: 14.850 PSI & 60 Deg F

Analyst: MR  
Processor: AL  
Cylinder ID: ST# 21

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

**CHROMATOGRAPH EXTENDED ANALYSIS  
TOTAL REPORT - GPA 2286**

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.185		0.078
Carbon Dioxide	0.018		0.012
Methane	0.000		0.001
Ethane	0.202	0.054	0.091
Propane	10.137	2.815	6.708
Isobutane	8.852	2.920	7.721
n-Butane	30.167	9.586	26.312
2,2 Dimethylpropane	0.370	0.142	0.401
Isopentane	15.123	5.574	16.374
n-Pentane	17.412	6.361	18.852
2,2 Dimethylbutane	0.570	0.240	0.737
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.805	0.332	1.041
2 Methylpentane	4.259	1.782	5.508
3 Methylpentane	2.477	1.019	3.203
n-Hexane	5.049	2.093	6.529
Methylcyclopentane	0.356	0.124	0.450
Benzene	0.078	0.022	0.091
Cyclohexane	0.432	0.148	0.545
2-Methylhexane	0.606	0.284	0.911
3-Methylhexane	0.569	0.261	0.856
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.649	0.285	0.966
n-Heptane	0.658	0.306	0.989
Methylcyclohexane	0.408	0.165	0.601
Toluene	0.071	0.024	0.098
Other C8's	0.379	0.178	0.627
n-Octane	0.082	0.042	0.141
Ethylbenzene	0.002	0.001	0.003
M & P Xylenes	0.020	0.008	0.032
O-Xylene	0.002	0.001	0.003
Other C9's	0.048	0.025	0.091
n-Nonane	0.007	0.004	0.013
Other C10's	0.005	0.003	0.011
n-Decane	0.002	0.001	0.004
Undecanes (11)	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
Totals	100.000	34.799	100.000

**Computed Real Characteristics Of Total Sample:**

Specific Gravity -----	2.412	(Air=1)
Compressibility (Z) -----	0.9539	
Molecular Weight -----	66.64	
Gross Heating Value		
Dry Basis -----	3921	BTU/CF
Saturated Basis -----	3853	BTU/CF

## Condensate Truck Loading Lost Emissions Per AP-42

Per AP-42, Chapter 5.2.2.1.1, the uncontrolled loading loss emission factor  $L_L$  can be estimated as follows:

$$L_L = 12.46[SPM/T]$$

Where:

$L_L$  = uncontrolled loading loss in pounds per 1000 gallons of liquid loaded

S= saturation factor (0.6)

P=true vapor pressure of liquid loaded: 3.1 psia (see attached condensate analysis report)

M= Molecular weight of vapor in lb/lb-mole 66.64(see attached condensate analysis report)

T= temperature of bulk liquid loaded in deg R or 460+deg F (70 Deg F)

Thus,  $L_L = 12.46[0.6 \times 3.1 \times 66.64]/[460+60]$

$L_L = 2.97$  lb/1000 gallons loaded

Based on sample data of breathing vapor (attached), these emissions are 99.6% VOCs. It is assumed that vapor composition from truck loading is the same as that from the tank breathing vapors.

Given a maximum loading of 100 BBL (4200 gallons) a day, uncontrolled VOC emissions are estimated at 11.09 lb of VOC per day  $[4.20 \times 2.97 \times .996]$ . There is no control on tank truck loading. With all daily loading taking place within 1 hour, the average hourly un-controlled emission rate is therefore estimated at 12.42 lb/hr.

Maximum annual throughput is 1,260,000 gallons (30,000 barrels) per year. Thus, un-captured/un-controlled VOC emissions are conservatively estimated at 3727 pounds per year  $[1260 \times 2.97 \times .996]$  or 1.86 tons per year.

Based on the attached analysis of a representative tank's breathing emissions, HAPs represent 6.8 percent of the emissions. Thus, daily HAPs emissions equal  $4.20 \times 2.97 \times 0.068$  or 0.85 lb/hr. Annual maximum HAPs emissions are estimated at 255 lb/yr  $[1260 \times 2.97 \times 0.068]$  or 0.13 tpy.

There are no significant VOC or HAP emissions anticipated from the loading of produced water.

## **Gas and Condensate Composition Data**



**Certificate of Analysis**  
 Number: 2030-14030288-003A

**Carencro Laboratory**  
 4790 NE Evangeline Thruway  
 Carencro, LA 70520

Alan Ball  
 Gas Analytical Services  
 PO Box 1028  
 Bridgeport, WV 26330

Apr. 02, 2014

Field: Jay Bee Oil & Gas  
 Station Name: RPT 8-1H  
 Sample Point: Submeter  
 Cylinder No: 0258  
 Analyzed: 04/01/2014 13:29:16 by GR14

Sampled By: DW-GAS  
 Sample Of: Gas Spot  
 Sample Date: 03/25/2014 12:00  
 Sample Conditions: 290 psig  
 Method: GPA 2286

**Analytical Data**

Components	Mol. %	Wt. %	GPM at 14.73 psia	
Nitrogen	0.394	0.530		
Carbon Dioxide	0.151	0.319		
Methane	77.080	59.336		GPM TOTAL C2+ 6.223
Ethane	14.832	21.401	3.980	
Propane	4.967	10.510	1.373	
iso-Butane	0.616	1.718	0.202	
n-Butane	1.210	3.375	0.383	
iso-Pentane	0.266	0.921	0.097	
n-Pentane	0.262	0.907	0.095	
i-Hexanes	0.093	0.376	0.037	
n-Hexane	0.058	0.239	0.023	
Benzene	0.001	0.004	NIL	
Cyclohexane	0.006	0.023	0.002	
i-Heptanes	0.031	0.150	0.014	
n-Heptane	0.011	0.066	0.005	
Toluene	0.002	0.008	0.001	
i-Octanes	0.015	0.080	0.007	
n-Octane	0.002	0.012	0.001	
Ethylbenzene	NIL	NIL	NIL	
Xylenes	NIL	NIL	NIL	
i-Nonanes	NIL	NIL	NIL	
n-Nonane	NIL	NIL	NIL	
Decane Plus	0.003	0.036	0.003	
	100.000	100.000	6.223	

Physical Properties	Total	C10+
Calculated Molecular Weight	20.84	162.34
GPA 2172-09 Calculation:		
Calculated Gross BTU per ft <sup>3</sup> @ 14.73 psia & 60°F		
Real Gas Dry BTU	1265.2	8778.9
Water Sat. Gas Base BTU	1243.1	8628.1
Relative Density Real Gas	0.7218	5.6078
Compressibility Factor	0.9964	

*Patti L. Peters*

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.



**Certificate of Analysis**  
 Number: 2030-14030288-003A

Carencro Laboratory  
 4790 NE Evangeline Thruway  
 Carencro, LA 70520

Alan Ball  
 Gas Analytical Services  
 PO Box 1028  
 Bridgeport, WV 26330

Apr. 02, 2014

Field: Jay Bee Oil & Gas  
 Station Name: RPT 8-1H  
 Sample Point: Submeter  
 Cylinder No: 0258  
 Analyzed: 04/01/2014 13:29:16 by GR14

Sampled By: DW-GAS  
 Sample Of: Gas Spot  
 Sample Date: 03/25/2014 12:00  
 Sample Conditions: 290 psig  
 Method: GPA 2286

**Analytical Data**

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Nitrogen	0.394	0.530			
Carbon Dioxide	0.151	0.319			
Methane	77.080	59.336		GPM TOTAL C2+	6.223
Ethane	14.832	21.401	3.980	GPM TOTAL C3+	2.243
Propane	4.967	10.510	1.373	GPM TOTAL iC5+	0.285
iso-butane	0.616	1.718	0.202		
n-Butane	1.210	3.375	0.383		
iso-pentane	0.266	0.921	0.097		
n-Pentane	0.262	0.907	0.095		
Hexanes Plus	0.222	0.983	0.093		
	100.000	100.000	6.223		

Physical Properties	Total	C6+
Relative Density Real Gas	0.7218	3.1591
Calculated Molecular Weight	20.84	91.50
Compressibility Factor	0.9964	
GPA 2172-09 Calculation:		
Calculated Gross BTU per ft <sup>3</sup> @ 14.73 psia & 60°F		
Real Gas Dry BTU	1265.2	5014.1
Water Sat. Gas Base BTU	1243.1	4926.8

Comments: H2O Mol% : 1.740 ; Wt% : 1.508

*Patricia L. Peters*

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.



**Certificate of Analysis**  
 Number: 2030-14030288-003A

Carencro Laboratory  
 4790 NE Evangeline Thruway  
 Carencro, LA 70520

Alan Ball  
 Gas Analytical Services  
 PO Box 1028  
 Bridgeport, WV 26330

Apr. 02, 2014

Field: Jay Bee Oil & Gas  
 Station Name: RPT 8-1H  
 Sample Point: Submeter  
 Cylinder No: 0258  
 Analyzed: 04/01/2014 13:29:16 by GR14

Sampled By: DW-GAS  
 Sample Of: Gas Spot  
 Sample Date: 03/25/2014 12:00  
 Sample Conditions: 290 psig  
 Method: GPA 2288

**Analytical Data**

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Nitrogen	0.394	0.530			
Carbon Dioxide	0.151	0.319			
Methane	77.080	59.336		GPM TOTAL C2+	6.223
Ethane	14.832	21.401		GPM TOTAL C3+	2.243
Propane	4.987	10.510	3.980	GPM TOTAL IC5+	0.285
Iso-Butane	0.616	1.718	1.373		
n-Butane	1.210	3.375	0.202		
Iso-Pentane	0.266	0.921	0.383		
n-Pentane	0.262	0.907	0.097		
Hexanes	0.151	0.615	0.095		
Heptanes Plus	0.071	0.368	0.060		
	<u>100.000</u>	<u>100.000</u>	<u>0.033</u>		
			6.223		

Physical Properties	Total	C7+
Relative Density Real Gas	0.7218	3.5570
Calculated Molecular Weight	20.84	103.02
Compressibility Factor	0.9964	
GPA 2172-09 Calculation:		
Calculated Gross BTU per ft <sup>3</sup> @ 14.73 psia & 60°F		
Real Gas Dry BTU	1265.2	5577.8
Water Sat. Gas Base BTU	1243.1	5480.7

Comments: H2O Mol% : 1.740 ; Wt% : 1.508

*Pat L. Ferro*

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.

