# JAY-BEE OIL & GAS, INC.

## APPLICATION FOR MODIFICATION OF GENERAL PERMIT

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

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

# APPLICATION FOR G70-D GENERAL PERMIT

## Jay-Bee Oil & Gas, Inc.

### Larry Well Pad Production Facility

### Tyler County, West Virginia

**Table of Contents**

# SECTION I

# Application Form

west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25 4
Phone (304) 926-0475
Fax (304) 926-0479
www.dep.wv.gov

# G70-D GENERAL PERMIT REGISTRATION APPLICATION

**PREVENTION AND CONTROL OF AIR POLLUTION IN REGARD TO THE CONSTRUCTION, MODIFICATION, RELOCATION, ADMINISTRATIVE UPDATE AND OPERATION OF NATURAL GAS PRODUCTION FACILITIES LOCATED AT THE WELL SITE**

☐CONSTRUCTION
☒MODIFICATION
☐RELOCATION
☐CLASS I ADMINISTRATIVE UPDATE
☐CLASS II ADMINISTRATIVE UPDATE

## SECTION 1. GENERAL INFORMATION

Name of Applicant (as registered with the WV Secretary of State's Office): **Jay-Bee Oil & Gas, Inc.**

Federal Employer ID No. (FEIN): **55-073-8862**

Applicant's Mailing Address: **3570 Shields Hill Rd**

| City: Cairo | State: WV | ZIP Code: 26337 |
|---|---|---|

Facility Name: **Larry Well Pad Production Facility**

Operating Site Physical Address: Off Klondike Acres Rd
If none available, list road, city or town and zip of facility.

| City: Middlebourne | Zip Code: 26149 | County: Tyler |
|---|---|---|

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: 39.47509
Longitude: -80.88063

| SIC Code: 1311 | SIC Code: 1311 |
|---|---|
| NAICS Code: 211111 | NAICS Code: 211111 |

## CERTIFICATION OF INFORMATION

This G70-D 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 the 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, 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 G70-D Registration Application will be returned to the applicant. Furthermore, if the G70-D forms are not utilized, the application will be returned to the applicant. No substitution of forms is allowed.**

I hereby certify that 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 Division of Air Quality immediately.

I hereby certify that all information contained in this G70-D 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.

Responsible Official Signature: _____
Name and Title: **Shane Dowell, Office Manager** Phone: **304-628-3119** Fax:
Email: **sdowell@jaybeeoil.com** Date:

If applicable:
Authorized Representative Signature: _____
Name and Title: Phone: Fax:
Email: Date:

If applicable:
Environmental Contact
Name and Title: Phone: Fax:
Email: Date:

| OPERATING SITE INFORMATION |
|---|
| Briefly describe the proposed new operation and/or any change(s) to the facility: Jay-Bee is seeking approval for installation of a compressor engine. There are no other proposed changes to the facility at this time. |
| Directions to the facility:<br>From Middlebourne, proceed southwest on State Route 18 (Main Street) out of town. Turn right onto Bridgeway Rd. Turn left onto Wick Rd and follow for approximately 2.0 miles. Turn left onto Klondike Acres Rd and follow for approximately 1.5 miles to well pad entrance. |

| ATTACHMENTS AND SUPPORTING DOCUMENTS | |
|---|---|
| **I have enclosed the following required documents:** | |
| Check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR13 and 45CSR22).<br><br>☒ Check attached to front of application.<br>☐ I wish to pay by electronic transfer. Contact for payment (incl. name and email address):<br>☐ I wish to pay by credit card. Contact for payment (incl. name and email address):<br><br>☒$500 (Construction, Modification, and Relocation) ☐$300 (Class II Administrative Update)<br>☒$1,000 NSPS fee for 40 CFR60, Subpart IIII, JJJJ, OOOO and/or OOOOa [1]<br>☐$2,500 NESHAP fee for 40 CFR63, Subpart ZZZZ and/or HH [2]<br><br>[1] Only one NSPS fee will apply.<br>[2] Only one NESHAP fee will apply. The Subpart ZZZZ NESHAP fee will be waived for new engines that satisfy requirements by complying with NSPS, Subparts IIII and/or JJJJ.<br>*NSPS and NESHAP fees apply to new construction or if the source is being modified.* | |
| ☒ Responsible Official or Authorized Representative Signature (if applicable) | |
| ☒ Single Source Determination Form **(must be completed)** – Attachment A | |
| ☐ Siting Criteria Waiver (if applicable) – Attachment B | ☒ Current Business Certificate – Attachment C |
| ☒ Process Flow Diagram – Attachment D | ☒ Process Description – Attachment E |
| ☒ Plot Plan – Attachment F | ☒ Area Map – Attachment G |
| ☒ G70-D Section Applicability Form – Attachment H | ☒ Emission Units/ERD Table – Attachment I |
| ☒ Fugitive Emissions Summary Sheet – Attachment J | |
| ☒ Gas Well Affected Facility Data Sheet (if applicable) – Attachment K | |
| ☐ Storage Vessel(s) Data Sheet (include gas sample data, USEPA Tanks, simulation software (e.g. ProMax, E&P Tanks, HYSYS, etc.), etc. where applicable) – Attachment L | |
| ☐ Natural Gas Fired Fuel Burning Unit(s) Data Sheet (GPUs, Heater Treaters, In-Line Heaters if applicable) – Attachment M | |
| ☒ Internal Combustion Engine Data Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment N | |
| ☐ Tanker Truck/Rail Car Loading Data Sheet (if applicable) – Attachment O | |
| ☐ Glycol Dehydration Unit Data Sheet(s) (include wet gas analysis, GRI- GLYCalc™ input and output reports and information on reboiler if applicable) – Attachment P | |
| ☒ Pneumatic Controllers Data Sheet – Attachment Q | |
| ☒ Pneumatic Pump Data Sheet – Attachment R | |
| ☐ Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment S | |
| ☒ Emission Calculations (please be specific and include all calculation methodologies used) – Attachment T | |
| ☒ Facility-wide Emission Summary Sheet(s) – Attachment U | |
| ☒ Class I Legal Advertisement – Attachment V | |
| ☒ One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments | |

**All attachments must be identified by name, divided into sections, and submitted in order.**

# SECTION II

# Attachments

## ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

Classifying multiple facilities as one "stationary source" under 45CSR13, 45CSR14, and 45CSR19 is based on the definition of Building, structure, facility, or installation as given in §45-14-2.13 and §45-19-2.12. The definition states:

*"Building, Structure, Facility, or Installation" means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities are a part of the same industrial grouping if they belong to the same "Major Group" (i.e., which have the same two (2)-digit code) as described in the Standard Industrial Classification Manual, 1987 (United States Government Printing Office stock number GPO 1987 0-185-718:QL 3).*

The Source Determination Rule for the oil and gas industry was published in the Federal Register on June 3, 2016 and will become effective on August 2, 2016. EPA defined the term "adjacent" and stated that equipment and activities in the oil and gas sector that are under common control will be considered part of the same source if they are located on the same site or on sites that share equipment and are within ¼ mile of each other.

Is there equipment and activities in the same industrial grouping (defined by SIC code)?
Yes ☐ No ☒

Is there equipment and activities under the control of the same person/people?
Yes ☐ No ☒

Is there equipment and activities located on the same site or on sites that share equipment and are within ¼ mile of each other?
Yes ☐ No ☒

**The proposed modification to this facility will not change the previous single source determination. Additionally, there have been no other Jay-Bee facilities installed in proximity to this facility since that previous determination.**

## ATTACHMENT C – CURRENT BUSINESS CERTIFICATE

If the applicant is a resident of West Virginia, the applicant should provide a copy of the current Business Registration Certificate issued to them from the West Virginia Secretary of State's Office. If the applicant is not a resident of the State of West Virginia, the registrant should provide a copy of the Certificate of Authority/Authority of LLC/Registration. This information is required for all sources to operate a business in West Virginia regardless of whether it is a construction, modification, or administrative update.

If you are a new business to West Virginia and have applied to the West Virginia Secretary of State's Office for a business license, please include a copy of your application.

Please note: Under the West Virginia Bureau of Employment Programs, 96CSR1, the DAQ may not grant, issue, or renew approval of any permit, general permit registration, or Certificate to Operate to any employing unit whose account is in default with the Bureau of Employment Programs Unemployment Compensation Division.

Attached Current WV Business Certificate

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

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

BUSINESS REGISTRATION ACCOUNT NUMBER: **1043-4424**

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 s. 11-12.*

*The person or organization identified on this certificate is registered to conduct business in the State of West Virginia at the location above.*

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

This certificate shall be permanent 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 shall be considered a cessation 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.

atl.006 v.1
L1388190464

SCANNED

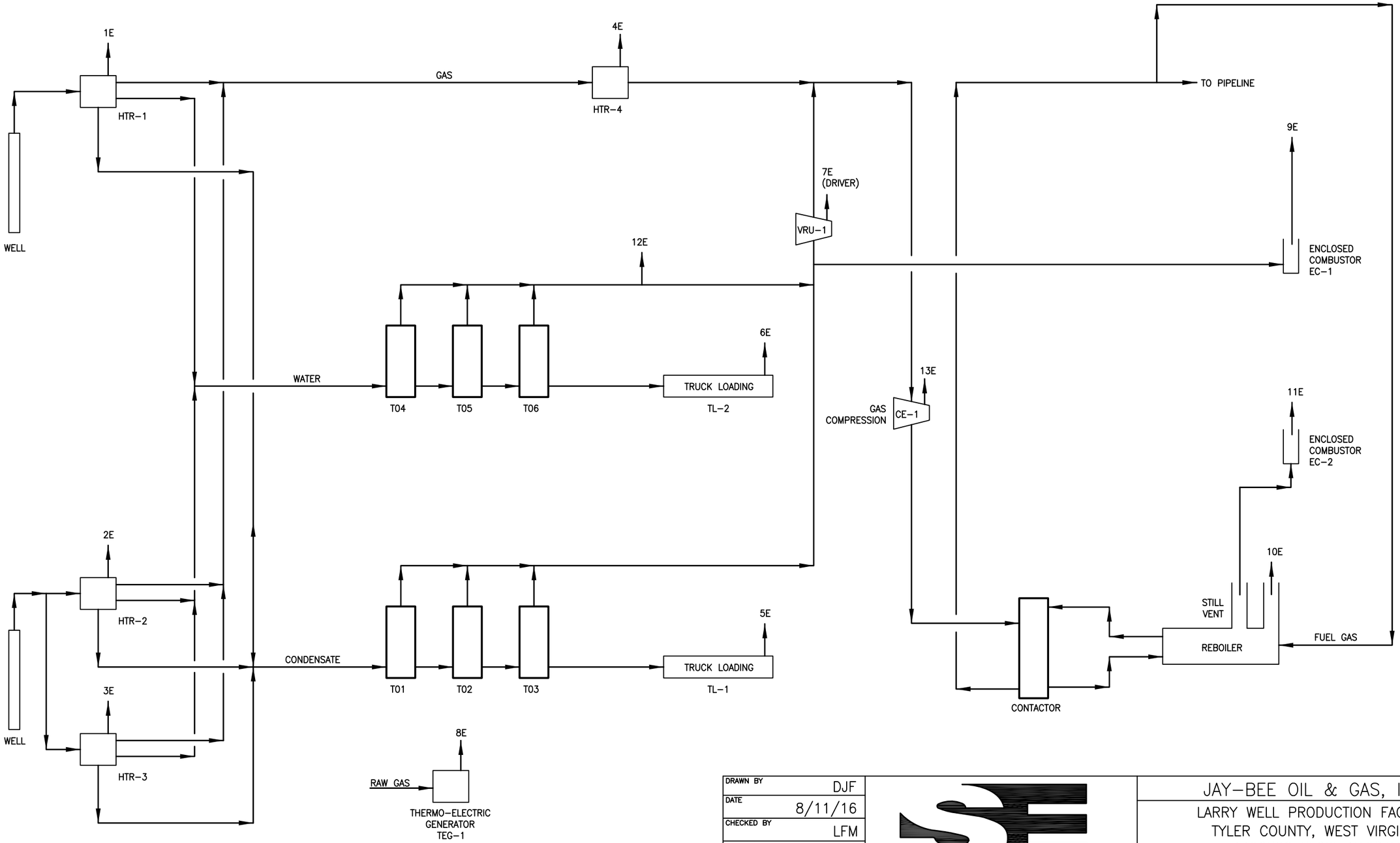
JUN 24 2010

## ATTACHMENT D – PROCESS FLOW DIAGRAM

Provide a diagram or schematic that supplements the process description of the operation. The process flow diagram must show all sources, components or facets of the operation in an understandable line sequence of operation. The process flow diagram should include the emission unit ID numbers, the pollution control device ID numbers, and the emission point ID numbers consistent with references in other attachments of the application. For a proposed modification, clearly identify the process areas, emission units, emission points, and/or control devices that will be modified, and specify the nature and extent of the modification.