AB288



Gas Analytical Services, Inc.  
P.O. Box 1028, Bridgeport, WV 26330  
4888 Water Street, Stonewood, WV 26301  
Phone: (304) 623-0020 Fax: (304) 624-8076

Date: 3/25/2014

Referred to: Southern Petroleum Laboratories  
4790 NE Evangeline Thruway  
Carencro, LA 70520  
Attn: Patti Petro

Testing Requested  
-SCF Base Conditions; P, 14.73psia / T, 60 F

	Client	Location	Date of Collection	Time of Collection	Cylinder Number	Sulfur Speciation (GPA-219)	Total Sulfur (GPA-219)	Extended Hydrocarbon (GPA-226)	C <sub>10</sub> +C <sub>14</sub> (GPA-226)	Extended Hydrocarbon (GPA-226)	C <sub>10</sub> +C <sub>14</sub> (GPA-226)	Hydrocarbon Dewpoint	Gas Temperature (F)
1	Jay-Bee Oil & Gas	RPT 8H	3/25/2014	11:30	0339				X				
2	Jay-Bee Oil & Gas	RPT 8-2H	3/26/2014	11:45	0118				X				
3	Jay-Bee Oil & Gas	RPT 8-1H	3/25/2014	12:00	0258				X				
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

Received by: *[Signature]* 3/25/14

Please email results to: [lab@gasana.com](mailto:lab@gasana.com)  
Submitted by: *[Signature]*  
Alan Ball, Lab Manger  
Stonewood, WV Laboratory

**GAS** ANALYTICAL SERVICES  
205 Water Street, Stonewood, WV 26301  
lab@gasana.com Phone: 304-623-0020  
Sample Date: 3/25/13 Time: \_\_\_\_\_  
Meter ID Number: \_\_\_\_\_

Company Name: Jay-Bee Oil & Gas Inc.

Sample Source: RPT-8H

Sample Pressure: 340 PSI Sample Temp.: \_\_\_\_\_  
Sample Type:  Wellhead  Sub-meter  Master Meter  Alternative Fuel  Source Analysis

Sampled By: D. Wilson  
(Print and Sign) Who declares that this sample was obtained from the source indicated above.

Comments: Standard Analysis

Send Results To: Randy Broda

Analysis Type:  Standard  Extended

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14030288 001A

**GAS** ANALYTICAL SERVICES  
205 Water Street, Stonewood, WV 26301  
lab@gasana.com Phone: 304-623-0020  
Sample Date: 3/25/14 Time: 11:45A  
Meter ID Number: \_\_\_\_\_

Company Name: Jay-Bee Oil & Gas Inc.

Sample Source: RPT-8-2h

Sample Pressure: 320 PSI Sample Temp.: \_\_\_\_\_  
Sample Type:  Wellhead  Sub-meter  Master Meter  Alternative Fuel  Source Analysis

Sampled By: D. Wilson  
(Print and Sign) Who declares that this sample was obtained from the source indicated above.

Comments: Extended Analysis

Send Results To: Randy Broda

Analysis Type:  Standard  Extended

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2A

**GAS** ANALYTICAL SERVICES  
205 Water Street, Stonewood, WV 26301  
lab@gasana.com Phone: 304-623-0020  
Sample Date: 3/25/14 Time: 12:00P  
Meter ID Number: \_\_\_\_\_

Company Name: Jay-Bee Oil & Gas Inc.

Sample Source: RPT-8-1h

Sample Pressure: 290 PSI Sample Temp.: \_\_\_\_\_  
Sample Type:  Wellhead  Sub-meter  Master Meter  Alternative Fuel  Source Analysis

Sampled By: D. Wilson  
(Print and Sign) Who declares that this sample was obtained from the source indicated above.

Comments: Extended Analysis

Send Results To: Randy Broda

Analysis Type:  Standard  Extended

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3A

April 29, 2014

FESCO, Ltd.  
1100 FESCO Avenue - Alice, Texas 78332

For: Jay-Bee Oil & Gas, Inc.  
1720 Route 22 East  
Union, New Jersey 07083

Sample: RPT 8-1  
Separator Hydrocarbon Liquid  
Sampled @ 340 psig & 65 °F

Date Sampled: 04/07/14

Job Number: 42794.002

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2188-M

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.011	0.003	0.004
Carbon Dioxide	0.025	0.011	0.014
Methane	7.015	3.036	1.384
Ethane	7.995	5.461	2.956
Propane	9.072	6.384	4.919
Isobutane	2.654	2.218	1.896
n-Butane	7.473	6.018	5.341
2,2 Dimethylpropane	0.192	0.188	0.170
Isopentane	4.335	4.049	3.845
n-Pentane	5.799	5.369	5.144
2,2 Dimethylbutane	0.319	0.341	0.338
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.532	0.557	0.564
2 Methylpentane	3.616	3.833	3.831
3 Methylpentane	2.379	2.481	2.521
n-Hexane	6.324	6.642	6.701
Heptanes Plus	<u>42.259</u>	<u>53.409</u>	<u>60.372</u>
Totals:	100.000	100.000	100.000

Characteristics of Heptanes Plus:

Specific Gravity ----- 0.7441 (Water=1)  
 °API Gravity ----- 58.66 @ 60°F  
 Molecular Weight ----- 118.2  
 Vapor Volume ----- 20.33 CF/Gal  
 Weight ----- 6.20 Lbs/Gal

Characteristics of Total Sample:

Specific Gravity ----- 0.6583 (Water=1)  
 °API Gravity ----- 83.46 @ 60°F  
 Molecular Weight ----- 81.3  
 Vapor Volume ----- 25.69 CF/Gal  
 Weight ----- 5.48 Lbs/Gal

Base Conditions: 14.850 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: XG  
Processor: JCdjv  
Cylinder ID: W-2408

David Dannhaus 361-861-7015

**TANKS DATA INPUT REPORT - GPA 2186-M**

COMPONENT	Mol %	LiqVol %	Wt %
Carbon Dioxide	0.025	0.011	0.014
Nitrogen	0.011	0.003	0.004
Methane	7.016	3.036	1.384
Ethane	7.995	5.461	2.956
Propane	9.072	6.384	4.919
Isobutane	2.654	2.218	1.696
n-Butane	7.666	6.206	5.511
Isopentane	4.335	4.049	3.845
n-Pentane	5.799	5.369	5.144
Other C-6's	6.846	7.212	7.254
Heptanes	13.266	15.122	16.031
Octanes	12.697	15.144	16.932
Nonanes	4.935	6.806	7.697
Decanes Plus	8.665	13.799	16.337
Benzene	0.113	0.081	0.108
Toluene	0.613	0.525	0.695
E-Benzene	0.534	0.526	0.697
Xylenes	1.436	1.407	1.875
n-Hexane	6.324	6.642	6.701
2,2,4 Trimethylpentane	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
Totals:	100.000	100.000	100.000

**Characteristics of Total Sample:**

Specific Gravity -----	0.6583 (Water=1)
*API Gravity -----	83.46 @ 60°F
Molecular Weight -----	81.3
Vapor Volume -----	25.69 CF/Gal
Weight -----	5.48 Lbs/Gal

**Characteristics of Decanes (C10) Plus:**

Specific Gravity -----	0.7794 (Water=1)
Molecular Weight -----	153.3

**Characteristics of Atmospheric Sample:**

*API Gravity -----	70.79 @ 60°F
Reid Vapor Pressure (ASTM D-5191) -----	5.28 psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	-----	W-2408*	W-2423
Pressure, PSIG	340	299	297
Temperature, °F	65	66	66

\* Sample used for analysis

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.011	0.003	0.004
Carbon Dioxide	0.025	0.011	0.014
Methane	7.015	3.036	1.384
Ethane	7.995	5.461	2.956
Propane	9.072	6.384	4.919
Isobutane	2.654	2.218	1.896
n-Butane	7.473	6.018	5.341
2,2 Dimethylpropane	0.192	0.188	0.170
Isopentane	4.335	4.049	3.845
n-Pentane	5.799	5.369	5.144
2,2 Dimethylbutane	0.319	0.341	0.338
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.532	0.557	0.564
2 Methylpentane	3.616	3.833	3.831
3 Methylpentane	2.379	2.481	2.521
n-Hexane	6.324	6.642	6.701
Methylcyclopentane	0.537	0.486	0.556
Benzene	0.113	0.081	0.108
Cyclohexane	0.956	0.831	0.989
2-Methylhexane	3.063	3.637	3.774
3-Methylhexane	2.577	3.022	3.175
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	1.532	1.725	1.868
n-Heptane	4.601	5.422	5.669
Methylcyclohexane	2.764	2.838	3.337
Toluene	0.613	0.525	0.695
Other C-8's	7.205	8.736	9.764
n-Octane	2.728	3.569	3.831
E-Benzene	0.534	0.526	0.697
M & P Xylenes	0.616	0.611	0.804
O-Xylene	0.820	0.796	1.071
Other C-9's	3.468	4.696	5.383
n-Nonane	1.467	2.109	2.314
Other C-10's	2.979	4.434	5.175
n-decane	0.771	1.208	1.349
Undecanes(11)	2.240	3.420	4.048
Dodecanes(12)	1.277	2.107	2.529
Tridecanes(13)	0.746	1.320	1.606
Tetradecanes(14)	0.349	0.660	0.814
Pentadecanes(15)	0.160	0.324	0.404
Hexadecanes(16)	0.078	0.169	0.213
Heptadecanes(17)	0.037	0.085	0.108
Octadecanes(18)	0.018	0.043	0.055
Nonadecanes(19)	0.007	0.017	0.022
Eicosanes(20)	0.002	0.005	0.006
Heneicosanes(21)	0.001	0.003	0.003
Docosanes(22)	0.001	0.001	0.002
Tricosanes(23)	0.000	0.001	0.001
Tetracosanes(24)	0.000	0.001	0.001
Pentacosanes(25)	0.000	0.000	0.000
Hexacosanes(26)	0.000	0.000	0.000
Heptacosanes(27)	0.000	0.000	0.000
Octacosanes(28)	0.000	0.000	0.000
Nonacosanes(29)	0.000	0.000	0.000
Triacosanes(30)	0.000	0.000	0.000
Hentriacosanes Plus(31+)	0.000	0.000	0.000
Total	100.000	100.000	100.000

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**ATTACHMENT J**

**Class I Legal Advertisement**

**Affidavit Notice Will Be Submitted  
Upon Receipt**

## AIR QUALITY PERMIT NOTICE Notice of Application

Notice is given that Jay-Bee Oil & Gas, Inc. has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G70A General Permit Registration for its Doc Well Pad Production Facility located off of Indian Creek Road east of Middlebourne, WV in Tyler County., West Virginia (Lat.39.449105, Long. -80.768234)

The applicant estimates the potential to discharge the following regulated air pollutants:

- 2.79 tons of Nitrogen Oxides per year
- 3.28 tons of Carbon Monoxide per year
- 45.53 tons of Volatile Organics per year
- 0.01 tons of Sulfur Dioxide per year
- 1.54 tons of Particulate Matter per year
- 0.08 tons of Formaldehyde per year
- 1.35 tons of n-Hexane
- 2,952 tons of Greenhouse Gases per year

Startup of operation is planned to begin on or about the 20th day of May, 2015. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57<sup>th</sup> Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1227, during normal business hours.

Dated this the (Day) day of (Month), (Year).

By: Mr. Shane Dowell  
Office Manager  
Jay-Bee Oil & Gas, Inc.

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**ATTACHMENT N**

**Material Safety Data Sheets**

Product Name: MOBIL DTE OIL EXTRA HEAVY  
Revision Date: 30 Apr 2012  
Page 1 of 10

## MATERIAL SAFETY DATA SHEET

### SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

#### PRODUCT

**Product Name:** MOBIL DTE OIL EXTRA HEAVY  
**Product Description:** Base Oil and Additives  
**Product Code:** 201560501595, 600205-00, 970010  
**Intended Use:** Circulating oil

#### COMPANY IDENTIFICATION

**Supplier:** EXXON MOBIL CORPORATION  
3225 GALLOWS RD.  
FAIRFAX, VA. 22037 USA

**24 Hour Health Emergency** 609-737-4411  
**Transportation Emergency Phone** 800-424-9300  
**ExxonMobil Transportation No.** 281-834-3296  
**Product Technical Information** 800-662-4525, 800-947-9147  
**MSDS Internet Address** <http://www.exxon.com>, <http://www.mobil.com>

### SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

### SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

#### POTENTIAL HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

<b>NFPA Hazard ID:</b>	Health: 0	Flammability: 1	Reactivity: 0
<b>HMIS Hazard ID:</b>	Health: 0	Flammability: 1	Reactivity: 0

**NOTE:** This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

### SECTION 4 FIRST AID MEASURES

#### INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use

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adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

## SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

## EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

## INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

## SECTION 5

### FIRE FIGHTING MEASURES

#### EXTINGUISHING MEDIA

**Appropriate Extinguishing Media:** Use water fog, foam, dry chemical or carbon dioxide (CO<sub>2</sub>) to extinguish flames.

**Inappropriate Extinguishing Media:** Straight Streams of Water

#### FIRE FIGHTING

**Fire Fighting Instructions:** Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

**Hazardous Combustion Products:** Smoke, Fume, Aldehydes, Sulfur oxides, Incomplete combustion products, Oxides of carbon

#### FLAMMABILITY PROPERTIES

**Flash Point [Method]:** >227°C (441°F) [ASTM D-92]

**Flammable Limits (Approximate volume % in air):** LEL: 0.9 UEL: 7.0

**Autoignition Temperature:** N/D

## SECTION 6

### ACCIDENTAL RELEASE MEASURES

#### NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

## PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders. For emergency responders: Respiratory protection: respiratory protection will be necessary only in special cases, e.g., formation of mists. Half-face or full-face respirator with filter(s) for dust/organic vapor or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to hydrocarbons are recommended. Gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

## SPILL MANAGEMENT

**Land Spill:** Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

**Water Spill:** Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

## ENVIRONMENTAL PRECAUTIONS

**Large Spills:** Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

## SECTION 7

## HANDLING AND STORAGE

### HANDLING

Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

**Static Accumulator:** This material is a static accumulator.

### STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Do not store in open or unlabelled containers. Keep away from incompatible materials.

## SECTION 8

## EXPOSURE CONTROLS / PERSONAL PROTECTION

**Exposure limits/standards for materials that can be formed when handling this product:** When mists/aerosols can occur the following are recommended: 5 mg/m<sup>3</sup> - ACGIH TLV (inhalable fraction), 5 mg/m<sup>3</sup> - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

## ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

## PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

**Respiratory Protection:** If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

**Hand Protection:** Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

**Eye Protection:** If contact is likely, safety glasses with side shields are recommended.

**Skin and Body Protection:** Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

**Specific Hygiene Measures:** Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

Product Name: MOBIL DTE OIL EXTRA HEAVY

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## ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

## SECTION 9

## PHYSICAL AND CHEMICAL PROPERTIES

**Note:** Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

### GENERAL INFORMATION

**Physical State:** Liquid  
**Form:** Clear  
**Color:** Amber  
**Odor:** Characteristic  
**Odor Threshold:** N/D

### IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

**Relative Density (at 15 °C):** 0.89  
**Flash Point [Method]:** >227°C (441°F) [ASTM D-92]  
**Flammable Limits (Approximate volume % in air):** LEL: 0.9 UEL: 7.0  
**Autoignition Temperature:** N/D  
**Boiling Point / Range:** > 316°C (600°F)  
**Vapor Density (Air = 1):** > 2 at 101 kPa  
**Vapor Pressure:** < 0.013 kPa (0.1 mm Hg) at 20 °C  
**Evaporation Rate (n-butyl acetate = 1):** N/D  
**pH:** N/A  
**Log Pow (n-Octanol/Water Partition Coefficient):** > 3.5  
**Solubility in Water:** Negligible  
**Viscosity:** 146.2 cSt (146.2 mm<sup>2</sup>/sec) at 40 °C | 14.4 cSt (14.4 mm<sup>2</sup>/sec) at 100°C  
**Oxidizing Properties:** See Hazards Identification Section.

### OTHER INFORMATION

**Freezing Point:** N/D  
**Melting Point:** N/A  
**Pour Point:** -12°C (10°F)  
**DMSO Extract (mineral oil only), IP-346:** < 3 %wt

## SECTION 10

## STABILITY AND REACTIVITY

**STABILITY:** Material is stable under normal conditions.

**CONDITIONS TO AVOID:** Excessive heat. High energy sources of ignition.

**MATERIALS TO AVOID:** Strong oxidizers

**HAZARDOUS DECOMPOSITION PRODUCTS:** Material does not decompose at ambient temperatures.

**HAZARDOUS POLYMERIZATION:** Will not occur.

## SECTION 11

## TOXICOLOGICAL INFORMATION

## ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
<b>Inhalation</b>	
Toxicity (Rat): LC50 > 5000 mg/m3	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
<b>Ingestion</b>	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
<b>Skin</b>	
Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
<b>Eye</b>	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

## CHRONIC/OTHER EFFECTS

### Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

Additional information is available by request.

The following ingredients are cited on the lists below: None.

1 = NTP CARC  
 2 = NTP SUS

--REGULATORY LISTS SEARCHED--

3 = IARC 1  
 4 = IARC 2A

5 = IARC 2B  
 6 = OSHA CARC

## SECTION 12

## ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

### ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

### MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

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## PERSISTENCE AND DEGRADABILITY

### Biodegradation:

Base oil component -- Expected to be inherently biodegradable

### BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

## SECTION 13

## DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

### DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

### REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

**Empty Container Warning** Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. **DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.**

## SECTION 14

## TRANSPORT INFORMATION

**LAND (DOT):** Not Regulated for Land Transport

**LAND (TDG):** Not Regulated for Land Transport

**SEA (IMDG):** Not Regulated for Sea Transport according to IMDG-Code

**AIR (IATA):** Not Regulated for Air Transport

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## SECTION 15 REGULATORY INFORMATION

**OSHA HAZARD COMMUNICATION STANDARD:** When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

**Complies with the following national/regional chemical inventory requirements::** AICS, DSL, EINECS, ENCS, IECSC, KECI, PICCS, TSCA

**EPCRA:** This material contains no extremely hazardous substances.

**SARA (311/312) REPORTABLE HAZARD CATEGORIES:** None.

**SARA (313) TOXIC RELEASE INVENTORY:** This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP)	68649-42-3	15

### --REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

## SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

### THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:

- Section 06: Notification Procedures - Header was modified.
- Section 13: Disposal Considerations - Disposal Recommendations was modified.
- Section 10 Stability and Reactivity - Header was modified.
- Section 13: Disposal Recommendations - Note was modified.
- Section 09: Phys/Chem Properties Note was modified.
- Section 09: Boiling Point C(F) was modified.
- Section 08: Comply with applicable regulations phrase was modified.
- Section 08: Personal Protection was modified.
- Section 08: Hand Protection was modified.

Product Name: MOBIL DTE OIL EXTRA HEAVY

Revision Date: 30 Apr 2012

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Section 09: Vapor Pressure was modified.  
Section 07: Handling and Storage - Handling was modified.  
Section 07: Handling and Storage - Storage Phrases was modified.  
Section 11: Dermal Lethality Test Data was modified.  
Section 11: Oral Lethality Test Data was modified.  
Section 05: Hazardous Combustion Products was modified.  
Section 06: Accidental Release - Spill Management - Water was modified.  
Section 09: Relative Density - Header was modified.  
Section 09: Flash Point C(F) was modified.  
Section 09: Viscosity was modified.  
Section 09: Viscosity was modified.  
Section 14: Sea (IMDG) - Header was modified.  
Section 14: Air (IATA) - Header was modified.  
Section 14: LAND (TDG) - Header was modified.  
Section 14: LAND (DOT) - Header was modified.  
Section 15: List Citation Table - Header was modified.  
Section 14: LAND (DOT) - Default was modified.  
Section 14: LAND (TDG) Default was modified.  
Section 14: Sea (IMDG) - Default was modified.  
Section 14: Air (IATA) - Default was modified.  
Section 15: National Chemical Inventory Listing - Header was modified.  
Section 15: National Chemical Inventory Listing was modified.  
Section 16: Code to MHCs was modified.  
Section 08: Exposure limits/standards was modified.  
Hazard Identification: OSHA - May be Hazardous Statement was modified.  
Section 06: Notification Procedures was modified.  
Section 09: Oxidizing Properties was modified.  
Section 01: Company Contact Methods Sorted by Priority was modified.  
Section 06: Protective Measures was added.  
Section 06: Accidental Release - Protective Measures - Header was added.

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MHC: 0B, 0B, 0, 0, 0, 0

PPEC: A

DGN: 2007114XUS (1013921)

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**Safety Data Sheet: Natural Gas Condensates**

**1. Identification**

**Product Name: Natural Gas Condensates**

MSDS Number: A0021.sds

Synonyms: Liquids, Natural Gas; Sweet and Sour; (includes natural gasoline component)

Product Use: Natural gas production liquids

EP Energy

1001 Louisiana Street  
Houston, Texas 77002

Information: (713) 997-1000 or 855-269-0826

CHEMTREC: (800) 424-9300

**2. Hazard(s) Identification**

**Note:** This product has not been tested by EP Energy to determine its specific health hazards. Therefore, the information provided in this section includes health hazard information on the product components.

**Potential Health Effects from Overexposure:**

**Acute Effects:**

**Eyes:** Slight to moderate eye irritation. Contact may cause eye burns or injury. H<sub>2</sub>S is irritating and may cause pain and an increased production of tears.

**Skin:** Harmful if absorbed through skin. Contact may cause irritation and possibly dermatitis.

**Inhalation:** Irritating to mucous membrane and respiratory tract. Can act as a simple asphyxiant. May cause dizziness or asphyxiation without warning. Overexposure may lead to headache, nausea, drowsiness, fatigue, pneumonitis, pulmonary edema, CNS depression, coma and respiratory arrest. H<sub>2</sub>S is a mucous membrane and respiratory tract irritant. High concentrations of H<sub>2</sub>S, even briefly, may cause dizziness, drowsiness, tremors, pulmonary edema, and death. H<sub>2</sub>S acts as a chemical asphyxiant by paralyzing the respiratory center. Lower concentrations of H<sub>2</sub>S will produce symptoms such as headache, dizziness, excitement, staggering gait, diarrhea and dysuria. H<sub>2</sub>S is fibrogenic to the lungs following acute exposures complicated by bronchitis obliterans.