Use the following guidelines to ensure a complete process flow diagram:

- The process flow diagram shall logically follow the entire process from beginning to end.
- Identify each emission source and air pollution control device with proper and consistent emission unit identification numbers, emission point identification numbers, and control device identification numbers.
- The process flow lines may appear different for clarity. For example, dotted lines may be used for vapor flow and solid lines used for liquid flow and arrows for direction of flow.
- The process flow lines may be color coded. For example: new or modified equipment may be red; old or existing equipment may be blue; different stages of preparation such as raw material may be green; and, finished product or refuse, another color.




| | |
|---|---|
| DRAWN BY | DJF |
| DATE | 8/11/16 |
| CHECKED BY | LFM |
| SET JOB NO. | 214054-18 |
| SET DWG FILE | LARRY FDb01.dwg |
| DRAWING SCALE | N.T.S. |


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


JAY-BEE OIL & GAS, INC.

LARRY WELL PRODUCTION FACILITY
TYLER COUNTY, WEST VIRGINIA
PROCESS FLOW DIAGRAM

DRAWING NAME: FIGURE 3

REV. 2

## ATTACHMENT E – PROCESS DESCRIPTION

Provide a detailed written description of the operation for which the applicant is seeking a permit. The process description is used in conjunction with the process flow diagram to provide the reviewing engineer a complete understanding of the activity at the operation. Describe in detail and order the complete process operation.

Use the following guidelines to ensure a complete Process Description:

- The process flow diagram should be prepared first and used as a guide when preparing the process description. The written description shall follow the logical order of the process flow diagram.
- All emission sources, emission points, and air pollution control devices must be included in the process description.
- When modifications are proposed, describe the modifications and the effect the changes will have on the emission sources, emission points, control devices and the potential emissions.
- Proper emission source ID numbers must be used consistently in the process description, the process flow diagram, the emissions calculations, and the emissions summary information provided.
- Include any additional information that may facilitate the reviewers understanding of the process operation.

The process description is required for all sources regardless of whether it is a construction, modification, or administrative update.

# Jay-Bee Oil & Gas, Incorporated
# Larry Well Pad Production Facility
# Attachment E
# Process Description

Jay-Bee is seeking approval for installation of a compressor engine. There are no other proposed changes to the facility at this time.

Currently, Natural gas and Produced Fluids (condensate and water) are received from three wells and passed through Gas Processing Units (one per Marcellus well and two per Utica well) to avoid ice formation during subsequent pressure drops. These materials pass through a three-way separator where gas, condensate and water are separated. All gas fired equipment use natural gas produced at the site as fuel. The Facility will then compress (proposed modification) and then dehydrate the gas. The gas is then injected into a gathering pipeline owned and operated by others.

Both Condensate and Produced Water are accumulated in six (6) 210 BBL tanks (three for Condensate and three for Produced Water), pending truck transportation by others. The Condensate is transported to a regional processing facility and the Produced Water is transported to a regional disposal facility. Flash, working and breathing losses from these tanks is routed to a Vapor Recovery Unit (VRU) with the captured vapors routed back to the raw gas discharge line. An enclosed combustor is utilized as a backup control device for times when the VRU is not available, and is also utilized if a large slug of condensate production generates flash gas in excess of the capacity of the VRU. A capture and control efficiency of 98% is being claimed for this overall combination of controls.

The dehydration unit generates emissions from the still vent and re-boiler. There is no flash tank. Vapors from the still vent are comprised of water and various low molecular weight hydrocarbons. Still vent vapors are routed to an enclosed combustor. A capture and control efficiency of 98% is being claimed for the combustor. Although needs are anticipated to be minimal, supplemental re-boiler fuel is available from the dehydrated gas stream prior to injection into the sales line. Any water condensing in the still vent column is routed to the wastewater tanks.

A Thermo-electric generator to meet the minor electric demands for various monitoring and data tracking equipment has also been installed at this facility.

In summary, upon approval of this application, emission sources at this facility will include the following:

- Three Gas Processing Units (GPUs), each with a 1.5 MMBTU/hr heater (Sources 1E, 2E and 3E).
- One Line Heater (Source 4E).
- Condensate Truck Loading (Source 5E)
- Produced Water Truck Loading (Source 6E)
- One Vapor Recovery Unit (VRU) with driver engine (Source 7E), controlling emissions from T01-T06.
- One Thermo-electric Generator (Source 8E)
- Backup Enclosed Combustor for VRU (Source 9E)
- Three Produced Water Tanks (T01-T03)
- Three Condensate Tanks (T04-T06)
- Dehydration Unit (Source 10E – reboiler vent and 11E – still vent)
- Enclosed Combustor for control of still vent (Source 11E)
- Un-captured/un-controlled emissions associated with VRU (Source 12E)
- One Caterpillar G2516BLE compressor engine (Source 13E) **– NEW SOURCE**

## ATTACHMENT F – PLOT PLAN

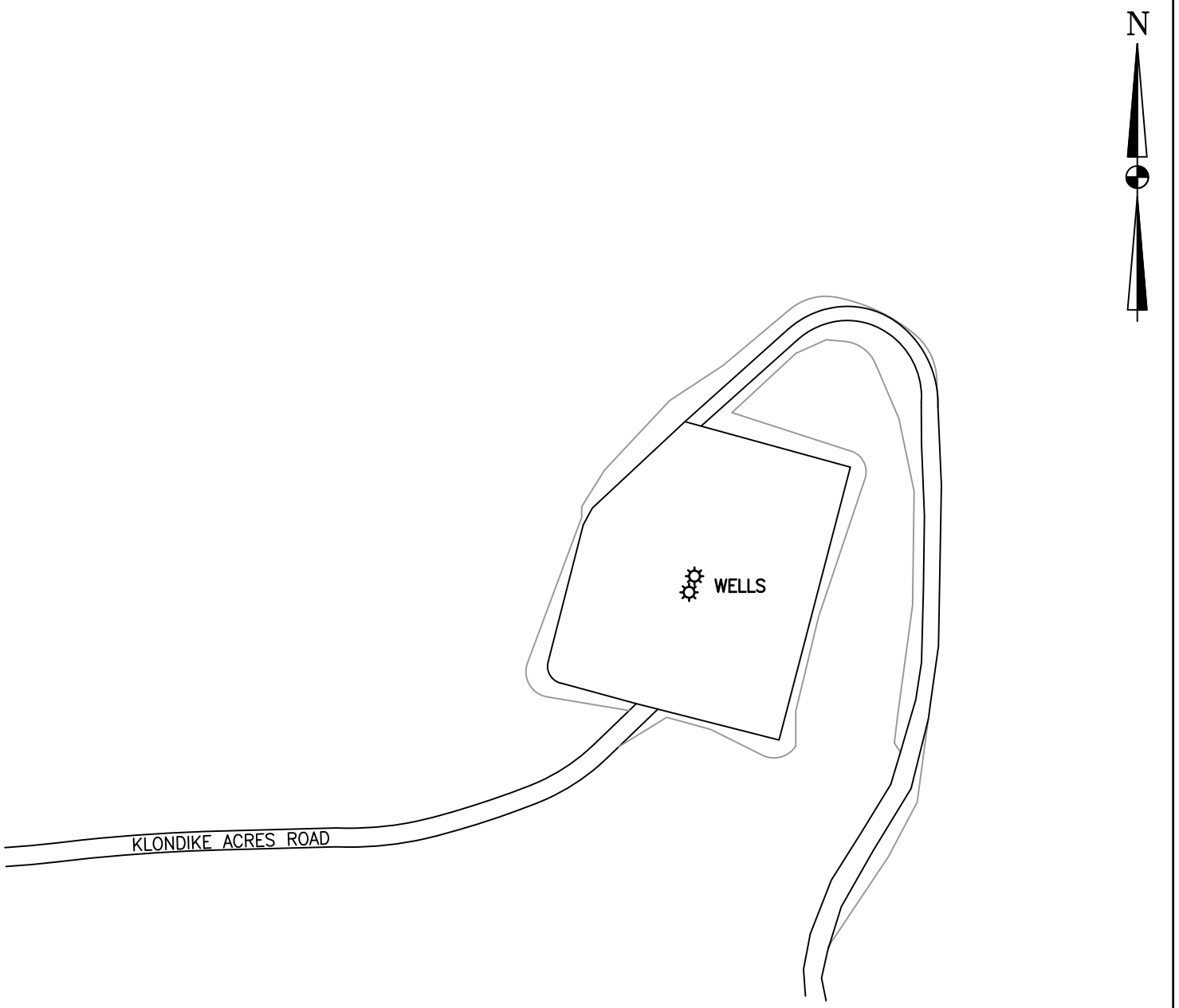
Provide an accurately scaled and detailed Plot Plan showing the locations of all emission units, emission points, and air pollution control devices. Show all emission units, affected facilities, enclosures, buildings and plant entrances and exits from the nearest public road(s) as appropriate. Note height, width and length of proposed or existing buildings and structures.

A scale between 1"=10' and 1"=200' should be used with the determining factor being the level of detail necessary to show operation or plant areas, affected facilities, emission unit sources, transfer points, etc. An overall small scale plot plan (e.g., 1"=300') should be submitted in addition to larger scale plot plans for process or activity areas (e.g., 1"=50') if the plant is too large to allow adequate detail on a single plot plan. Process or activity areas may be grouped for the enlargements as long as sufficient detail is shown.

Use the following guidelines to ensure a complete Plot Plan:

- Facility name
- Company name
- Company facility ID number (for existing facilities)
- Plot scale, north arrow, date drawn, and submittal date.
- Facility boundary lines
- Base elevation
- Lat/Long reference coordinates from the area map and corresponding reference point elevation
- Location of all point sources labeled with proper and consistent source identification numbers

This information is required for all sources regardless of whether it is a construction, modification, or administrative update.




| | |
|---|---|
| DRAWN BY | DJF |
| DATE | 8/11/16 |
| CHECKED BY | LFM |
| SET JOB NO. | 214054-18 |
| SET DWG FILE | LARRYa01.dwg |
| DRAWING SCALE | N.T.S. |

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

JAY-BEE OIL & GAS, INC.