**Ingestion:** Stomach irritation, gastritis, headache, nausea, drowsiness, loss of consciousness, convulsions, cyanosis, pneumonitis, pulmonary edema and CNS depression, capillary hemorrhaging of the lung and internal organs. Aspiration hazard if vomiting occurs.

**Chronic Effects:**

Cancer hazard. Contains chemicals which may have reproductive toxicity, teratogenic or mutagenic effects. Due to presence of benzene and n-hexane, long-term exposure may increase the risk of anemia, leukemia and nervous system damage. Liver or kidney injury may occur. May cause central nervous system disorders and/or damage. Frequent or prolonged contact may lead to dermatitis. In regards to H<sub>2</sub>S exposure, CNS injury can be immediate and significant. Chronic low exposures to H<sub>2</sub>S may cause conjunctivitis, photophobia, bronchitis and headaches.

**Additional Medical and Toxicological Information:**

Contact with full strength or dilute formulations of this product may aggravate pre-existing dermatitis or respiratory disorders in certain individuals. n-butane has been shown to cause mild cardiac sensitization in laboratory test animals. H<sub>2</sub>S exposure may aggravate pre-existing lung ailments, gastrointestinal, cardiovascular and nervous disorders.

**3. Composition/Information**

**Note:** Composition will vary with geographic location, geologic formation, temperature and pressure.

Components	CAS No.	Wt% <sup>(1)</sup>
Propane	74-98-6	20-60
Ethane	74-84-0	1-60
n-Pentane	109-66-0	5-25
n-Hexane	110-54-3	2-13
Heptane	142-82-5	1-10
Octane	111-65-9	1-10
n-Butane	106-97-8	2-5
Cyclohexane	110-82-7	1-5
Toluene	108-88-3	0.1-5
Ethyl benzene	100-41-4	0.1-5
Xylenes	1330-20-7	0.1-5
Benzene	71-43-2	0-2
Hydrogen Sulfide	7783-06-4	Varies

## Safety Data Sheet: Natural Gas Condensates

<sup>(1)</sup>Normal composition ranges are shown. Exceptions may occur depending upon the source of the condensate.

### 4. First-Aid Measures

- Eye Contact:** Immediately flush gently with large amounts of luke warm water, holding eyelids open, for at least 15 minutes. Seek medical attention. If eye is exposed to hot liquid, cover eyes with cloth and seek immediate medical attention.
- Skin Contact:** Remove and isolate contaminated clothing and shoes. Flush skin with water. Seek medical attention if irritation persists or there is a large area of contact. Decontaminate clothing before reuse. In case of hot liquid exposure, do not remove clothing or treat, wash only unburned area and seek immediate medical attention.
- Inhalation:** If atmosphere is safe, move victim to fresh air. If breathing has stopped and airway is clear, provide artificial respiration. i. Do not use mouth-to-mouth method if victim ingested or inhaled the substance. Provide artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult, if qualified. Seek immediate medical attention.
- Ingestion:** DO NOT INDUCE VOMITING. If spontaneous vomiting occurs, place on the left side with head down to prevent aspiration of liquid into the lungs. Give 1-2 glasses of water if patient is alert and able to swallow. Have exposed individual rinse mouth thoroughly with water. Never give anything by mouth to an unconscious person. Do not leave victim unattended. Monitor for breathing difficulties. Seek immediate medical attention.

**Medical Providers:** Medical providers are urged to contact a Regional Poison Center at 800-222-1222.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents.

At high concentrations, H<sub>2</sub>S may produce pulmonary edema, respiratory depression, and/or respiratory paralysis.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

### 5. Fire-Fighting Measures

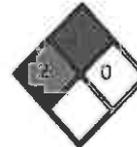
#### Flammable Properties:

Flash Point: -45 °F to -170 °F

Flammable Limits in Air % by Vol.:

Lower (LFL): 1.4-3.0 % Upper (UFL): 7.6-12.5 %

Auto-ignition Temperature: 495-850 °F



**NFPA Ratings:** Health: 2 Flammability: 4 Reactivity: 0

#### General Fire Hazards:

Extremely flammable. Easily ignited by heat, sparks or flames or other sources of ignition. Flowing condensates can be ignited by self-generated static electricity. Containers should be grounded and bonded. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may reach an ignition source, and flashback. Runoff to sewer may create fire or explosion hazard downstream from the source. Gases may form explosive mixtures with air. BLEVE'S (Boiling Liquid Expanding Vapor Explosions) can occur when a liquid in a pressurized container is heated to temperatures beyond its boiling point. This can lead to failure of the container and damage to the surrounding area.

Hazardous combustion/decomposition products may include carbon monoxide, carbon dioxide, hydrocarbons, nitrogen oxides, and sulfur oxides. Hydrogen sulfide may be present. Downwind personnel must be evacuated.

#### Extinguishing Media:

Suitable extinguishing media: Class B fire extinguisher, dry chemical, foam or carbon dioxide. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. For large fires, use unmanned hoses.

Unsuitable extinguishing media: Water should not be used as an extinguishing media, but should be used as a spray to keep surroundings area cool.

**Fire Fighting Instructions:** DO NOT extinguish a leaking gas flame unless the leak can be stopped. Allow gas to burn out. Move containers from fire area if you can do it without risk. Use a smothering technique for extinguishing fire of this flammable liquid. Do not use a forced-water stream directly on condensate fires as this will scatter the fire. Use a water spray to cool fire-exposed containers and surrounding areas until well after fire is out. Do not direct water at source of leak or safety devices as icing may occur. Dike fire-control water for later disposal; do not scatter the material. Firefighters should wear self-contained breathing apparatus and full protective clothing. Refer to Section 8 for proper PPE selection.

**Precautions for Fire Involving Tanks or Car/Trailer Loads:** If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions. Consider initial evacuation for 800 meters (1/2 mile) in all directions. ALWAYS stay away from tanks engulfed in flame. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. If unmanned hose

holders or monitor nozzles cannot be used, withdraw from area and let fire burn.

## 6. Accidental Release Measures

As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before re-entering.

Remove any ignition sources and protect from ignition. Water spray may reduce vapor, but may not prevent ignition in closed spaces. A vapor suppressing foam may be used to reduce vapors. Provide sufficient ventilation in the affected area(s) and wear appropriate personal protective equipment as indicated in Section 8 when handling spill material.

If the facility has an oil or hazardous substance contingency plan, activate its procedures. For emergency information and procedures to follow in the case of an accidental release, call the Emergency Telephone Number(s) listed in Section 1.

In case of spillage, absorb with inert material and dispose of in accordance with applicable regulations. Use clean, non-sparking tools to collect absorbed materials. Dike far ahead of liquid spill for later disposal. Never discharge releases directly into sewers or surface waters. Advise authorities and the National Response Center (800-424-8802) if the release is to navigable waters. Clean up in accordance with all applicable regulations.

## 7. Handling and Storage

Handle in accordance with good industrial hygiene and safety practices. These practices include, but are not limited to, avoiding unnecessary exposure and prompt removal of material from eyes, skin, and clothing. If needed, take first aid actions as indicated in Section 4.

**Handling:** Handle as a flammable liquid. Keep away from heat, sparks and open flame. No smoking. May release or contain dangerous levels of H<sub>2</sub>S. Use only with adequate ventilation. Wear appropriate personal protective equipment and use exposure controls as indicated in Section 8. Vent slowly to the atmosphere when opening. Avoid all contact with skin and eyes. Avoid breathing product dust or vapors. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Non-sparking tools should be used. Bond and ground containers before product transfer. Review all operations which have the potential of generating and accumulating electrostatic charge and/or flammable atmosphere including tank and container filling, cleaning, sampling gauging, switch loading, mixing, agitation and vacuum truck operations. Use appropriate mitigating procedures. Do not enter confined spaces without following proper entry procedures. Remove contaminated clothing immediately. Wash with soap and water after working with this product.

Scales, deposits and sludge from equipment associated with this product may have accumulation of Naturally Occurring Radioactive Materials (NORM). Equipment should be assessed for external gamma radiation.

**Storage:** Keep away from flame, sparks, excessive temperatures and open flame. No smoking. Maintain vessels closed and clearly labeled. Empty vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose these vessels to sources of ignition. This material may contain or release H<sub>2</sub>S. In a tank or other closed container, the vapor space above this material may accumulate hazardous concentrations of H<sub>2</sub>S. Do not enter confined spaces without following proper entry procedures. Ground all containers during transfer. Store away from incompatible materials. Use appropriate containment to avoid environmental contamination.

**Incompatibilities:** Keep away from strong oxidizers, ignition sources and heat.

8. Exposure Controls/Personal Protection

Components	CAS No.	Occupational Exposure Limits			Units
		OSHA <sup>(1)</sup>	ACGIH <sup>(1)</sup>	NIOSH <sup>(2)</sup>	
Ethane	74-84-0	N/A	1000 <sup>(3)</sup>	N/A	ppm
Propane	74-98-6	1000	1000 <sup>(3)</sup>	1000	ppm
n-Butane	106-97-8	N/A	1000 <sup>(3)</sup>	800	ppm
n-Pentane	109-66-0	1000	600	120 610 <sup>Ceiling</sup>	ppm
n-Hexane	110-54-3	500	50 <sup>(4)</sup>	50	ppm
Heptane	142-82-5	500	400 500 <sup>STEL</sup>	85 440 <sup>Ceiling</sup>	ppm
Octane	111-65-9	500	300	75 385 <sup>Ceiling</sup>	ppm
Cyclohexane	110-82-7	300	100	300	ppm
Toluene	108-88-3	200 300 <sup>Ceiling</sup>	20 <sup>(4)</sup>	100 150 <sup>STEL</sup>	ppm
Ethyl benzene	100-41-4	100	20 <sup>(4)</sup>	100 125 <sup>STEL</sup>	ppm
Xylenes	1330-20-7	100	100 <sup>(4)</sup> 150 <sup>STEL</sup>	100 150 <sup>STEL</sup>	ppm
Petroleum distillates, naphtha	8002-05-9	<1	500 ppm	N/A	350 mg/m <sup>3</sup>
Hydrogen Sulfide	7783-06-4	20 <sup>Ceiling</sup>	15 <sup>STEL</sup>	10 <sup>Ceiling</sup>	ppm
Benzene	71-43-2	1 5 <sup>STEL</sup>	0.5 <sup>(5)</sup> 2.5 <sup>STEL</sup>	0.1 1 <sup>STEL</sup>	ppm

<sup>(1)</sup>8-hour TWA unless otherwise specified.

<sup>(2)</sup>10-hour TWA unless otherwise specified.

<sup>(3)</sup>Exposure limit given as Aliphatic hydrocarbon gases: Alkanes [C<sub>1</sub>-C<sub>4</sub>].

<sup>(4)</sup>ACGIH has established a Biological Exposure Index (BEI) for this substance.

N/A: Not Applicable

STEL: 15-minute Short Term Exposure Limit

Ceiling: Concentration not to be exceeded at any time

**Eye Protection:** Safety glasses are required standard PPE. If contact with liquid condensates is possible, chemical splash goggles or face shield may be required. Ensure that eye wash station is operable and nearby.

**Skin Protection:** Fire Resistant Clothing (FRC) is required standard PPE. Where contact with liquid condensates is possible, use protective clothing and/or gloves made of nitrile rubber or polyvinyl alcohol (PVA). Wash with soap and water before eating, drinking or smoking. Wash contaminated clothing before reuse.

**Inhalation:** A NIOSH-approved respirator must be worn where controls do not maintain airborne concentrations below occupational exposure limits. Positive-pressure, full-face, self-contained breathing apparatus (SCBA) should be available for emergency use. HYDROGEN SULFIDE MAY BE PRESENT OR RELEASED. NIOSH-approved respiratory protection should be used when handling crude of high or unknown hydrogen sulfide content and to reduce airborne concentrations to allowable occupational exposure levels.

**Engineering Controls:** Provide adequate general and local exhaust ventilation to: (1) Maintain airborne chemical concentrations below applicable exposure limits, (2) Prevent accumulation of flammable vapors and formation of explosive atmospheres, and (3) Prevent formation of oxygen deficient atmospheres, especially in confined spaces.

9. Physical and Chemical Properties

Values given are typical of similar products. There are no test results for this mixture.

Appearance:	Brown to clear liquid	% Volatile by Volume:	100
Odor:	Petroleum-like, gasoline-like or rotten eggs	Viscosity:	Not available
Boiling Point:	Varies widely based on hydrocarbon content	Melting Point:	-122 °F
Freezing Point:	Not available	Vapor Density (Air = 1):	3-4 (natural gasoline)
Vapor Pressure:	Not available	pH:	Not available
Solubility in H <sub>2</sub> O:	Negligible	Evaporation Rate: (Ethyl Ether = 1)	> 1
Specific Gravity @ 60° F & 1 atm:	0.6-0.8	Molecular Wt.:	Not available

10. Stability and Reactivity

**Stability:** Stable under normal conditions of use and normal temperature conditions

**Hazardous Polymerization:** Will not occur.

**Conditions to Avoid/Incompatibilities:** Strong oxidizing agents, strong acids, chlorine, fluorine, bromine and metal catalysts, heat, sparks, flame and build-up of static electricity.

**Hazardous Decomposition Products:** Carbon monoxide, carbon dioxide, nitrogen oxides, hydrocarbons and sulfur dioxide.

11. Toxicological Information

Toxicological data does not exist for this mixture. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffers Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline. This substance may have a potential for sensitization. Exposure to light hydrocarbons in the same boiling range as this product have been associated in animal studies with effects to the central nervous system, peripheral nervous system, liver, and kidneys. The significance of these animal models to predict similar human response is uncertain. Observing good work practices and personal hygiene procedures can minimize potential risks to humans. Harmful if swallowed. May cause cancer.

**BENZENE:** This product contains benzene, which can cause degeneration in blood forming bone marrow leading to anemia which may further degrade to leukemia, a type of cancer. Acute benzene poisoning causes central nervous system depression. Chronic exposure affects the hematopoietic system causing blood disorders including anemia and pancytopenia. Mutagenic and clastogenic in mammalian and non-mammalian test systems. Reproductive or developmental toxicant only at doses that are maternally toxic based on tests with animals.

**HYDROGEN SULFIDE:** This product may contain or release hydrogen sulfide, which may be fatal if inhaled. Greater than 15-20 ppm continuous exposure can cause mucous membrane and respiratory tract irritation. 50-500 ppm can cause headache, nausea, dizziness, loss of reasoning and balance, difficulty breathing, fluid in the lungs and possible loss of consciousness. Greater than 500 ppm can cause rapid or immediate unconsciousness due to respiratory paralysis and death by suffocation unless removed from exposure and successfully resuscitated. Inhalation of a single breath at a concentration of 1000 ppm (0.1%) can cause immediate unconsciousness and death. Hydrogen sulfide is corrosive when moist. Skin contact may cause burns. There is a rapid loss of sense of smell on exposure to gas concentrations above 50 ppm. At high concentrations, individuals may not even recognize the odor before becoming unconscious.

**Carcinogenicity:**

Component (CAS No.)	ACGIH <sup>(1)</sup>	IARC Monographs <sup>(2)</sup>	US NTP	OSHA Regulated
Benzene (71-43-2)	A1	1	Yes	Yes
Ethyl benzene (100-41-4)	A3	2B	No	No
Toluene (108-88-3)	A4	3	No	No
Xylene (1330-20-7)	A4	3	No	No

<sup>(1)</sup>ACGIH Carcinogens: A1 = Confirmed human carcinogen, A2 = Suspected human carcinogen, A3 = Confirmed animal carcinogen with unknown relevance to humans, A4 = Not classifiable as a human carcinogen, A5 = Not suspected as a human carcinogen

<sup>(2)</sup>IARC Monographs: 1 = Carcinogenic to humans, 2A = Probably carcinogenic to humans, 2B = Possibly carcinogenic to humans, 3 = Not classifiable as to carcinogenicity to humans, 4 = Probably not carcinogenic to humans

12. Ecological information

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations. May be hazardous to waterways/wildlife.

13. Disposal Information

Do not dispose of waste into sewer. Do not allow this material to drain into sewers/water supplies. If discarded, this material meets the criteria of

## Safety Data Sheet: Natural Gas Condensates

# EP ENERGY

being an "ignitable" waste. If hydrogen sulfide, benzene, toluene and/or xylene are present in the waste, the waste may be considered a hazardous U-listed waste. Under RCRA, it is the responsibility of the user to determine, at the time of disposal, if the material meets federal, state, or local criteria to be defined as a hazardous waste.

### 14. Transport Information

Proper Shipping Name: Petroleum products, n.o.s (condensate)  
UN/Identification No: UN 1268  
Hazard Class: 3  
Packing Group: II  
ERG#: 128

Proper Shipping Name: Gasoline  
UN/Identification No: UN1203  
Hazard Class: 3  
Packing Group: II  
ERG#: 128

Additional Info: Dependent on the product's properties, the shipper may elect to classify as Gasoline UN1203 or Petroleum Crude Oil UN1267 - reference 49 CFR 172.101 for further description.

### 15. Regulatory Information

#### EPA SARA TITLE III

#### Section 302 EPCRA Extremely Hazardous Substances (EHS)

Product Component	CAS No.	Wt%	RQ, lb	TPQ, lb
Hydrogen Sulfide	7783-06-4	0.1-2	100	500

#### Section 304 CERCLA Hazardous Substances

Product Component	CAS No.	Wt%	RQ, lb
Benzene	71-43-2	0-5	10
Toluene	108-88-3	0.1-5	1000
Xylene	1330-20-7	0.1-5	100
Cyclohexane	110-82-7	0.1-5	1000
Hydrogen Sulfide	7783-06-4	0.1-2	100
Ethylbenzene	100-41-4	0.1-5	1000
n-Hexane	110-54-3	1-10	5000

#### Section 311/312 Hazard Categorization

Acute:	Chronic:	Fire:	Pressure:	Reactive:
Yes	Yes	Yes	Yes	No

#### Section 313 EPCRA Toxic Substances

Product Component	CAS No.	Wt. %
Benzene	71-43-2	0-5
Toluene	108-88-3	0.1-5
Xylene	1330-20-7	0.1-5
Cyclohexane	110-82-7	0.1-5
Hydrogen Sulfide	7783-06-4	0.1-2
Ethylbenzene	100-41-4	0.1-5
N-Hexane	110-54-3	1-10

#### EPA TSCA

All components are either on the U.S. EPA TSCA Inventory List, or are not regulated under TSCA.

Key: RQ = Reportable Quantity  
TPQ = Threshold Planning Quantity (EHS)

#### CALIFORNIA PROPOSITION 65 WARNING

Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm may be found in crude oil and petroleum products. Although it is possible to sufficiently refine a crude oil or its end products to remove the potential for cancer, we are advising that one or more of the listed chemicals may be present in some detectable quantities. Read and follow directions and use care when handling crude oil and petroleum products.

**16. Other Information**

Last Revision: 08/01/2012, Date Prepared: 10/27/1985

THIS INFORMATION RELATES ONLY TO THE SPECIFIC MATERIAL DESIGNATED AND MAY NOT BE VALID FOR SUCH MATERIAL USED IN COMBINATION WITH ANY OTHER MATERIALS OR IN ANY PROCESS. SUCH INFORMATION IS TO THE BEST OF THIS COMPANY'S KNOWLEDGE AND BELIEVED ACCURATE AND RELIABLE AS OF THE DATE INDICATED. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY OR COMPLETENESS. IT IS THE USER'S RESPONSIBILITY TO SATISFY THEMSELVES AS TO THE SUITABILITY AND COMPLETENESS OF SUCH INFORMATION FOR THEIR OWN PARTICULAR USE.

**Key/Legend:**

ACGIH - American Conference of Governmental Industrial Hygienists  
ADR - Agreement on Dangerous Goods by Road  
CAA - Clean Air Act  
CAS - Chemical Abstracts Service Registry Number  
CDG - Carriage of Dangerous Goods By Road and Rail Manual  
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act  
CFR - Code of Federal Regulations  
CNS - Central Nervous System  
EINECS - European Inventory of Existing Chemical Substances Registry Number  
ERG - Emergency Response Guidebook  
EPCRA - Emergency Planning and Community Right-to-Know Act  
GHS - Globally Harmonized System of Classification and Labeling of Chemicals  
IARC - International Agency for Research on Cancer  
IATA - International Air Transport Association  
ICAO - International Civil Aviation Organization  
IMDG - International Maritime Dangerous Goods Code  
IMO - International Maritime Organization  
MSDS - Material Safety Data Sheet  
N/E - Not Established  
NTP - National Toxicology Program  
OSHA - Occupational Safety and Health Administration  
PEL - Permissible Exposure Limit  
PPE - Personal Protective Equipment  
RCRA - Resource Conservation and Recovery Act  
RID - Regulations Concerning the International Transport of Dangerous Goods by Rail  
RQ - Reportable Quantities  
SARA - Superfund Amendments and Reauthorization Act of 1986  
SDS - Safety Data Sheet  
TCC - Tag Closed Cup  
TDG - Transportation of Dangerous Goods  
TLV - Threshold Limit Value  
TSCA - Toxic Substance Control Act  
UN/NA - United Nations / North American Number  
UNECE - United Nations Economic Commission for Europe  
US DOT - United States Department of Transportation  
US EPA - United States Environmental Protection Agency  
Vol. - Volume  
WHMIS - Workplace Hazardous Materials Information System

This is the end of MSDS A0021.sds



# MATERIAL SAFETY DATA SHEET

## 1. Product and Company Identification

**Material name** Produced water (sweet)  
**Version #** 01  
**Revision date** 04-27-2010  
**CAS #** Mixture  
**Synonym(s)** Crude Oil Separated Water, Salt Water Brine, Salt Water, Formation Water  
**Manufacturer/Supplier** Devon US Operations  
 20 North Broadway  
 Oklahoma City, OK 73102-8260  
 Telephone: (405) 235-3611  
 -  
 Devon Canadian Operations  
 Calgary, AB. T2P 4H2  
 2000, 400 – 3rd Avenue SW.  
 Telephone: (403) 232-7100  
**Emergency** Emergency Chemtrec:  
 Within the USA (800) 424-9300  
 Outside the USA (703) 527-3887  
 Devon Canada Emergency Phone:  
 (403) 232-7100