LARRY WELL PRODUCTION FACILITY
TYLER COUNTY, WEST VIRGINIA
SITE LAYOUT PLAN

| DRAWING NAME | REV. |
|---|---|
| FIGURE 2 | 0 |

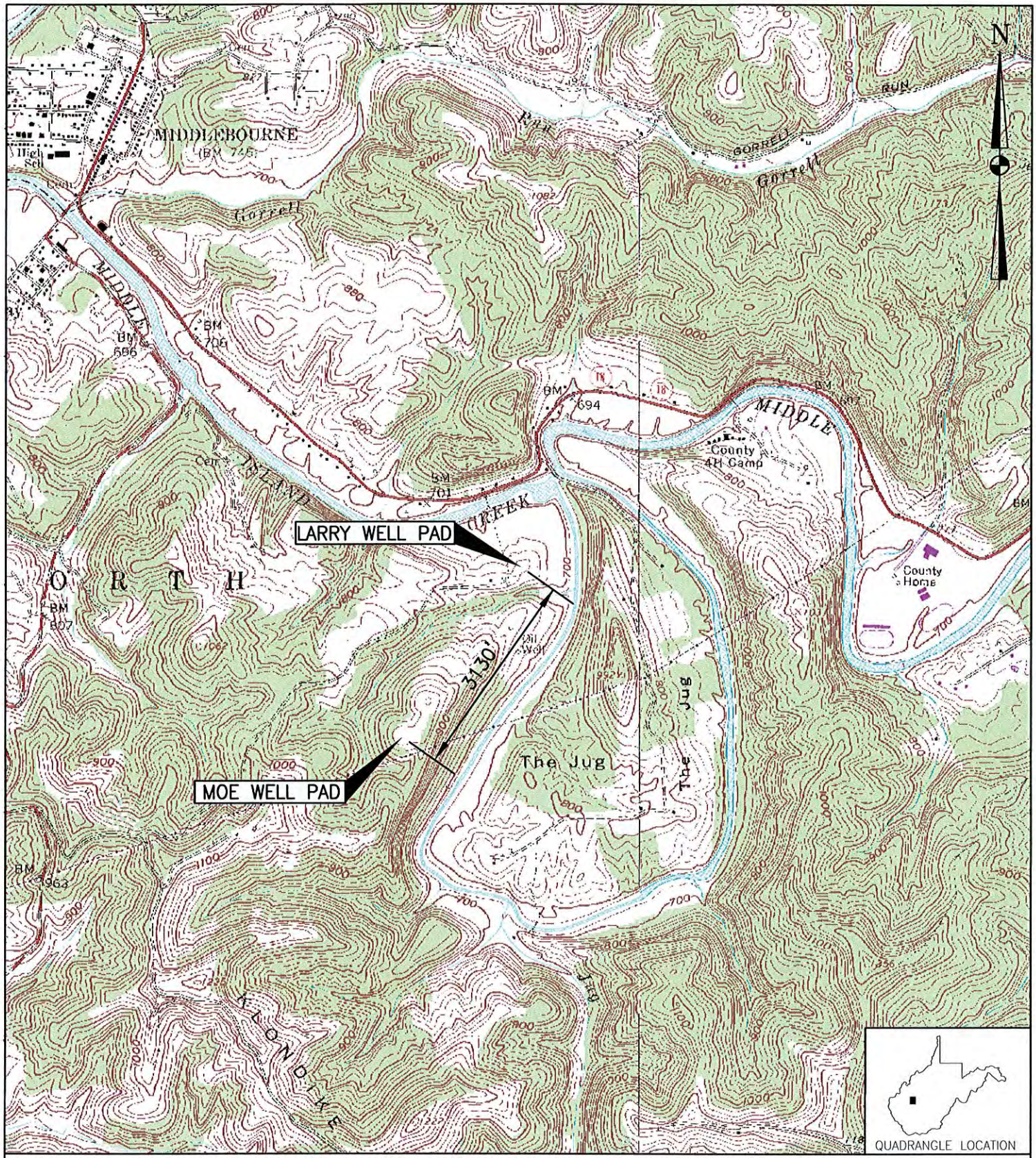
Plot: env045 08/11/2016 13:25 G:\JAY-BEE OIL&GAS\214054\LARRY\LARRYa01.dwg

## ATTACHMENT G – AREA MAP

Provide an Area Map showing the current or proposed location of the operation. On this map, identify plant or operation property lines, access roads and any adjacent dwelling, business, public building, school, church, cemetery, community or institutional building or public park within a 300’ boundary circle of the collective emission units.

Please provide a 300’ boundary circle on the map surrounding the proposed emission units collectively.

This information is required for all sources regardless of whether it is a construction, modification, or administrative update.




REFERENCE: USGS 7.5' QUADRANGLE MAP OF: MIDDLEBOURNE, WEST VIRGINIA; DATED 1960, PHOTOREVISED 1976.

| | |
|---|---|
| DRAWN BY | DJF |
| DATE | 7/11/16 |
| CHECKED BY | RAD |
| SET JOB NO. | 214054 |
| SET DWG FILE | LARRY & MOEm01.dwg |
| DRAWING SCALE | 1"=2000' |

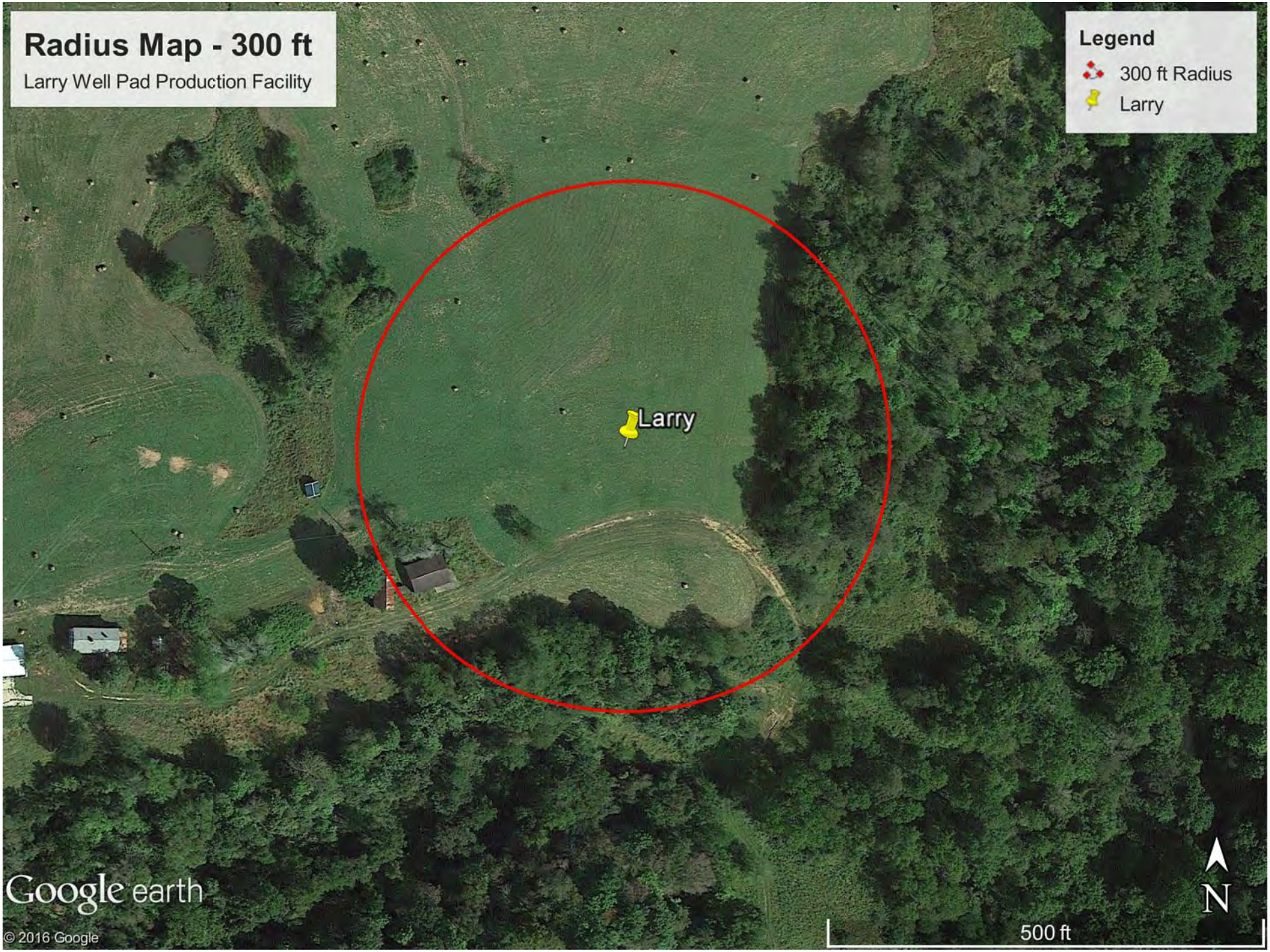
SE TECHNOLOGIES
98 Vanadium Road Bridgeville, PA 15017 (412) 221-1100

# JAY-BEE OIL & GAS, INC.

LARRY & MOE WELL PADS
TYLER COUNTY, WEST VIRGINIA
SITE LOCATION MAP

| DRAWING NO. | REV. |
|---|---|
| FIGURE 1 | 0 |

Plot: env045 07/11/2016 11:19 G:\JAY-BEE OIL&GAS\214054\LARRY MOE\LARRY & MOEm01.dwg


Radius Map - 300 ft
Larry Well Pad Production Facility
Legend
300 ft Radius
Larry
Larry
Google earth
© 2016 Google
500 ft
N

## ATTACHMENT H – G70-D SECTION APPLICABILITY FORM

# General Permit G70-D Registration
# Section Applicability Form

General Permit G70-D was developed to allow qualified applicants to seek registration for a variety of sources. These sources include gas well affected facilities, storage vessels, gas production units, in-line heaters, heater treaters, glycol dehydration units and associated reboilers, pneumatic controllers, pneumatic pumps, reciprocating internal combustion engines (RICEs), tank truck/rail car loading, fugitive emissions, 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-D 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.

| GENERAL PERMIT G70-D APPLICABLE SECTIONS | |
|---|---|
| ☒Section 5.0 | Gas and Oil Well Affected Facility (NSPS, Subpart OOOO/OOOOa) |
| ☒Section 6.0 | Storage Vessels Containing Condensate and/or Produced Water[1] |
| ☐Section 7.0 | Storage Vessel Affected Facility (NSPS, Subpart OOOO/OOOOa) |
| ☒Section 8.0 | Control Devices and Emission Reduction Devices not subject to NSPS Subpart OOOO/OOOOa and/or NESHAP Subpart HH |
| ☒Section 9.0 | Small Heaters and Reboilers not subject to 40CFR60 Subpart Dc |
| ☐Section 10.0 | Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO/OOOOa) |
| ☐Section 11.0 | Pneumatic Pump Affected Facility (NSPS, Subpart OOOOa) |
| ☒Section 12.0 | Fugitive Emissions GHG and VOC Standards (NSPS, Subpart OOOOa) |
| ☒Section 13.0 | Reciprocating Internal Combustion Engines, Generator Engines |
| ☒Section 14.0 | Tanker Truck/Rail Car Loading[2] |
| ☒Section 15.0 | Glycol Dehydration Units[3] |

1 *Applicants that are subject to Section 6 may also be subject to Section 7 if the applicant is subject to the NSPS, Subparts OOOO or OOOOa control requirements or the applicable control device requirements of Section 8.*

2 *Applicants that are subject to Section 14 may also be subject to control device and emission reduction device requirements of Section 8.*

3 *Applicants that are subject to Section 15 may also be subject to the requirements of Section 9 (reboilers). Applicants that are subject to Section 15 may also be subject to control device and emission reduction device requirements of Section 8.*

## ATTACHMENT I – EMISSION UNITS / EMISSION REDUCTION DEVICES (ERD) TABLE

Include ALL emission units and air pollution control devices/ERDs that will be part of this permit application review. Do not include fugitive emission sources in this table. Deminimis storage tanks shall be listed in the Attachment L table. This information is required for all sources regardless of whether it is a construction, modification, or administrative update.

| Emission Unit ID[1] | Emission Point ID[2] | Emission Unit Description | Year Installed | Manufac. Date[3] | Design Capacity | Type[4] and Date of Change | Control Device(s)[5] | ERD(s)[6] |
|---|---|---|---|---|---|---|---|---|
| HTR-1 | 1E | Gas Processing Unit | 2016 | | 1.5 MMBTU/hr | Existing | None | None |
| HTR-2 | 2E | Gas Processing Unit | 2016 | | 1.5 MMBTU/hr | Existing | None | None |
| HTR-3 | 3E | Gas Processing Unit | 2016 | | 1.5 MMBTU/hr | Existing | None | None |
| HTR-4 | 4E | Line Heater | 2016 | | 0.5 MMBTU/hr | Existing | None | None |
| TL-1 | 5E | Condensate Truck Loading | 2016 | | 30,000 BBL/yr | Existing | None | None |
| TL-2 | 6E | Produced Water Truck Loading | 2016 | | 63,600 BBL/yr | Existing | None | None |
| VRU-1 | 7E | VRU Driver | 2016 | 3/19/2012 | 84 HP | Existing | 1C | None |
| TEG-1 | 8E | Thermoelectric Generator | 2016 | | 4.4 KW/hr | Existing | None | None |
| EC-1 | 9E | Enclosed Combustor | 2016 | | 10.0 MMBTU/hr | Existing | N/A | None |
| T01 | 7E/9E | Condensate Tank | 2016 | | 210 BBL | Existing | EC-1 | VRU-1 |
| T02 | 7E/9E | Condensate Tank | 2016 | | 210 BBL | Existing | EC-1 | VRU-1 |
| T03 | 7E/9E | Condensate Tank | 2016 | | 210 BBL | Existing | EC-1 | VRU-1 |
| T04 | 7E/9E | Produce Water Tank | 2016 | | 210 BBL | Existing | EC-1 | VRU-1 |
| T05 | 7E/9E | Produced Water Tank | 2016 | | 210 BBL | Existing | EC-1 | VRU-1 |
| T06 | 7E/9E | Produced Water Tank | 2016 | | 210 BBL | Existing | EC-1 | VRU-1 |
| RBV-1 | 10E | Dehydration Unit Re-boiler Vent | 2016 | | 0.500 MMBTU/hr | Existing | None | None |
| RSV-1 | 11E | Dehydration Unit Still Vent | 2016 | | 40 MMSCFD | Existing | EC-2 | None |
| EC-2 | 11E | Enclosed Combustor | 2016 | | 10.0 MMBTU/hr | Existing | None | None |
| T01-T06 | 12E | Un-captured/Un-controlled VRU-1 Emissions | 2016 | | | Existing | None | None |
| CE-1 | 13E | Compressor Engine | Pending Approval | 3/21/2012 | 1,380 HP | New | 2C | None |

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.
[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.
[3] When required by rule
[4] New, modification, removal, existing
[5] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.
[6] For ERDs use the following numbering system: 1D, 2D, 3D,... or other appropriate designation.