## 2. Hazards Identification

**Physical state** Liquid.  
**Appearance** Dirty colored liquid with a faint hydrocarbon odor.  
**Emergency overview** WARNING! Causes eye irritation.  
 This product may contain a small amount of hydrocarbons with a trace amount of benzene which may cause cancer and heritable genetic damage.  
**OSHA regulatory status** This preparation is not classified as dangerous according to Directive 1999/45/EC and its amendments. This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).  
**Potential health effects**  
**Routes of exposure** Eye contact. Skin contact. Ingestion. Inhalation.  
**Eyes** Causes eye irritation.  
**Skin** Prolonged or repeated skin contact may cause irritation. Human and animal studies show that benzene is absorbed through the skin. However, absorption through the skin is normally low because benzene evaporates rapidly. In most cases, any skin contact would also involve significant inhalation exposure.  
**Inhalation** No inhalation hazard under normal conditions. If misting occurs: may cause mild mucous membrane irritation of the nose, throat, and upper respiratory tract. Produced water may contain benzene which may cause cancer and cause blood disorders.  
**Ingestion** Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. The product may contain benzene which may cause cancer and cause blood disorders  
**Chronic effects** Contains benzene. Human epidemiology studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-producing system and serious blood disorders, including leukemia. Animal tests suggest that prolonged and/or repeated overexposure to benzene may damage the embryo/fetus. The relevance of these animal studies to humans has not been fully established.  
**Potential environmental effects** Not expected to be harmful to aquatic organisms.

## 3. Composition / Information on Ingredients

Components	CAS #	Percent
Water	7732-18-5	80-95
Calcium chloride	10043-52-4	0-20
Potassium Chloride	7447-40-7	0-20

Produced water (sweet)

Sodium chloride	7647-14-5	0-20
Benzene	71-43-2	<0.1

**Composition comments** May contain small amounts of condensate or crude oil as a contaminate. All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

#### 4. First Aid Measures

##### First aid procedures

###### Eye contact

In case of contact, immediately flush eyes with fresh water for at least 15 minutes while holding the eyelids open. Remove contact lenses if worn. Get medical attention if irritation persists.

###### Skin contact

Remove contaminated clothing and shoes. Wash affected area with mild soap and water. Get medical attention if irritation develops and persists.

###### Inhalation

If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Call a physician if symptoms develop or persist.

###### Ingestion

Rinse mouth thoroughly. Get medical attention if any discomfort occurs.

##### General advice

If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

#### 5. Fire Fighting Measures

##### Flammable properties

This product is not flammable; however sufficient hydrocarbon vapors may accumulate from oil or natural gas condensate floating on the surface of the produced water to cause a flash fire. The fire should burn out fairly rapidly depending on the amount of oil and natural gas condensate floating on the surface of the produced water.

##### Extinguishing media

###### Suitable extinguishing media

Dry chemical powder. Foam. Carbon dioxide (CO<sub>2</sub>).

##### Protection of firefighters

###### Protective equipment and precautions for firefighters

A fire would be associated with vapors related to oil or natural gas condensate floating on the surface of the produced water. Water maybe ineffective on flames and may even spread the fire but should be used to cool pressurized containers in the fire.

##### Special protective equipment for fire-fighters

Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with full face-piece operated in positive pressure mode. Use approved gas detectors in confined spaces.

##### Specific methods

Promptly isolate the scene by removing persons from the vicinity of the incident if there is a fire. Do not extinguish flames at leak because of the possibility of a uncontrolled re-ignition exists. If it is safe to do so, cut off fuel supply and/or allow fire to burn out. The fire should burn out fairly rapidly depending on the amount of oil and natural gas condensate floating on the surface of the produced water. If leak or spill has not ignited, water spray or ventilation can be used to disperse the vapors.

##### Hazardous combustion products

Sodium oxides. Carbon oxides.

#### 6. Accidental Release Measures

##### Personal precautions

Keep away from sources of ignition - No smoking. The vapors should dissipate fairly rapidly depend on the amount of oil and natural gas condensate floating on the surface of the produced water. Stay upwind. Keep unnecessary personnel away. See Section 8 of the MSDS for Personal Protective Equipment.

##### Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not allow to enter drains, sewers or watercourses.

##### Methods for containment

Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Prevent entry into waterways, sewer, basements or confined areas.

##### Methods for cleaning up

Recover by pumping (use an explosion-proof motor or hand pump) or by sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Where feasible and appropriate, remove contaminated soil or flush with fresh water. On water spills utilize absorbent material to remove oil and natural gas liquid from the surface of the water.

##### Other information

Avoid excess skin contact with spilled material.

## 7. Handling and Storage

### Handling

Handle as a flammable liquid. Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, discharging and sampling from storage tanks. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion. Keep away from heat, sparks, and open flame. Electrical equipment should be approved for classified area. Wear appropriate personal protective equipment (see section 8). Special precautions should be taken when entering or handling equipment in this type of produced water service because of possible radioactive contamination. All equipment should be checked for radioactivity or opened to the atmosphere and have forced ventilation applied for at least 4 hours prior to entry or handling. Avoid direct skin contact with any surface. Avoid generation of dust, smoke, fumes, etc. in the work area, or if they cannot be avoided, a tested and certified radionuclide dust respirator should be worn. Smoking, eating or drinking should be prohibited when working with the equipment. Workers should wash thoroughly with soap and water and discard contaminated clothing after entering or handling the equipment. Workers should wash hands and face before eating, drinking and smoking.

### Storage

Keep containers in well-ventilated area away from flame, sparks, excessive temperatures and open flames. Keep the containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition. Do not enter storage areas and confined spaces without adequate ventilation. Use appropriate respiratory protection if there is the potential to exceed the exposure limit(s). Vapors containing benzene may accumulate during storage and transport.

## 8. Exposure Controls / Personal Protection

### Occupational exposure limits

ACGIH		
Components	Type	Value
Benzene (71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
U.S. - OSHA		
Components	Type	Value
Benzene (71-43-2)	Ceiling	25 ppm
	STEL	5 ppm
	TWA	1 ppm
Canada - Alberta		
Components	Type	Value
Benzene (71-43-2)	STEL	8 mg/m <sup>3</sup>
		2.5 ppm
	TWA	1.6 mg/m <sup>3</sup> 0.5 ppm
Canada - British Columbia		
Components	Type	Value
Benzene (71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
Canada - Ontario		
Components	Type	Value
Benzene (71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
Calcium chloride (10043-52-4)	TWA	5 mg/m <sup>3</sup>
Canada - Quebec		
Components	Type	Value
Benzene (71-43-2)	STEL	15.5 mg/m <sup>3</sup>
		5 ppm
	TWA	3 mg/m <sup>3</sup> 1 ppm

### Engineering controls

Ensure adequate ventilation, especially in confined areas.

### Personal protective equipment

#### Eye / face protection

If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.

**Skin protection**

No special garments required. Wash contaminated clothing prior to reuse. Avoid unnecessary skin contamination with material. Use of chemical resistant gloves is advised to prevent skin contact.

**Respiratory protection**

No personal respiratory protective equipment normally required.

**General hygiene considerations**

Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Handle in accordance with good industrial hygiene and safety practice.

**9. Physical & Chemical Properties**

Appearance	Dirty colored liquid with a faint hydrocarbon odor.
Color	Varies from clear to dark brown.
Odor	Faint. Hydrocarbon-like.
Odor threshold	Not available.
Physical state	Liquid.
Form	Liquid.
pH	4.9 - 8.5
Melting point	Not available.
Freezing point	< 32 °F (< 0 °C)
Boiling point	212 °F (100 °C) Approx.
Flash point	Variable organic oil and dissolved gases are flammable.
Evaporation rate	0.36
Flammability	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	13.6 mm Hg @ 68°F (20°C)
Vapor density	< 1
Specific gravity	1.1 @ 68°F (20°C)
Solubility (water)	Complete
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.

**10. Chemical Stability & Reactivity Information**

Chemical stability	Stable.
Conditions to avoid	Keep away from heat, sparks and open flame.
Hazardous decomposition products	Carbon Dioxide. Water vapor. May produce oxides of sulfur. Incomplete combustion may generate carbon monoxide.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

**11. Toxicological Information****Toxicological data****Components****Test Results**

Calcium chloride (10043-52-4)

Acute Oral LD50 Rat: 1000 mg/kg

Acute Other LD50 Mouse: 42 mg/kg

Acute Inhalation LC50 Mouse: 9980 mg/l

Acute Inhalation LC50 Rat: 10000 mg/l 7 Hours

Acute Oral LD50 Mouse: 4700 mg/kg

Acute Oral LD50 Rat: 3306 mg/kg

Acute Other LD50 Mouse: 340 mg/kg

Benzene (71-43-2)

Produced water (sweet)

**Components**

Benzene (71-43-2)

Potassium Chloride (7447-40-7)

**Toxicological information****Local effects****Sensitization****Chronic effects****Carcinogenicity****ACGIH Carcinogens**

Benzene (CAS 71-43-2)

**IARC Monographs. Overall Evaluation of Carcinogenicity**

Benzene (CAS 71-43-2)

**US NTP Report on Carcinogens: Known carcinogen**

Benzene (CAS 71-43-2)

**US OSHA Specifically Regulated Substances: Cancer hazard**

Benzene (CAS 71-43-2)

**Epidemiology****Mutagenicity****Neurological effects****Reproductive effects****Teratogenicity****Further information****12. Ecological Information****Ecotoxicological data****Components**

Calcium chloride (10043-52-4)

Benzene (71-43-2)

Potassium Chloride (7447-40-7)

Sodium chloride (7647-14-5)

**Ecotoxicity****Environmental effects****Persistence and degradability****Test Results**

Acute Other LD50 Mouse: 0.000001 ml/kg

Acute Other LD50 Rat: 2.89 mg/kg

Acute Oral LD50 Rat: 2600 mg/kg

This product may contain detectable but varying quantities of the naturally occurring radioactive substance radon 222. The amount in the gas itself is not hazardous, but since radon rapidly decays ( $t_{1/2} = 3.82$  days) to form other radioactive elements including lead 210, polonium 210, and bismuth 210, equipment may be radioactive. The radon daughters are solids and therefore may attach to dust particles or form films and sludges in equipment. Inhalation, ingestion or skin contact with radon daughters can lead to the deposition of radioactive material in the lungs, bone, blood forming organs, intestinal tract, kidney and colon. Occupational exposure to radon and radon daughters has been associated with an increased risk of lung cancer in underground uranium miners. Follow the special precautions listed in handling and storage section of this document (see section 7).

Causes eye irritation. May cause skin irritation. May cause discomfort if swallowed.

Not a skin sensitizer.

No additional adverse health effects noted.

This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

A1 Confirmed human carcinogen.