## ATTACHMENT J – FUGITIVE EMISSIONS SUMMARY SHEET

Sources of fugitive emissions may include loading operations, equipment leaks, blowdown emissions, etc.

Source/Equipment:

| Leak Detection Method Used | ☒ Audible, visual, and olfactory (AVO) inspections | ☐ Infrared (FLIR) cameras | ☐ Other (please describe) | ☐ None required |
|---|---|---|---|---|

| Component Type | Closed Vent System | Count | Source of Leak Factors (EPA, other (specify)) | Stream type (gas, liquid, etc.) | Estimated Emissions (tpy) | | |
|---|---|---|---|---|---|---|---|
| | | | | | VOC | HAP | GHG (methane, $CO_2e$) |
| Pumps | ☐ Yes ☒ No | 1 | API | ☒ Gas ☐ Liquid ☐ Both | <0.01 | <0.01 | 0.34 |
| Valves | ☐ Yes ☒ No | 56 | EPA | ☐ Gas ☐ Liquid ☒ Both | 0.28 | <0.01 | 3.87 |
| Safety Relief Valves | ☐ Yes ☒ No | 3 | EPA | ☐ Gas ☐ Liquid ☒ Both | 0.01 | <0.01 | 0.45 |
| Open Ended Lines | ☐ Yes ☒ No | 20 | EPA | ☒ Gas ☐ Liquid ☐ Both | 0.06 | <0.01 | 4.60 |
| Sampling Connections | ☐ Yes ☒ No | 17 | TECQ | ☐ Gas ☐ Liquid ☒ Both | 1.16 | 0.01 | 23.60 |
| Connections (Not sampling) | ☐ Yes ☒ No | 237 | EPA | ☐ Gas ☐ Liquid ☒ Both | 0.13 | <0.01 | 2.00 |
| Compressors | ☐ Yes ☒ No | 1 | API | ☒ Gas ☐ Liquid ☐ Both | 0.02 | <0.01 | 1.26 |
| Flanges | ☐ Yes ☒ No | 120 | API | ☐ Gas ☐ Liquid ☒ Both | 0.09 | <0.01 | 4.47 |
| Other[1] | ☐ Yes ☒ No | 16 | n/a | ☒ Gas ☐ Liquid ☐ Both | 0.04 | <0.01 | 0.055 |

[1] Other equipment types may include compressor seals, relief valves, diaphragms, drains, meters, etc.

Please provide an explanation of the sources of fugitive emissions (e.g. pigging operations, equipment blowdowns, pneumatic controllers, etc.): **Blowdowns**

Please indicate if there are any closed vent bypasses (include component): **No**

Specify all equipment used in the closed vent system (e.g. VRU, ERD, thief hatches, tanker truck/rail car loading, etc.)
**Thief Hatch, VRU, Enclosed Combustors**

## ATTACHMENT K – 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).

| API Number | Date of Flowback | Date of Well Completion | Green Completion and/or Combustion Device | Subject to OOOO or OOOOa? |
|---|---|---|---|---|
| 47-095-02315 | December 2016 | TBD | Flow to separator and into gathering line as soon as practical. | 47-095-02315 |
| 47-095-02334 | December 2016 | TBD | Flow to separator and into gathering line as soon as practical. | 47-095-02334 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

*Note: If future wells are planned and no API number is available please list as PLANNED.*
*If there are existing wells that commenced construction prior to August 23, 2011, please acknowledge as existing.*

*This is the same API (American Petroleum Institute) 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 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.*

## ATTACHMENT N – INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

| | | | | |
|---|---|---|---|---|
| Emission Unit ID#[1] | VRU-1 | CE-1 | | |
| Engine Manufacturer/Model | Cummins G5.9 | Caterpillar G3516 BLE | | |
| Manufacturers Rated bhp/rpm | 84 @ 1800 | 1380 @ 1400 | | |
| Source Status[2] | ES | NS | | |
| Date Installed/ Modified/Removed/Relocated[3] | 2016 | Upon Receipt of Permit | | |
| Engine Manufactured /Reconstruction Date[4] | After 3/1/2013 | 3/21/2012 | | |
| Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5] | ☒40CFR60 Subpart JJJJ<br>☐JJJJ Certified?<br>☐40CFR60 Subpart IIII<br>☐IIII Certified?<br>☐40CFR63 Subpart ZZZZ<br>☐ NESHAP ZZZZ/ NSPS JJJJ Window<br>☐ NESHAP ZZZZ Remote Sources | ☒40CFR60 Subpart JJJJ<br>☐JJJJ Certified?<br>☐40CFR60 Subpart IIII<br>☒IIII Certified?<br>☐40CFR63 Subpart ZZZZ<br>☐ NESHAP ZZZZ/ NSPS JJJJ Window<br>☐ NESHAP ZZZZ Remote Sources | ☐40CFR60 Subpart JJJJ<br>☐JJJJ Certified?<br>☐40CFR60 Subpart IIII<br>☐IIII Certified?<br>☐40CFR63 Subpart ZZZZ<br>☐ NESHAP ZZZZ/ NSPS JJJJ Window<br>☐ NESHAP ZZZZ Remote Sources | |
| Engine Type[6] | 4SRB | 4SLB | | |
| APCD Type[7] | NSCR | OxCat | | |
| Fuel Type[8] | RG | RG | | |
| $H_2S$ (gr/100 scf) | <1 | <1 | | |
| Operating bhp/rpm | 84 @ 1800 | 1380 @ 1400 | | |
| BSFC (BTU/bhp-hr) | 7914 | 8256 | | |
| Hourly Fuel Throughput | 526.4 $ft^3$/hr<br>gal/hr | 9,020.65 $ft^3$/hr<br>gal/hr | $ft^3$/hr<br>gal/hr | |
| Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator) | 4.62 $MMft^3$/yr<br>gal/yr | 79.02 $MMft^3$/yr<br>gal/yr | $MMft^3$/yr<br>gal/yr | |
| Fuel Usage or Hours of Operation Metered | Yes ☒ No ☐ | Yes ☒ No ☐ | Yes ☐ No ☐ | |

| **Calculation Methodology[9]** | **Pollutant[10]** | **Hourly PTE (lb/hr)[11]** | **Annual PTE (tons/year)[11]** | **Hourly PTE (lb/hr)[11]** | **Annual PTE (tons/year)[11]** | **Hourly PTE (lb/hr)[11]** | **Annual PTE (tons/year)[11]** |
|---|---|---|---|---|---|---|---|
| AP | $NO_x$ | 0.19 | 0.81 | 1.52 | 6.66 | | |
| AP | CO | 0.37 | 1.62 | 0.52 | 2.27 | | |
| AP | VOC | 0.04 | 0.18 | 1.40 | 6.13 | | |
| AP | $SO_2$ | <0.01 | <0.01 | <0.01 | 0.03 | | |
| AP | $PM_{10}$ | 0.013 | 0.06 | 0.11 | 0.50 | | |
| AP | Formaldehyde | 0.015 | 0.065 | 0.32 | 1.41 | | |
| AP | Total HAPs | 0.022 | 0.10 | 0.53 | 2.31 | | |
| AP | GHG ($CO_2e$) | 89.7 | 393 | 1,750 | 7,666 | | |

1 Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion engine/generator engine located at the well site. Multiple engines should be designated CE-1, CE-2, CE-3 etc. Generator engines should be designated GE-1, GE-2, GE-3 etc. Microturbine generator engines should be designated MT-1, MT-2, MT-3 etc. If more than three (3) engines exist, please use additional sheets.

2 Enter the Source Status using the following codes:

NS Construction of New Source (installation) ES Existing Source

| | | | |
|---|---|---|---|
| MS | Modification of Existing Source | RS | Relocated Source |
| REM | Removal of Source | | |

3 Enter the date (or anticipated date) of the engine's installation (construction of source), modification, relocation or removal.

4 Enter the date that the engine was manufactured, modified or reconstructed.

5 Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart IIII/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 as appropriate.

**Provide a manufacturer's data sheet for all engines being registered.**

6 Enter the Engine Type designation(s) using the following codes:

| | | | |
|---|---|---|---|
| 2SLB | Two Stroke Lean Burn | 4SRB | Four Stroke Rich Burn |
| 4SLB | Four Stroke Lean Burn | | |

7 Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:

| | | | |
|---|---|---|---|
| A/F | Air/Fuel Ratio | IR | Ignition Retard |
| HEIS | High Energy Ignition System | SIPC | Screw-in Precombustion Chambers |
| PSC | Prestratified Charge | LEC | Low Emission Combustion |
| NSCR | Rich Burn & Non-Selective Catalytic Reduction | OxCat | Oxidation Catalyst |
| SCR | Lean Burn & Selective Catalytic Reduction | | |

8 Enter the Fuel Type using the following codes:

| | | | | | |
|---|---|---|---|---|---|
| PQ | Pipeline Quality Natural Gas | RG | Raw Natural Gas /Production Gas | D | Diesel |

9 Enter the Potential Emissions Data Reference designation using the following codes. Attach all reference data used.

| | | | | |
|---|---|---|---|---|
| MD | Manufacturer's Data | AP | AP-42 | |
| GR | GRI-HAPCalc™ | OT | Other | (please list) |

10 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*.

11 PTE for engines shall be calculated from manufacturer's data unless unavailable.

## Engine Air Pollution Control Device
## (Emission Unit ID# VRU-1) – No Changes Since Initial Permit

Air Pollution Control Device Manufacturer's Data Sheet included?
Yes ☒ No ☐

☒ NSCR ☐ SCR ☐ Oxidation Catalyst

Provide details of process control used for proper mixing/control of reducing agent with gas stream: n/a

| | |
|---|---|
| Manufacturer: **Miratech** | Model #: **VXC-1408-04-HSG** |
| Design Operating Temperature: 1000 ºF | Design gas volume: **430 + scfm** |
| Service life of catalyst: **2+ years, depending on site conditions** | Provide manufacturer data? ☒Yes ☐ No |
| Volume of gas handled: **430 acfm at 1078 ºF** | Operating temperature range for NSCR/Ox Cat: **From 750 ºF to 1250 ºF** |
| Reducing agent used, if any: **None** | Ammonia slip (ppm): **N/A** |

Pressure drop against catalyst bed (delta P): **3.0 inches of $H_2O$**

Provide description of warning/alarm system that protects unit when operation is not meeting design conditions: **Part of the routine maintenance inspection to warn or alert operations of emissions control degradation is a task called the post-PM emissions check.**

Is temperature and pressure drop of catalyst required to be monitored per 40CFR63 Subpart ZZZZ?
☐ Yes ☒ No

How often is catalyst recommended or required to be replaced (hours of operation)?
**Because there are so many factors that impact life of a catalyst, the vendor does not recommend "hours of operation prior to replacement." The routine post-PM emissions check task (every 60 days or 1440 hrs of operation, whichever comes first) determines when the catalyst needs to be serviced or replaced**.

How often is performance test required?
☐ Initial
☐ Annual
☐ Every 8,760 hours of operation
☐ Field Testing Required
☒ No performance test required. If so, why (please list any maintenance required and the applicable sections in NSPS/GACT)? **Per 40 CFR 60.4243(a)(iii), an owner or operator of a stationary SI internal combustion engine less than 100 HP, must keep a maintenance plan and records of conducted maintenance to demonstrate compliance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions, but no performance testing is required for an owner or operator.**

## Engine Air Pollution Control Device
## (Emission Unit ID# CE-1)

Air Pollution Control Device Manufacturer's Data Sheet included?
Yes ☒ No ☐

☐ NSCR ☐ SCR ☒ Oxidation Catalyst

Provide details of process control used for proper mixing/control of reducing agent with gas stream: n/a

| | |
|---|---|
| Manufacturer: **EMIT Technologies, Inc.** | Model #: **ELX-4200Z-1616F-31CEO-36P** |
| Design Operating Temperature: 1000 ºF | Design gas volume: **9126 + scfm** |
| Service life of catalyst: **2+ years, depending on site conditions** | Provide manufacturer data? ☒Yes ☐ No |
| Volume of gas handled: **9126 acfm at 1078 ºF** | Operating temperature range for NSCR/Ox Cat: **From 750 ºF to 1250 ºF** |
| Reducing agent used, if any: **None** | Ammonia slip (ppm): **N/A** |

Pressure drop against catalyst bed (delta P): **3.0 inches of $H_2O$**

Provide description of warning/alarm system that protects unit when operation is not meeting design conditions: **Part of the routine maintenance inspection to warn or alert operations of emissions control degradation is a task called the post-PM emissions check.**

Is temperature and pressure drop of catalyst required to be monitored per 40CFR63 Subpart ZZZZ?
☐ Yes ☒ No

How often is catalyst recommended or required to be replaced (hours of operation)?
**Because there are so many factors that impact life of a catalyst, the vendor does not recommend "hours of operation prior to replacement." The routine post-PM emissions check task (every 60 days or 1440 hrs of operation, whichever comes first) determines when the catalyst needs to be serviced or replaced**.

How often is performance test required?
☒ Initial
☐ Annual
☒ Every 8,760 hours of operation
☐ Field Testing Required
☐ No performance test required. If so, why (please list any maintenance required and the applicable sections in NSPS/GACT)?

## ATTACHMENT Q – PNEUMATIC CONTROLLERS DATA SHEET

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?**

☐ Yes ☒ No

Please list approximate number.

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility that commenced construction, modification or reconstruction after September 18, 2015?**

☐ Yes ☒ No

Please list approximate number.

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility with a bleed rate greater than 6 standard cubic feet per hour that are required based on functional needs, including but not limited to response time, safety and positive actuation that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?**

☐ Yes ☒ No

Please list approximate number.

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility with a bleed rate greater than 6 standard cubic feet per hour that are required based on functional needs, including but not limited to response time, safety and positive actuation that commenced construction, modification or reconstruction after September 18, 2015?**

☐ Yes ☒ No

Please list approximate number.

## ATTACHMENT R – PNEUMATIC PUMP DATA SHEET

**Are there any natural gas-driven diaphragm pumps located at a well site that commenced construction, modification or reconstruction after September 18, 2015?**

☐ Yes ☒ No

Please list.

| Source ID # | Date | Pump Make/Model | Pump Size |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## ATTACHMENT T – EMISSIONS CALCULATIONS

Provide detailed potential to emit (PTE) emission calculations for criteria and hazardous air pollutants (HAPs) for each emission point identified in the application. For hazardous air pollutants and volatile organic compounds (VOCs), the speciated emission calculations must be included.

Use the following guidelines to ensure complete emission calculations:

- All emission sources and fugitive emissions are included in the emission calculations, as well as all methods used to calculate the emissions.
- Proper emission point identification numbers and APCD and ERD identification numbers are used consistently in the emission calculations that are used throughout the application.
- A printout of the emission summary sheets is attached to the registration application.
- Printouts of any modeling must be included with the emission calculations. The modeling printout must show all inputs/outputs or assumptions that the modeled emissions are based upon.
- If emissions are provided from the manufacturer, the manufacturer's documentation and/or certified emissions must also be included.
- The emission calculations results must match the emissions provided on the emissions summary sheet.
- If calculations are based on a compositional analysis of the gas, attach the laboratory analysis. Include the following information: the location that the sample was taken (and whether the sample was taken from the actual site or a representative site); the date the sample was taken; and, if the sample is considered representative, the reasons that it is considered representative (same gas field, same formation and depth, distance from actual site, etc.).
- Provide any additional clarification as necessary. Additional clarification or information is especially helpful when reviewing modeling calculations to assist the engineer in understanding the basis of assumptions and/or inputs.

Please follow specific guidance provided on the emissions summary sheet when providing the calculations.

# USA Compression Unit 2302 Caterpillar G3516BLE Engine Emissions

| | | | | | |
|---|---|---|---|---|---|
| Date of Manufacture | March 22, 2012 | Engine Serial Number | JEF01613 | Date Modified/Reconstructed | Not Any |
| Driver Rated HP | 1380 | Rated Speed in RPM | 1400 | Combustion Type | Spark Ignited 4 Stroke |
| Number of Cylinders | 16 | Compression Ratio | 8:1 | Combustion Setting | Ultra Lean Burn |
| Total Displacement ($in^3$) | 4230 | Fuel Delivery Method | Carburetor | Combustion Air Treatment | T.C./Aftercooled |

**Raw Engine Emissions (905 LHV BTU/SCF Fuel Gas with little to no H2S)**

*Fuel Consumption* *7443 LHV BTU/bhp-hr or 8256 HHV BTU/bhp-hr*
*Altitude* *1200 ft*
*Maximum Air Inlet Temp* *105 F*

| | g/bhp-hr [1] | lb/MMBTU [2] | lb/hr | TPY |
|---|---|---|---|---|
| Nitrogen Oxides (NOx) | 0.5 | | 1.52 | 6.66 |
| Carbon Monoxide (CO) | 2.43 | | 7.39 | 32.38 |
| Volatile Organic Compounds (VOC or NMNEHC) | 0.92 | | 2.80 | 12.26 |
| Formaldehyde (CH2O) | 0.44 | | 1.34 | 5.86 |
| Particulate Matter (PM) Filterable+Condensable | | 9.99E-03 | 1.14E-01 | 4.98E-01 |
| Sulfur Dioxide (SO2) | | 5.88E-04 | 6.70E-03 | 2.93E-02 |

| | g/bhp-hr [1] | lb/hr | Metric Tonne/yr |
|---|---|---|---|
| Carbon Dioxide (CO2) | 474 | 1442 | 5729 |
| Methane (CH4) | 4.05 | 12.32 | 48.95 |

[1] g/bhp-hr are based on Caterpillar Specifications (GERP) assuming 905 LHV BTU/SCF fuel gas, 1200 ft elevation, and 105 F Max Air Inlet Temperature. Note that g/bhp-hr values are based on 100% Load Operation. For Air Permitting, it is recommended to add a safety margin to CO, VOC, and Formaldehyde to account for variations in fuel gas composition and load.

[2] Emission Factor obtained from EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combution Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-2).

**Catalytic Converter Emissions**

*Catalytic Converter Make amd Model:* *EMIT ELX-4200Z-1616F-31CEO-36P*
*Element Type:* *EMIT RE-3615Z*
*Number of Elements in Housing:* *1.5*
*Air/Fuel Ratio Control* *Caterpillar ADEM3, NOx Feedback*

| | % Reduction | | **lb/hr** | **TPY** |
|---|---|---|---|---|
| Nitrogen Oxides (NOx) | 0 | | **1.52** | **6.66** |
| Carbon Monoxide (CO) | 93 | | **0.52** | **2.27** |
| Volatile Organic Compounds (VOC or NMNEHC) | 50 | (use 30% DRE for High BTU Fuels) | **1.40** | **6.13** |
| Formaldehyde (CH2O) | 76 | | **0.32** | **1.41** |
| Particulate Matter (PM) | 0 | | **1.14E-01** | **4.98E-01** |
| Sulfur Dioxide (SO2) | 0 | | **6.70E-03** | **2.93E-02** |

| | % Reduction | **lb/hr** | **Metric Tonne/yr** |
|---|---|---|---|
| Carbon Dioxide (CO2) | 0 | **1442** | **5729** |
| Methane (CH4) | 0 | **12.32** | **48.95** |

# G3516B

GAS COMPRESSION APPLICATION

## GAS ENGINE SITE SPECIFIC TECHNICAL DATA
## G3516B

CATERPILLAR®

| | | | |
|---|---|---|---|
| ENGINE SPEED (rpm): | 1400 | FUEL SYSTEM: | CAT WIDE RANGE WITH AIR FUEL RATIO CONTROL |
| COMPRESSION RATIO: | 8:1 | | |
| AFTERCOOLER - STAGE 2 INLET (°F): | 130 | **SITE CONDITIONS:** | |
| AFTERCOOLER - STAGE 1 INLET (°F): | 201 | FUEL: | Nat Gas |
| JACKET WATER OUTLET (°F): | 210 | FUEL PRESSURE RANGE(psig): | 7.0-50.0 |
| COOLING SYSTEM: | JW+OC+1AC, 2AC | FUEL METHANE NUMBER: | 84.8 |
| IGNITION SYSTEM: | ADEM3 | FUEL LHV (Btu/scf): | 905 |
| EXHAUST MANIFOLD: | DRY | ALTITUDE(ft): | 1200 |
| COMBUSTION: | Ultra Lean Burn | MAXIMUM INLET AIR TEMPERATURE(°F): | 105 |
| NOx EMISSION LEVEL (g/bhp-hr NOx): | 0.5 | NAMEPLATE RATING: | 1380 bhp@1400rpm |
| SET POINT TIMING: | 30.0 | | |

| | | | MAXIMUM RATING | SITE RATING AT MAXIMUM INLET AIR TEMPERATURE | | |
|---|---|---|---|---|---|---|
| **RATING** | **NOTES** | **LOAD** | **100%** | **100%** | **75%** | **50%** |
| ENGINE POWER | (1) | bhp | 1380 | 1380 | 1035 | 690 |
| INLET AIR TEMPERATURE | | °F | 106 | 105 | 105 | 105 |
| **ENGINE DATA** | | | | | | |
| FUEL CONSUMPTION (LHV) | (2) | Btu/bhp-hr | 7443 | 7443 | 7972 | 8562 |
| FUEL CONSUMPTION (HHV) | (2) | Btu/bhp-hr | 8256 | 8256 | 8843 | 9498 |
| AIR FLOW | (3)(4) | lb/hr | 13863 | 13863 | 10874 | 7602 |
| AIR FLOW WET (77°F, 14.7 psia) | (3)(4) | scfm | 3126 | 3126 | 2452 | 1715 |
| INLET MANIFOLD PRESSURE | (5) | in Hg(abs) | 94.6 | 94.6 | 76.8 | 54.0 |
| EXHAUST STACK TEMPERATURE | (6) | °F | 992 | 992 | 986 | 1006 |
| EXHAUST GAS FLOW (@ stack temp, 14.5 psia) | (7)(4) | ft3/min | 9126 | 9126 | 7138 | 5065 |
| EXHAUST GAS MASS FLOW | (7)(4) | lb/hr | 14380 | 14380 | 11290 | 7900 |
| **EMISSIONS DATA** | | | | | | |
| NOx (as NO2) | (8) | g/bhp-hr | 0.50 | 0.50 | 0.50 | 0.50 |
| CO | (8) | g/bhp-hr | 2.43 | 2.43 | 2.61 | 2.56 |
| THC (mol. wt. of 15.84) | (8) | g/bhp-hr | 4.77 | 4.77 | 5.11 | 5.19 |
| NMHC (mol. wt. of 15.84) | (8) | g/bhp-hr | 0.72 | 0.72 | 0.77 | 0.78 |
| NMNEHC (VOCs) (mol. wt. of 15.84) | (8)(9) | g/bhp-hr | 0.48 | 0.48 | 0.51 | 0.52 |
| HCHO (Formaldehyde) | (8) | g/bhp-hr | 0.44 | 0.44 | 0.43 | 0.42 |
| CO2 | (8) | g/bhp-hr | 474 | 474 | 506 | 550 |
| EXHAUST OXYGEN | (10) | % DRY | 9.0 | 9.0 | 8.7 | 8.3 |
| **HEAT REJECTION** | | | | | | |
| HEAT REJ. TO JACKET WATER (JW) | (11) | Btu/min | 23438 | 23438 | 21564 | 19970 |
| HEAT REJ. TO ATMOSPHERE | (11) | Btu/min | 6110 | 6110 | 5092 | 4074 |
| HEAT REJ. TO LUBE OIL (OC) | (11) | Btu/min | 4449 | 4449 | 3947 | 3323 |
| HEAT REJ. TO A/C - STAGE 1 (1AC) | (11)(12) | Btu/min | 12934 | 12934 | 10814 | 3965 |
| HEAT REJ. TO A/C - STAGE 2 (2AC) | (11)(12) | Btu/min | 5679 | 5679 | 5341 | 3462 |

| **HEAT EXCHANGER SIZING CRITERIA** | | | |
|---|---|---|---|
| TOTAL JACKET WATER CIRCUIT (JW+OC+1AC) | (12)(13) | Btu/min | 44701 |
| TOTAL AFTERCOOLER CIRCUIT (2AC) | (12)(13) | Btu/min | 5963 |
| A cooling system safety factor of 0% has been added to the heat exchanger sizing criteria. | | | |