1 Carcinogenic to humans.

Known carcinogen.

Cancer hazard.

No epidemiological data is available for this product.

No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

No data available.

Contains no ingredient listed as toxic to reproduction

No known human teratogenic effect.

This product has no known adverse effect on human health.

**Test Results**

EC50 Water flea (*Daphnia magna*): 52 mg/l 48 hours

LC50 Fathead minnow (*Pimephales promelas*): 3930 - 5360 mg/l 96 hours

EC50 Water flea (*Daphnia magna*): 8.76 - 15.6 mg/l 48 hours

EC50 Water flea (*Daphnia magna*): 8.76 - 15.6 mg/l 48 Hours

LC50 Rainbow trout, donaldson trout (*Oncorhynchus mykiss*): 5 mg/l 96 Hours

EC50 Water flea (*Daphnia magna*): 83 mg/l 48 hours

LC50 Western mosquitofish (*Gambusia affinis*): 435 mg/l 96 hours

EC50 Water flea (*Daphnia magna*): 340.7 - 469.2 mg/l 48 hours

LC50 American eel (*Anguilla rostrata*): 0 - 27260 mg/l 96 hours

Not expected to be harmful to aquatic organisms.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

None known.

Produced water (sweet)

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DVN NA MSDS

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<b>Bioaccumulation / Accumulation</b>	No data available.
<b>Partition coefficient (n-octanol/water)</b>	Not available.
<b>Mobility in environmental media</b>	No data available.

**13. Disposal Considerations**

<b>Disposal instructions</b>	Do not allow this material to drain into sewers/water supplies. This product, in its present state, when discarded or disposed of, is not a hazardous waste according to Federal regulations (40 CFR 261.4 (b)(4)). Under RCRA, it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste.
<b>Waste from residues / unused products</b>	Not applicable.
<b>Contaminated packaging</b>	Offer rinsed packaging material to local recycling facilities.

**14. Transport Information**

**DOT**  
Not regulated as dangerous goods.

**IATA**  
Not regulated as dangerous goods.

**IMDG**  
Not regulated as dangerous goods.

**TDG**  
Not regulated as dangerous goods.

**15. Regulatory Information**

<b>US federal regulations</b>	This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200. All components are on the U.S. EPA TSCA Inventory List.
<b>US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration</b>	
Benzene (CAS 71-43-2)	0.1 %
<b>US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance</b>	
Benzene (CAS 71-43-2)	Listed.

**CERCLA (Superfund) reportable quantity (lbs)**  
Benzene 10

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

<b>Hazard categories</b>	Immediate Hazard - Yes Delayed Hazard - No Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
<b>Section 302 extremely hazardous substance</b>	No
<b>Section 311 hazardous chemical</b>	No
<b>Drug Enforcement Agency (DEA)</b>	Not controlled
<b>WHMIS status</b>	Controlled
<b>WHMIS classification</b>	D2B - Other Toxic Effects-TOXIC
<b>WHMIS labeling</b>	



<b>State regulations</b>	This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.
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- US - California Hazardous Substances (Director's): Listed substance**  
Benzene (CAS 71-43-2) Listed.
- US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance**  
Benzene (CAS 71-43-2) Listed.
- US - California Proposition 65 - CRT: Listed date/Carcinogenic substance**  
Benzene (CAS 71-43-2) Listed: February 27, 1987 Carcinogenic.
- US - California Proposition 65 - CRT: Listed date/Developmental toxin**  
Benzene (CAS 71-43-2) Listed: December 26, 1997 Developmental toxin.
- US - California Proposition 65 - CRT: Listed date/Male reproductive toxin**  
Benzene (CAS 71-43-2) Listed: December 26, 1997 Male reproductive toxin.
- US - Massachusetts RTK - Substance: Listed substance**  
Benzene (CAS 71-43-2) Listed.
- US - New Jersey Community RTK (EHS Survey): Reportable threshold**  
Benzene (CAS 71-43-2) 500 LBS
- US - New Jersey RTK - Substances: Listed substance**  
Benzene (CAS 71-43-2) Listed.
- US - Pennsylvania RTK - Hazardous Substances: Listed substance**  
Benzene (CAS 71-43-2) Listed.
- US - Pennsylvania RTK - Hazardous Substances: Special hazard**  
Benzene (CAS 71-43-2) Special hazard.

**16. Other Information**

<b>Further information</b>	HMIS® is a registered trade and service mark of the NPCA.
<b>HMIS® ratings</b>	Health: 1 Flammability: 1 Physical hazard: 0
<b>NFPA ratings</b>	Health: 1 Flammability: 1 Instability: 0
<b>Disclaimer</b>	The information in the sheet was written based on the best knowledge and experience currently available.
<b>Issue date</b>	04-27-2010

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**ATTACHMENT O**

**Emissions Summary Sheets**

### G70-A EMISSIONS SUMMARY SHEET

Emission Point ID No.	Emission Point Type <sup>1</sup>	Emission Unit Vented Through This Point		Air Pollution Control Device		All Regulated Pollutants - Chemical Name/CAS <sup>2</sup> (Speciate VOCs & HAPs)	Maximum Potential Uncontrolled Emissions <sup>3</sup>		Maximum Potential Controlled Emissions <sup>4</sup>		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used <sup>5</sup>
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
1E	Upward Vertical Stack	HTR-1	GPU	None		NOx	0.15	0.66	0.15	0.66	Gas	EE
						CO	0.13	0.55	0.13	0.55	Gas	EE
						VOC	0.01	0.04	0.01	0.04	Gas	EE
						PM	0.01	0.05	0.01	0.05	Solid	EE
						HCOH	<0.01	<0.01	<0.01	<0.01	Gas	EE
						Total HAPs	<0.01	<0.01	<0.01	<0.01	Gas	EE
CO2e	181.2	794	181.2	794	Gas	EE						
2E	Upward Vertical Stack	HTR-2	GPU	None		NOx	0.15	0.66	0.15	0.66	Gas	EE
						CO	0.13	0.55	0.13	0.55	Gas	EE
						VOC	0.01	0.04	0.01	0.04	Gas	EE
						PM	0.01	0.05	0.01	0.05	Solid	EE
						HCOH	<0.01	<0.01	<0.01	<0.01	Gas	EE
						Total HAPs	<0.01	<0.01	<0.01	<0.01	Gas	EE
CO2e	181.2	794	181.2	794	Gas	EE						
3E	Upward Vertical Stack	HTR-3	GPU	None		NOx	0.15	0.66	0.15	0.66	Gas	EE
						CO	0.13	0.55	0.13	0.55	Gas	EE
						VOC	0.01	0.04	0.01	0.04	Gas	EE
						PM	0.01	0.05	0.01	0.05	Solid	EE
						HCOH	<0.01	<0.01	<0.01	<0.01	Gas	EE
						Total HAPs	<0.01	<0.01	<0.01	<0.01	Gas	EE
CO2e	181.2	794	181.2	794	Gas	EE						
4E	Fugitive	VRU	Un-Controlled Tank Emissions	VRU-1	VRU	NOx					Gas	EE
						CO					Gas	EE
						VOC	135.3	592.6	12.42	42.50	Gas	EE
						PM					Solid	EE
						HCOH					Gas	EE
						Total HAPs	4.4	19.2	0.221	1.38	Gas	EE
CO2e	478	2095	23.9	150.1	Gas	EE						

5E	Fugitive	TL-1	Condensate Truck Loading	None		NOx	12.42	1.86	12.42	1.86	Gas	EE
						CO					Gas	EE
						VOC					Gas	EE
						PM					Solid	EE
6E	Fugitive	TL-2	Water Truck Loading	None		Total HAPs	0.85	0.13	0.85	0.13	Gas	EE
						CO2e					Gas	EE
						NOx					Gas	EE
						CO					Gas	EE
7E	Upward Vertical Stack	CE-1	Engine	1C	NSCR	VOC	<0.01	<0.01	<0.01	<0.01	Gas	EE
						PM					Gas	EE
						HCOH					Solid	EE
						Total HAPs	<0.01	<0.01	<0.01	<0.01	Gas	EE
8E	Upward Vertical Stack	TEG-1	Thermoelectric Generator	None		CO2e	89.4	391	89.4	391	Gas	EE
						NOx					Gas	EE
						CO					Gas	EE
						VOC					Gas	EE
8E	Upward Vertical Stack	TEG-1	Thermoelectric Generator	None		PM	<0.01	<0.01	<0.01	<0.01	Gas	EE
						HCOH					Solid	EE
						Total HAPs	<0.01	<0.01	<0.01	<0.01	Gas	EE
						CO2e	2	7	2	7	Gas	EE

The EMISSION SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSIONS SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

1 Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.  
 2 List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS<sub>2</sub>, VOCs, H<sub>2</sub>S, Inorganics, Lead, Organics, O<sub>3</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, SO<sub>3</sub>, all applicable Greenhouse Gases (including CO<sub>2</sub> and methane), etc. DO NOT LIST H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, and Noble Gases (minute batch).

3 Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

4 Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

5 Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; M = modeling; O = other (specify).

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**ATTACHMENT P**

**Other Supporting Documentation**

# **Doc Well Pad Production Facility**

## **Attachment P**

### **Regulatory Analysis**

Both State and Federal environmental regulations governing air emissions apply to the planned Doc Well Pad Production Facility. The West Virginia Department of Environmental Protection (WVDEP) has been delegated the authority to implement certain federal air quality requirements for the state. Air quality regulations that potentially affect the modification are discussed herein.

#### **1.1 PSD and NSR**

The facility will be a minor source with respect to Prevention of Significant Deterioration (PSD) regulations as it will not have the potential to emit more than the annual emission thresholds of any PSD regulated pollutant with the voluntary restrictions (e.g., catalytic converter on the engine).

The facility is within an area designated as attainment for all criteria pollutants. Consequently, the facility is not subject to the New Source Review (NSR) regulations. Consequently, NSR requirements are not applicable to this project.

#### **1.2 Title V Operating Permit Program**

West Virginia has incorporated provisions of the federal Title V operating permit program. Thresholds for inclusion under the Title V program are 10 tpy of any single Hazardous Air Pollutant (HAP) or 25 tons of any combination of HAP and/or 100 tpy of all other regulated pollutants. Additionally, facilities regulated under certain New Source Performance Standards (NSPS) require facilities to have Title V permits.

The expanded facility will remain a minor source. Additionally, the NSPS regulating this facility does not trigger a Title V permit. Hence, a Title V permit will not be required for the Doc Well Pad Production Facility.

#### **1.3 Aggregation**

Source aggregation determinations are typically made based on the following criteria:

- Whether the facilities are under common control,
- Whether the facilities belong to the same Major Group (i.e. the first two digit code) as described in the Standard Industrial Classification Manual, 1972, as amended by the 1977 Supplement;
- Whether the facilities are located on one or more contiguous or adjacent properties; and the distance between all pollutant emitting activities,

- Whether the facilities can operate independently

Only if all criteria are met does a permitting authority aggregate the facilities into a single source.