**CONDITIONS AND DEFINITIONS**

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature.
100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature.
Max. rating is the maximum capability for the specified fuel at site altitude and reduced inlet air temperature.
Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

PREPARED BY: Joel LeBlanc, USA Compression
Data generated by Gas Engine Rating Pro Version 3.04.00
Ref. Data Set DM8800-04-002, Printed 31Jan2011

772 Airfield Lane
Sheridan, WY 82801
Office: 307.673.0883
EST@emittechnologies.com

**Prepared For:**
Joel LeBlanc
USA COMPRESSION

## INFORMATION PROVIDED BY CATERPILLAR

| | |
|---|---|
| Engine: | G3516B |
| Horsepower: | 1380 |
| RPM: | 1400 |
| Compression Ratio: | 8.0:1 |
| Exhaust Flow Rate: | 9126 CFM |
| Exhaust Temperature: | 992 °F |
| Reference: | DM8800-04 |
| Fuel: | Natural Gas |
| Annual Operating Hours: | 8760 |

**Uncontrolled Emissions**

| | |
|---|---|
| NOx: | 0.50 g/bhp-hr |
| CO: | 2.43 g/bhp-hr |
| THC: | 4.77 g/bhp-hr |
| NMHC: | 0.72 g/bhp-hr |
| NMNEHC: | 0.48 g/bhp-hr |
| HCHO: | 0.44 g/bhp-hr |
| Oxygen: | 9.00 % |

## POST CATALYST EMISSIONS

| | |
|---|---|
| NOx: | Unaffected by Oxidation Catalyst |
| CO: | >93% Reduction |
| VOC: | >50% Reduction |
| HCHO: | >76% Reduction |

## CONTROL EQUIPMENT

### Catalytic Converter

| | |
|---|---|
| Model: | **ELX-4200Z-1616F-31CE0-36P** |
| Catalyst Type: | Oxidation, Precious group metals |
| Manufacturer: | EMIT Technologies, Inc. |
| Element Size: | 1 - Rectangle 36 x 15 x 3.5<br>1 - Rectangle 18 x 15 x 3.5 |
| Catalyst Elements: | 2 |
| Housing Type: | 3 Element Capacity |
| Catalyst Installation: | Accessible Housing |
| Construction: | 10 gauge Carbon Steel |
| Sample Ports: | 6 (0.5" NPT) |
| Inlet Connections: | 16" Flat Face Flange |
| Outlet Connections: | 16" Flat Face Flange |
| Configuration: | End In / Side Out |
| Silencer: | Integrated |
| Silencer Grade: | Hospital Enhanced |
| Insertion Loss: | 35-50 dBA |

# Jay-Bee Oil & Gas, Inc.

**EMISSIONS SUMMARY**

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

| Emission Point ID | Emission Unit ID | Description | NOx lb/hr | CO lb/hr | CO2e lb/hr | CH4[4] lb/hr | VOC[4] lb/hr | SO2 lb/hr | PM lb/hr | Benzene lb/hr | Ethylbenzene lb/hr | Xylenes lb/hr | n-Hexane lb/hr | Toluene lb/hr | Formaldehyde lb/hr | Total HAPs lb/hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13E | CE-1 | Compressor Engine (Controlled) NEW | 1.52 | 0.52 | 1,750 | 12.32 | 1.40 | 0.007 | 0.11 | 0.005 | 0.000 | 0.002 | 0.01 | 0.005 | 0.321 | 0.53 |
| 1E | HTR-1 | GPU #1 | 0.15 | 0.13 | 181.1 | 0.003 | 0.01 | 0.001 | 0.011 | | | | 0.003 | | 0.000 | 0.003 |
| 2E | HTR-2 | GPU #2 | 0.15 | 0.13 | 181.1 | 0.003 | 0.01 | 0.001 | 0.011 | | | | 0.003 | | 0.000 | 0.003 |
| 3E | HTR-3 | GPU #3 | 0.15 | 0.13 | 181.1 | 0.003 | 0.01 | 0.001 | 0.011 | | | | 0.003 | | 0.000 | 0.003 |
| 4E | HTR-4 | Line Heater | 0.05 | 0.04 | 60.4 | 0.00 | 0.00 | 0.000 | 0.004 | | | | 0.001 | | 0.000 | 0.001 |
| 5E | TL-1 | Truck Loading - Condensate[2] | | | | | 2.96 | | | | | | 0.16 | | | 0.16 |
| 6E | TL-2 | Truck Loading - Produced Water[2] | | | | | 0.08 | | | | | | 0.01 | | | 0.01 |
| 7E | VRU-1 | VRU Compressor | 0.19 | 0.37 | 89.7 | 0.13 | 0.04 | 0.000 | 0.013 | 0.001 | 0.000 | 0.000 | | 0.000 | 0.015 | 0.022 |
| 8E | TEG-1 | Thermoelectric Generator | 0.00 | 0.00 | 1.6 | 0.00 | 0.00 | 0.000 | 0.000 | | | | 0.000 | | 0.000 | 0.000 |
| 12E | T01-T06 | Condensate Tanks + Water Tanks[3] | | | 6.5 | 0.26 | 1.83 | | | 0.00 | 0.00 | 0.002 | 0.055 | 0.002 | | 0.060 |
| 9E | EC-1 | Condensate Tanks + Water Tanks[1] | 0.29 | 1.10 | 446.6 | 0.26 | 1.84 | 0.001 | 0.017 | | | | 0.004 | | 0.000 | 0.00 |
| 10E | RBV-1 | 500 MBTU/hr Reboiler | 0.05 | 0.04 | 60.4 | 0.00 | 0.003 | 0.000 | 0.004 | | | | 0.001 | | 0.000 | 0.001 |
| 11E | EC-2 | Dehydration Unit Combustor | 0.27 | 1.03 | 417.4 | 0.01 | 0.81 | 0.001 | 0.037 | 0.010 | | | 0.02 | 0.034 | 0.000 | 0.06 |
| --- | --- | Truck Traffic Fugitive Dust | | | | | | | 12.90 | | | | | | | |
| --- | --- | Fugitive Emissions | | | 9.3 | 0.37 | 0.41 | | | | | | | | | 0.004 |
| **Total (Exluding Fugitive Emissions)** | | | 2.82 | 3.48 | 3376.13 | 12.73 | 7.16 | 0.01 | 0.22 | 0.02 | 0.00 | 0.00 | 0.27 | 0.04 | 0.34 | 0.86 |
| **Total** | | | 2.82 | 3.48 | 3385.41 | 13.10 | 7.57 | 0.01 | 13.12 | 0.02 | 0.00 | 0.00 | 0.27 | 0.04 | 0.34 | 0.86 |

| Emission Point ID | Emission Unit ID | Description | NOx tpy | CO tpy | CO2e tpy | CH4 tpy | VOC tpy | SO2 tpy | PM tpy | Benzene tpy | Ethylbenzene tpy | Xylenes tpy | n-Hexane tpy | Toluene tpy | Formaldehyde tpy | Total HAPs tpy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13E | CE-1 | Compressor Engine (Controlled) NEW | 6.66 | 2.27 | 7,666 | 53.97 | 6.13 | 0.029 | 0.50 | 0.022 | 0.002 | 0.009 | 0.06 | 0.020 | 1.407 | 2.31 |
| 1E | HTR-1 | GPU #1 | 0.66 | 0.55 | 793 | 0.02 | 0.04 | 0.004 | 0.05 | | | | 0.01 | | 0.000 | 0.01 |
| 2E | HTR-2 | GPU #2 | 0.66 | 0.55 | 793 | 0.02 | 0.04 | 0.004 | 0.05 | | | | 0.01 | | 0.000 | 0.01 |
| 3E | HTR-3 | GPU #3 | 0.66 | 0.55 | 793 | 0.02 | 0.04 | 0.004 | 0.05 | | | | 0.01 | | 0.000 | 0.01 |
| 4E | HTR-4 | Line Heater | 0.22 | 0.18 | 264 | 0.01 | 0.01 | 0.001 | 0.02 | | | | 0.00 | | 0.000 | 0.00 |
| 5E | TL-1 | Truck Loading - Condensate[2] | | | | | 0.91 | | | | | | 0.05 | | | 0.05 |
| 6E | TL-2 | Truck Loading - Produced Water[2] | | | | | 0.04 | | | | | | 0.00 | | | 0.00 |
| 7E | VRU-1 | VRU Compressor | 0.81 | 1.62 | 393 | 0.55 | 0.18 | 0.002 | 0.06 | 0.005 | 0.000 | 0.001 | | 0.002 | 0.065 | 0.10 |
| 8E | TEG-1 | Thermoelectric Generator | 0.01 | 0.00 | 7 | 0.00 | 0.00 | 0.000 | 0.00 | | | | 0.00 | | 0.000 | 0.00 |
| 12E | T01-T06 | Condensate Tanks + Water Tanks[3] | | | 28 | 1.14 | 8.03 | | | 0.00 | 0.00 | 0.01 | 0.24 | 0.01 | | 0.26 |
| 9E | EC-1 | Condensate Tanks + Water Tanks[1] | 1.25 | 4.81 | 1956 | 0.07 | 0.43 | 0.00 | 0.07 | | | | 0.01 | | 0.001 | 0.02 |
| 10E | RBV-1 | 500 MBTU/hr Reboiler | 0.22 | 0.18 | 264.5 | 0.01 | 0.01 | 0.001 | 0.017 | | | | 0.004 | | 0.000 | 0.004 |
| 11E | EC-2 | Dehydration Unit Combustor | 1.19 | 4.50 | 1828.1 | 0.03 | 3.54 | 0.003 | 0.161 | 0.04 | | | 0.09 | 0.15 | 0.002 | 0.28 |
| --- | --- | Truck Traffic Fugitive Dust | | | | | | | 2.56 | | | | | | | |
| --- | --- | Fugitive Emissions | | | 40.65 | 1.63 | 1.78 | | | | | | | | | 0.018 |
| **Total (Exluding Fugitive Emissions)** | | | 12.33 | 15.23 | 14787.43 | 55.81 | 19.38 | 0.05 | 0.97 | 0.07 | 0.00 | 0.02 | 0.50 | 0.18 | 1.48 | 3.07 |
| **Total** | | | 12.33 | 15.23 | 14828.08 | 57.44 | 21.16 | 0.05 | 3.54 | 0.07 | 0.00 | 0.02 | 0.50 | 0.18 | 1.48 | 3.09 |
| | | **Previous Emissions** | 5.67 | 12.96 | 7160.64 | 3.40 | 15.01 | 0.02 | 3.04 | 0.05 | 0.00 | 0.01 | 0.44 | 0.16 | 0.07 | 0.78 |
| | | **Increase/Decrease** | 6.66 | 2.27 | 7667.44 | 54.04 | 6.15 | 0.03 | 0.50 | 0.02 | 0.00 | 0.01 | 0.06 | 0.02 | 1.41 | 2.31 |

[1] Condensate and water tank emissions are currently controlled by a VRU + Enclosed Combustor at 98%. This line represents the un-controlled 2%.
[2] Truck loading is un-controlled.
[3] This line represents the 2% Un-captured/Controlled associated with the VRU.
[4] VRU-1 and EC-1 would not run concurrent so hourly VOC and CH4 emissions for these sources are only accounted for once.

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

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

**Controlled Emissions**

**Source CE-1**

**Engine Data:**

| | | |
|---|---|---|
| Engine Manufacturer | Caterpillar | |
| Engine Model | G3516 BLE | |
| Type (Rich-burn or Low Emission) | Lean | |
| Aspiration (Natural or Turbocharged) | Turbo | |
| Turbocharge Cooler Temperature | 130 | deg. F |
| Manufacturer Rating | 1,380 | hp |
| Speed at Above Rating | 1,400 | rpm |
| Configeration ( In-line or Vee) | In-Line | |
| Number of Cylinders | 16 | |
| Fuel Heat Content (HHV) | 1,263 | BTU/scf |
| Fuel Consumption (HHV) | 8,256 | Btu/bhp-hr |

| **Emission Rates:** | g/bhp-hr | lb/hr | tons/year | g/hr | lb/day | AP-42 4Stroke Lean lb/mmbtu | |
|---|---|---|---|---|---|---|---|
| Oxides of Nitrogen, NOx | 0.50 | 1.52 | 6.66 | 690 | 36.51 | | Comment |
| Carbon Monoxide CO | 0.17 | 0.52 | 2.27 | 235 | 12.42 | | 453.59 grams = 1 pound |
| VOC (NMNEHC) | 0.46 | 1.40 | 6.13 | 635 | 33.59 | | 2,000 pounds = 1 ton |
| CO2e | | 1750.13 | 7665.57 | | | | |
| **Total Annual Hours of Operation** | **8,760** | | | | | | |
| SO2 | | 0.006699 | 0.0293 | | | 0.000588 | Mfg. Data |
| PM2.5 | | 0.000878 | 0.0038 | | | 0.0000771 | |
| PM | | 0.113819 | 0.4985 | | | 0.00999 | Mfg. Data |
| CO2 | 474 | 1442.09 | 6316.35 | | | | Mfg. Data |
| Methane | 4.05 | 12.32 | 53.97 | | | | Mfg. Data |
| acrolein | | 0.058561 | 0.2565 | | | 0.00514 | |
| acetaldehyde | | 0.095248 | 0.4172 | | | 0.00836 | |
| formaldehyde | 0.106 | 0.32127 | 1.4072 | | | 0.02820 | Mfg. Data |
| benzene | | 0.005013 | 0.0220 | | | 0.00044 | |
| ethylbenzene | | 0.000452 | 0.0020 | | | 0.0000397 | |
| methanol | | 0.028483 | 0.1248 | | | 0.00250 | |
| toluene | | 0.004648 | 0.0204 | | | 0.00041 | |
| xylenes | | 0.002096 | 0.0092 | | | 0.00018 | |
| n-Hexane | | 0.012647 | 0.0554 | | | 0.00111 | |
| total HAPs | | 0.528419 | 2.3145 | | | 0.045270384 | |

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

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

**Un-controlled Emissions**

**Source CE-1**

**Engine Data:**

| | | |
|---|---|---|
| Engine Manufacturer | Caterpillar | |
| Engine Model | G3516 BLE | |
| Type (Rich-burn or Low Emission) | Lean | |
| Aspiration (Natural or Turbocharged) | Turbo | |
| Turbocharge Cooler Temperature | 130 | deg. F |
| Manufacturer Rating | 1,380 | hp |
| Speed at Above Rating | 1,400 | rpm |
| Configeration ( In-line or Vee) | In-Line | |
| Number of Cylinders | 16 | |
| Fuel Heat Content (HHV) | 1,263 | BTU/scf |
| Fuel Consumption (HHV) | 8,256 | Btu/bhp-hr |

| **Emission Rates:** | g/bhp-hr | lb/hr | tons/year | g/hr | lb/day | AP-42 4Stroke Lean lb/mmbtu | |
|---|---|---|---|---|---|---|---|
| Oxides of Nitrogen, NOx | 0.50 | 1.52 | 6.66 | 690 | 36.51 | | Comment |
| Carbon Monoxide CO | 2.43 | 7.39 | 32.38 | 3,353 | 177.43 | | 453.59 grams = 1 pound |
| VOC (NMNEHC) | 0.92 | 2.80 | 12.26 | 1,270 | 67.18 | | 2,000 pounds = 1 ton |
| CO2e | | 1750.13 | 7665.57 | | | | |
| **Total Annual Hours of Operation** | **8,760** | | | | | | |
| SO2 | | 0.006699 | 0.0293 | | | 0.000588 | |
| PM2.5 | | 0.000878 | 0.0038 | | | 0.0000771 | |
| PM | | 0.113819 | 0.4985 | | | 0.00999 | |
| CO2 | 474 | 1442.09 | 6316.35 | | | | Mfg. Data |
| Methane | 4.05 | 12.32 | 53.97 | | | | Mfg. Data |
| acrolein | | 0.058561 | 0.2565 | | | 0.00514 | |
| acetaldehyde | | 0.095248 | 0.4172 | | | 0.00836 | |
| formaldehyde | 0.440 | 1.338624 | 5.8632 | | | 0.11749 | Mfg. Data |
| benzene | | 0.005013 | 0.0220 | | | 0.00044 | |
| ethylbenzene | | 0.000452 | 0.0020 | | | 0.0000397 | |
| methanol | | 0.028483 | 0.1248 | | | 0.00250 | |
| toluene | | 0.004648 | 0.0204 | | | 0.00041 | |
| xylenes | | 0.002096 | 0.0092 | | | 0.00018 | |
| n-Hexane | | 0.012647 | 0.0554 | | | 0.00111 | |
| total HAPs | | 1.545774 | 6.7705 | | | 0.134566219 | |

## Jay-Bee Oil &Gas ,LLC

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

**Controlled Emission Rates**

**Source VRU-1**

**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 V) | 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 | tpy | g/hr | lb/day | AP-42 4strokerich lb/MMBtu | |
|---|---|---|---|---|---|---|---|
| Oxides of Nitrogen, NOx | 1.000 | 0.19 | 0.81 | 84 | 4.44 | | Comment |
| Carbon Monoxide CO | 2.000 | 0.37 | 1.62 | 168 | 8.89 | | 453.59 grams = 1 pound |
| VOC (NMNEHC) | 0.220 | 0.04 | 0.18 | 18 | 0.98 | | 2,000 pounds = 1 ton |
| CO2 | 449 | 83 | 364 | 37,716 | 1,996 | | |
| CO2e | | 90 | 393 | | | | |
| **Total Annual Hours of Operation** | **8,760** | | | | | | |
| SO2 | | 0.0004 | 0.0017 | | | 0.0006 | |
| PM2.5 | | 0.00632 | 0.0277 | | | 0.0095 | |
| PM (Condensable) | | 0.00659 | 0.0289 | | | 0.00991 | |
| $CH_4$ | | 0.12623 | 0.5529 | | | 0.0022 | Factor From 40 CFR 98, Table C-2 |
| $N_2O$ | | 0.01148 | 0.0503 | | | 0.0002 | Factor From 40 CFR 98, Table C-2 |
| acrolein | | 0.00175 | 0.0077 | | | 0.00263 | |
| acetaldehyde | | 0.00185 | 0.0081 | | | 0.00279 | |
| formaldehyde | 0.080 | 0.0148 | 0.0649 | | | | Per Mfg. |
| benzene | | 0.00105 | 0.0046 | | | 0.00158 | |
| toluene | | 0.00037 | 0.0016 | | | 0.000558 | |
| ethylbenzene | | 1.6E-05 | 0.0001 | | | 0.0000248 | |
| xylenes | | 0.00013 | 0.0006 | | | 0.000195 | |
| methanol | | 0.00203 | 0.0089 | | | 0.00306 | |
| Total HAPs | | 0.02202 | 0.0964 | | | | |

**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, Inc.

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

**Potential Emission Rates**

## Source HTR-1 Through HTR-3

## *Emissions shown below are for each Gas Processing Unit

| | | |
|---|---|---|
| Burner Duty Rating | 1500.0 | Mbtu/hr |
| Burner Efficiency | 98.0 | % |
| Gas Heat Content (HHV) | 1263.0 | Btu/scf |
| Total Gas Consumption | 29,084.8 | scfd |
| H2S Concentration | 0.000 | Mole % |
| Hours of Operation | 8760 | |

Average heating value of natural gas
1020 Btu/scf

| | | | | |
|---|---|---|---|---|
| NOx | 0.1501 | lb/hr | 0.657 | tpy |
| CO | 0.1261 | lb/hr | 0.552 | tpy |
| CO2 | 180.1 | lb/hr | 788.7 | tpy |
| CH4 | 0.003 | lb/hr | 0.015 | tpy |
| CO2e | 181 | lb/hr | 793 | tpy |
| VOC | 0.0083 | lb/hr | 0.036 | tpy |
| SO2 | 0.0009 | lb/hr | 0.004 | tpy |
| H2S | 0.0000 | lb/hr | 0.000 | tpy |
| PM10 | 0.0114 | lb/hr | 0.050 | tpy |
| CHOH | 0.0001 | lb/hr | 0.000 | tpy |
| Benzene | 0.0000 | lb/hr | 0.000 | tpy |
| N-Hexane | 0.0027 | lb/hr | 0.012 | tpy |
| Toluene | 0.0000 | lb/hr | 0.000 | tpy |
| Total HAPs | 0.0028 | lb/hr | 0.012 | tpy |

**AP-42 Factors Used**

| | | | |
|---|---|---|---|
| **NOx** | **100** | **lb/MMCF** | |
| **CO** | **84** | **lb/MMCF** | |
| **$CO_2$** | **120,000** | **lb/MMCF** | Global Warming Potential = 1 |
| **VOC** | **5.5** | **lb/MMCF** | |
| **PM** | **7.6** | **lb/MMCF** | |
| **$SO_2$** | **0.6** | **lb/MMCF** | |
| **$CH_4$** | **2.3** | **lb/MMCF** | Global Warming Potential = 25 |
| **$N_2O$** | **2.2** | **lb/MMCF** | Global Warming Potential =298 |
| **HCOH** | **0.075** | **lb/MMCF** | |
| **Benzene** | **0.0021** | **lb/MMCF** | |
| **n-Hexane** | **1.8** | **lb/MMCF** | |
| **Toluene** | **0.0034** | **lb/MMCF** | |

# Jay-Bee Oil & Gas, Inc.

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

**Potential Emission Rates**

## Source HTR-4
## Line Heater

| | | |
|---|---|---|
| Burner Duty Rating | 500.0 | Mbtu/hr |
| Burner Efficiency | 98.0 | % |
| Gas Heat Content (HHV) | 1263.0 | Btu/scf |
| Total Gas Consumption | 9,694.9 | scfd |
| H2S Concentration | 0.000 | Mole % |
| Hours of Operation | 8760 | |

Average heating value of natural gas
1020 Btu/scf

| | | | | |
|---|---|---|---|---|
| NOx | 0.0500 | lb/hr | 0.219 | tpy |
| CO | 0.0420 | lb/hr | 0.184 | tpy |
| CO2 | 60.0 | lb/hr | 262.9 | tpy |
| CH4 | 0.001 | lb/hr | 0.01 | tpy |
| CO2e | 60.4 | lb/hr | 264 | tpy |
| VOC | 0.0028 | lb/hr | 0.012 | tpy |
| SO2 | 0.0003 | lb/hr | 0.001 | tpy |
| H2S | 0.0000 | lb/hr | 0.000 | tpy |
| PM10 | 0.0038 | lb/hr | 0.017 | tpy |
| CHOH | 0.0000 | lb/hr | 0.000 | tpy |
| Benzene | 0.0000 | lb/hr | 0.000 | tpy |
| N-Hexane | 0.0009 | lb/hr | 0.004 | tpy |
| Toluene | 0.0000 | lb/hr | 0.000 | tpy |
| Total HAPs | 0.0009 | lb/hr | 0.004 | tpy |

**AP-42 Factors Used**

| | | | |
|---|---|---|---|
| **NOx** | **100** | **lb/MMCF** | |
| **CO** | **84** | **lb/MMCF** | |
| **$CO_2$** | **120,000** | **lb/MMCF** | Global Warming Potential = 1 |
| **VOC** | **5.5** | **lb/MMCF** | |
| **PM** | **7.6** | **lb/MMCF** | |
| **$SO_2$** | **0.6** | **lb/MMCF** | |
| **$CH_4$** | **2.3** | **lb/MMCF** | Global Warming Potential = 25 |
| **$N_2O$** | **2.2** | **lb/MMCF** | Global Warming Potential =298 |
| **HCOH** | **0.075** | **lb/MMCF** | |
| **Benzene** | **0.0021** | **lb/MMCF** | |
| **n-Hexane** | **1.8** | **lb/MMCF** | |
| **Toluene** | **0.0034** | **lb/MMCF** | |