This new Jay-Bee Oil & Gas facility will receive and manage raw natural gas and associated produced fluids from the contiguous Doc Well Pad. After separation of the liquids, the gas will be injected into gathering lines for transportation to either Jay-Bee's Big Moses Compressor Station or its Ketel Compressor Station for compression, dehydration and injection into a pipeline system for transportation to a regional natural gas processing plant owned and operated by others.

The Doc Well Pad Production Facility and the receiving Big Moses Compressor Station are under the same general SIC Code. They are also under common ownership and may, from time to time have a sharing of staff. However, Big Moses Compressor station is approximately 1.7 miles from the Doc Well Pad (see map in Attachment F), with no clear line of sight and properties owned by others in between. Additionally, as the gas can flow also flow to other compressor stations further away, there is no dependency of the Doc Well Pad Production Facility on this compressor station. Additionally, operation of this compressor station is not dependent upon the Doc Well Pad as it also receives gas from other well pads. Most importantly, the distance between the planned Doc Well Pad Production facility and the Big Moses Compressor Station does not rise to the definition of contiguous or adjacent. Thus, not all of the criteria for aggregation are met. Hence, emissions from the Doc Well Pad Production Facility should not be aggregated with those of the receiving Big Moses Compressor Station.

The closest Jay-Bee facility to the Doc Well Pad Production Facility is its Dopy Well Pad. As with the compressor station discussed above, this facility is under common ownership, under the same SIC code and may, from time to time, have a sharing of staff. However, these two well pads are approximately 4100 feet (0.78 miles) apart. Additionally, they are not on contiguous or adjacent parcels. Lastly, there is no interconnection or interdependency between these two facilities. Gas from one well pad does not flow to the other. Accordingly, the operation of one well pad is not dependent upon the operation of the other. Thus, given the lack of dependency and the distance of separation, emissions from these two well pads should not be aggregated.

#### **1.4 New Source Performance Standards**

New Source Performance Standards (NSPS) regulations promulgated under 40 CFR 60 require new and reconstructed facilities to control emissions to the level achievable by Best-Available Control Technology (BACT). Specific NSPS requirements potentially applicable to the Doc Well Pad Production Facility are as follows:

- 40 CFR 60, Subpart Dc—Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

- 40 CFR 60, Subpart KKK – Equipment Leaks of VOC from Onshore Natural Gas Processing Stations
- 40 CFR 60, Subpart LLL – Onshore Natural Gas Processing Stations: SO<sub>2</sub> Emissions
- 40 CFR 60, Subpart JJJJ – Stationary Spark Ignition Internal Combustion Engines
- 40 CFR 60, Subpart OOOO - Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution

#### 1.4.1 Subpart Dc

This subpart limits SO<sub>2</sub> and PM emissions from boilers and heaters fired by various fuels. While the primary thrust of this set of regulations is to control SO<sub>x</sub> and PM emissions from coal and oil-fired boilers and heaters, natural gas fired units are also covered under this rule. The planned Gas Processing Units have heat inputs that are well below the threshold of coverage for this rule (10 MMBTU/Hr). Thus, this rule does not apply.

#### 1.4.2 Subpart KKK

This subpart limits VOC emissions from equipment at a natural gas processing station. The planned Doc Well Pad Production Facility does not meet the definition of a processing station under this rule. Hence, this rule does not apply.

#### 1.4.3 Subpart LLL

This set of regulations governs emissions from processes used to remove sulfur gases from the field gas stream (sweetening unit) and subsequent sulfur recovery operations. The field gas that will be received by the Doc Well Pad Production Facility does not contain sufficient sulfur compounds to warrant a sweetening unit. Accordingly, not such equipment will be present. Hence, this rule does not apply.

#### 1.4.4 Subpart IIII

This subpart governs emissions from new compression ignition internal combustion engines (CI ICE) manufactured after July 11, 2005. There will be no compression ignition engines (e.g. diesel-fired emergency generator) at this station. Hence, this rule does not apply.

#### 1.4.5 Subpart JJJJ

This subpart governs emissions from new stationary spark ignition internal combustion engines (SI ICE) manufactured after July 1, 2007. The driver for the Vapor Recovery Unit will be SI ICE units manufactured after this date. Accordingly, this rule applies to this engine. More specifically, 60.4233(d) stipulates that non-emergency natural gas-fired rich burn engines 25-100 HP must comply with the emission standards of 40 CFR 1048.101(c). According to this rule, there are only NO<sub>x</sub> and CO limitations for engines of this size and fueled by natural gas. Thus, NO<sub>x</sub> must be less than 3.8 g/kW-hr and CO must be less than 6.5 g/kW-hr. Given that 1 kW equals 1.341 Hp, this is equivalent to 2.8 g/bhp-hr for NO<sub>x</sub> and 4.8 g/bhp-hr for CO. The controlled engine emissions will meet this standard.

#### 1.4.6 Subpart OOOO

This subpart governs emissions from a broad spectrum of operations in the oil and natural gas industries, including operations at natural gas well pads. The potentially applicable sections of this rule sets restrictions, recordkeeping and reporting requirements on emissions from storage vessels with potential VOC emissions greater than 6 tons per year, fugitive emissions, reciprocating compressors and pneumatic controllers. This rule applies to the Doc Well Pad Production Facility.

One of the key components to this rule [40 CFR 60.5390(b)] applicable to the Doc Well Pad Production Facility is the requirement that all pneumatic controllers located between the well head and a processing plant must have a bleed rate of less than 6 scfh. All pneumatic controllers to be installed at Doc Well Pad Production Facility will meet these criteria.

This rule also stipulates that storage vessels with VOC emissions equal to or greater than 6 tpy must control those emissions by 95% by October 15, 2013. The condensate tanks at Doc will have an estimated *uncontrolled* VOC emission rate well in excess of this threshold. Thus, emissions from these tanks must be controlled by at least 95%. Jay-Bee Oil & Gas will meet this requirement through installation of a system that will capture vapors released from the tank and route them to a vapor recovery unit. This unit will control VOC emissions to at least 95%, fulfilling this regulatory requirement.

### 1.5 **National Emission Standards for Hazardous Air Pollutants**

National Emission Standards for Hazardous Air Pollutants (NESHAPs) promulgated under 40 CFR 63 regulate the emission of Hazardous Air Pollutants (HAPs) from certain industrial processes. In general, these rules apply to major sources of HAPs with a major source being defined as having the potential to emit more than 10 tpy of any individual HAP or 25 tpy of total HAPs. Emissions standards under these rules have been established as the Maximum Achievable Control Technology (MACT) for each source category. The following NESHAP source category standards are potentially applicable to the planned Doc Well Pad Production Facility:

- 40 CFR 63, Subpart ZZZZ – NESHAP from Stationary Reciprocating Internal Combustion Engines
- 40 CFR 63, Subpart DDDDD – NESHAP for Industrial, Commercial and Institutional Boilers and Process Heaters

#### 1.5.1 Subpart ZZZZ

This Subpart governs emissions from a stationary reciprocating internal combustion engine (RICE) located both at major and area source of HAPs. The facility will not be a major source of HAPs, but will be considered an area source of HAPs. Hence, this rule is potentially applicable to

the facility. In accordance with 40 CFR 63.6590(a)(2)(iii), the single engine at the planned Doc Well Pad Production Facility will not be considered an Existing Stationary RICE. Rather, it will be considered “new” engine. Thus, the engine will meet the requirements of this rule by meeting the requirements of NSPS, Subpart JJJJ as described above.

#### 1.5.2 Subpart DDDDD

This Subpart applies to industrial boilers and process heaters of various sizes and fuel types located at facilities that are classified as a major source of HAPs. As the planned facility is not a major source of HAPs, this rule does not apply.

### 1.6 **Chemical Accident Prevention**

Subparts B-D of 40 CFR 68 present the requirements for the assessment and subsequent preparation of a Risk Management Plan (RMP) for a facility that stores more than a threshold quantity of a regulated substance listed in 40 CFR 68.130. If a facility stores, handles or processes one or more regulated substances in an amount greater than its corresponding threshold, the facility must prepare and implement an RMP. The Doc Well Pad Production Facility will potentially store more than 10,000 lbs of a flammable mixture containing several of the substances listed in Table 3 in 40 CFR 68.130. However, an RMP is not required as this facility qualifies for the exclusion provided for remote oil and gas production facilities (40 CFR 68.115).

### 1.7 **West Virginia State Requirements**

#### 1.7.1 45 CSR 2

The purpose of 45CSR2 is to control smoke and particulate matter emissions from fuel burning units. The facility is subject to the opacity requirement of 45 CSR 2. Emissions from the facility cannot exceed 10% over any six minute period.

#### 1.7.2 45 CSR 4

This regulation prohibits the emission of objectionable odors. Jay-Bee Oil & Gas is obligated to run the station in a manner that does not produce objectionable odors.

#### 1.7.3 45 CSR 6

This rule establishes emission standards for particulate matter and other requirements for incineration of refuse not subject to or specifically exempted from federal regulation. The Vapor Recovery Unit (VRU) falls under Section 4.1 of this rule. PM emissions from the VRU must remain below the allowable limit calculated under this rule.

The VRU must also meet the visible emissions requirements of this rule limiting visible emissions to 20% opacity.

#### 1.7.4 45 CSR 10

This regulation limits emissions of sulfur oxides. As the sulfur content of the Inlet Gas contains no measurable sulfur, emissions of sulfur oxides is negligible. Thus, while parts of this rule are applicable to the planned facility, no actions are required on the part of Jay-Bee Oil & Gas to attain compliance. The various non-engine combustion units have a design heat input less than 10 MMBTU/Hr and are therefore exempt from the requirements of this rule.

#### 1.7.5 45 CSR 13

The state regulations applicable to the permitting of the proposed construction are in Title 45 Series 13 of the Code of State Regulations. The proposed Doc Well Pad Production Facility has the potential to emit several regulated pollutants in excess of the thresholds that define a Stationary Source.

When taking into consideration the voluntary limit to operate the engines equipped with catalysts only when the catalytic converters are properly functioning, the facility's potential to emit is less than the thresholds that would classify the facility as a Major Source under 45 CSR 14.

#### 1.7.6 45 CSR 16

This series of regulations is an incorporation, by reference, of the New Source Performance Standards codified under 40 CFR 60. As discussed under the federal regulations, the Doc Well Pad Production Facility is subject to the emission limitations, monitoring, testing and recordkeeping of Subpart JJJJ. The facility is also subject to Subpart OOOO.

#### 1.7.7 45 CSR 30

The state regulations applicable to Title V operating permits are in Title 45 Series 30. The planned Doc Well Pad Production Facility, as noted above, does not have the potential to emit any regulated pollutant about the threshold that would define it as a major facility. Additionally, although the facility is subject to certain New Source Performance Standards, the NSPS applicable to this facility do not trigger the need to submit a Title V application and obtain a Title V permit. Hence this rule is not applicable.

#### 1.7.8 Other Applicable Requirements

Through Series 34, WVDEP has adopted the National Emission Standards for Hazardous Air Pollutants for Source Categories. Both of these topics have been addressed above.