# Jay-Bee Oil & Gas, Inc.

## Larry 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 | |

Average heating value of natural gas
1020 Btu/scf

| | | | | |
|---|---|---|---|---|
| NOx | 0.0013 | lb/hr | 0.006 | tpy |
| CO | 0.0011 | lb/hr | 0.005 | tpy |
| CO2 | 1.6 | lb/hr | 6.8 | tpy |
| CH4 | 0.000 | lb/hr | 0.000 | tpy |
| CO2e | 1.6 | lb/hr | 7 | tpy |
| VOC | 0.0001 | lb/hr | 0.000 | tpy |
| SO2 | 0.0000 | lb/hr | 0.000 | tpy |
| H2S | 0.0000 | lb/hr | 0.000 | tpy |
| PM10 | 0.0001 | lb/hr | 0.000 | tpy |
| CHOH | 0.0000 | lb/hr | 0.000 | tpy |
| Benzene | 0.0000 | lb/hr | 0.000 | tpy |
| N-Hexane | 0.0000 | lb/hr | 0.000 | tpy |
| Toluene | 0.0000 | lb/hr | 0.000 | tpy |
| Total HAPs | 0.0000 | lb/hr | 0.000 | tpy |

**AP-42 Factors Used**

| | | | |
|---|---|---|---|
| **NOx** | **100** | **lb/MMCF** | |
| **CO** | **84** | **lb/MMCF** | |
| **$CO_2$** | **120,000** | **lb/MMCF** | Global Warming Potential = 1 |
| **VOC** | **5.5** | **lb/MMCF** | |
| **PM** | **7.6** | **lb/MMCF** | |
| **$SO_2$** | **0.6** | **lb/MMCF** | |
| **$CH_4$** | **2.3** | **lb/MMCF** | Global Warming Potential = 25 |
| **$N_2O$** | **2.2** | **lb/MMCF** | Global Warming Potential =298 |
| **HCOH** | **0.075** | **lb/MMCF** | |
| **Benzene** | **0.0021** | **lb/MMCF** | |
| **n-Hexane** | **1.8** | **lb/MMCF** | |
| **Toluene** | **0.0034** | **lb/MMCF** | |

# Jay-Bee Oil & Gas, Inc.

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

**Potential Emission Rates**

## Source EC-1
## Enclosed Combustor Pilot

| | | |
|---|---|---|
| Burner Duty Rating | 985.1 | MBtu/hr |
| Burner Efficiency | 98.0 | % |
| Gas Heat Content (HHV) | 1263.0 | Btu/scf |
| Total Gas Consumption | 19100.9 | scfd |
| H2S Concentration | 0.000 | Mole % |
| Hours of Operation | 8760 | |

| | | | | |
|---|---|---|---|---|
| NOx | 0.0985 | lb/hr | 0.432 | tpy |
| CO | 0.0828 | lb/hr | 0.363 | tpy |
| CO2 | 118.3 | lb/hr | 518.0 | tpy |
| CH4 | 0.002 | lb/hr | 0.01 | tpy |
| CO2e | 119 | lb/hr | 521 | tpy |
| VOC | 0.0054 | lb/hr | 0.024 | tpy |
| SO2 | 0.0006 | lb/hr | 0.003 | tpy |
| H2S | 0.0000 | lb/hr | 0.000 | tpy |
| PM10 | 0.0075 | lb/hr | 0.033 | tpy |
| CHOH | 0.0001 | lb/hr | 0.000 | tpy |
| Benzene | 0.0000 | lb/hr | 0.000 | tpy |
| N-Hexane | 0.0018 | lb/hr | 0.008 | tpy |
| Toluene | 0.0000 | lb/hr | 0.000 | tpy |
| Total HAPs | 0.0019 | lb/hr | 0.008 | tpy |

**AP-42 Factors Used (Tables 1.4.1-1.4.3)**

| | | | |
|---|---|---|---|
| **NOx** | **100** | **lb/MMCF** | |
| **CO** | **84** | **lb/MMCF** | |
| **$CO_2$** | **120,000** | **lb/MMCF** | Global Warming Potential = 1 |
| **VOC** | **5.5** | **lb/MMCF** | |
| **PM** | **7.6** | **lb/MMCF** | |
| **$SO_2$** | **0.6** | **lb/MMCF** | |
| **$CH_4$** | **2.3** | **lb/MMCF** | Global Warming Potential = 25 |
| **$N_2O$** | **2.2** | **lb/MMCF** | Global Warming Potential =298 |
| **HCOH** | **0.075** | **lb/MMCF** | |
| **Benzene** | **0.0021** | **lb/MMCF** | |
| **n-Hexane** | **1.8** | **lb/MMCF** | |
| **Toluene** | **0.0034** | **lb/MMCF** | |

# Jay-Bee Oil & Gas, Inc.

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

**Potential Emission Rates**

## Source EC-1
## Enclosed Vapor Combustor - Control of Tank Emissions

| | | | | |
|---|---|---|---|---|
| Destruction Efficiency | 98.0 | % | | |
| Gas Heat Content (HHV) | 2313.1 | Btu/scf | | |
| Max Flow to T-E | 0.028 | MMSCFD | 10.401 | MMSCF/yr |
| Max BTUs to Flare | 2.746 | MMBTU/hr | 24,058 | MMBTU/yr |

| | | | | |
|---|---|---|---|---|
| NOx | 0.19 | lb/hr | 0.82 | tpy |
| CO | 1.02 | lb/hr | 4.45 | tpy |
| CO2 | 321.02 | lb/hr | 1,406.07 | tpy |
| CO2e | 327.68 | lb/hr | 1,435.26 | tpy |
| VOC | 1.83 | lb/hr | 0.40 | tpy |
| CH4 | 0.26 | lb/hr | 0.06 | tpy |
| N2O | 0.0006 | lb/hr | 0.0026 | tpy |
| PM | 0.0090 | lb/hr | 0.0395 | tpy |
| CHOH | 0.0001 | lb/hr | 0.0004 | tpy |
| Benzene | 0.0000 | lb/hr | 0.0000 | tpy |
| n-Hexane | 0.0021 | lb/hr | 0.0094 | tpy |
| Toluene | 0.0000 | lb/hr | 0.0000 | tpy |
| Total HAP | 0.0022 | lb/hr | 0.0098 | tpy |

Notes: VOC, Total HAP, N-Hexane and CH4 emissions are taken from the Condensate and Produced Water Tank Emissions

**Factors Used**

| | | | | |
|---|---|---|---|---|
| **AP-42 Table 13.5-1** | **NOx** | **0.068** | **lb/MMBTU** | |
| **AP-42 Table 13.5-1** | **CO** | **0.37** | **lb/MMBTU** | |
| **40 CFR 98 Table C-1** | **CO2** | **116.89** | **lb/MMBTU** | Global Warming Potential = 1 |
| **40 CFR 98 Table C-2** | **CH4** | **0.0022** | **lb/MMBTU** | Global Warming Potential = 25 |
| **40 CFR 98 Table C-2** | **N2O** | **0.00022** | **lb/MMBTU** | Global Warming Potential =298 |
| **AP-42 Table 1.4-2** | **PM** | **7.6** | **lb/MMSCF** | |
| **AP-42 Table 1.4-3** | **Benzene** | **0.0021** | **lb/MMSCF** | |
| **AP-42 Table 1.4-3** | **Toluene** | **0.0034** | **lb/MMSCF** | |
| **AP-42 Table 1.4-3** | **Hexane** | **1.8** | **lb/MMSCF** | |
| **AP-42 Table 1.4-3** | **CHOH** | **0.075** | **lb/MMSCF** | |

# Jay-Bee Oil & Gas, Inc.

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

## Source RBV-1

| | | |
|---|---|---|
| Burner Duty Rating | 500.0 | MBtu/hr |
| Burner Efficiency | 98.0 | % |
| Gas Heat Content (HHV) | 1263.0 | Btu/scf |
| Total Gas Consumption | 9,695 | scfd |
| H2S Concentration | 0.000 | Mole % |
| Hours of Operation | 8760 | |

| | | | | |
|---|---|---|---|---|
| NOx | 0.0500 | lb/hr | 0.219 | tpy |
| CO | 0.0420 | lb/hr | 0.184 | tpy |
| CO2 | 60.0 | lb/hr | 262.9 | tpy |
| CH4 | 0.001 | lb/hr | 0.01 | tpy |
| CO2e | 60.4 | lb/hr | 264.5 | tpy |
| VOC | 0.0028 | lb/hr | 0.012 | tpy |
| SO2 | 0.0003 | lb/hr | 0.001 | tpy |
| H2S | 0.0000 | lb/hr | 0.000 | tpy |
| PM10 | 0.0038 | lb/hr | 0.017 | tpy |
| CHOH | 0.0000 | lb/hr | 0.000 | tpy |
| Benzene | 0.0000 | lb/hr | 0.000 | tpy |
| N-Hexane | 0.0009 | lb/hr | 0.004 | tpy |
| Toluene | 0.0000 | lb/hr | 0.000 | tpy |
| Total HAPs | 0.0009 | lb/hr | 0.004 | tpy |

**AP-42 Factors Used**

| | | | |
|---|---|---|---|
| **NOx** | **100** | **lb/MMCF** | |
| **CO** | **84** | **lb/MMCF** | |
| **$CO_2$** | **120,000** | **lb/MMCF** | Global Warming Potential = 1 |
| **VOC** | **5.5** | **lb/MMCF** | |
| **PM** | **7.6** | **lb/MMCF** | |
| **$SO_2$** | **0.6** | **lb/MMCF** | |
| **$CH_4$** | **2.3** | **lb/MMCF** | Global Warming Potential = 25 |
| **$N_2O$** | **2.2** | **lb/MMCF** | Global Warming Potential = 298 |
| **HCOH** | **0.075** | **lb/MMCF** | |
| **Benzene** | **0.0021** | **lb/MMCF** | |
| **n-Hexane** | **1.8** | **lb/MMCF** | |
| **Toluene** | **0.0034** | **lb/MMCF** | |

# Jay-Bee Oil & Gas, Inc.

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

**Potential Emission Rates**

## Source EC-2
## Enclosed Combustor Pilot

| | | |
|---|---|---|
| Burner Duty Rating | 985.1 | MBtu/hr |
| Burner Efficiency | 98.0 | % |
| Gas Heat Content (HHV) | 1263.0 | Btu/scf |
| Total Gas Consumption | 19100.9 | scfd |
| H2S Concentration | 0.000 | Mole % |
| Hours of Operation | 8760 | |

| | | | | |
|---|---|---|---|---|
| NOx | 0.0985 | lb/hr | 0.432 | tpy |
| CO | 0.0828 | lb/hr | 0.363 | tpy |
| CO2 | 118.3 | lb/hr | 518.0 | tpy |
| CH4 | 0.002 | lb/hr | 0.01 | tpy |
| CO2e | 119 | lb/hr | 521 | tpy |
| VOC | 0.0054 | lb/hr | 0.024 | tpy |
| SO2 | 0.0006 | lb/hr | 0.003 | tpy |
| H2S | 0.0000 | lb/hr | 0.000 | tpy |
| PM10 | 0.0075 | lb/hr | 0.033 | tpy |
| CHOH | 0.0001 | lb/hr | 0.000 | tpy |
| Benzene | 0.0000 | lb/hr | 0.000 | tpy |
| N-Hexane | 0.0018 | lb/hr | 0.008 | tpy |
| Toluene | 0.0000 | lb/hr | 0.000 | tpy |
| Total HAPs | 0.0019 | lb/hr | 0.008 | tpy |

**AP-42 Factors Used (Tables 1.4.1-1.4.3)**

| | | | |
|---|---|---|---|
| **NOx** | **100** | **lb/MMCF** | |
| **CO** | **84** | **lb/MMCF** | |
| **$CO_2$** | **120,000** | **lb/MMCF** | Global Warming Potential = 1 |
| **VOC** | **5.5** | **lb/MMCF** | |
| **PM** | **7.6** | **lb/MMCF** | |
| **$SO_2$** | **0.6** | **lb/MMCF** | |
| **$CH_4$** | **2.3** | **lb/MMCF** | Global Warming Potential = 25 |
| **$N_2O$** | **2.2** | **lb/MMCF** | Global Warming Potential =298 |
| **HCOH** | **0.075** | **lb/MMCF** | |
| **Benzene** | **0.0021** | **lb/MMCF** | |
| **n-Hexane** | **1.8** | **lb/MMCF** | |
| **Toluene** | **0.0034** | **lb/MMCF** | |

# Jay-Bee Oil & Gas, Inc.

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

**Potential Emission Rates**

## Source EC-2
## Enclosed Vapor Combustor

| | | | | |
|---|---|---|---|---|
| Destruction Efficiency | 98.0 | % | | |
| Gas Heat Content (HHV) | 660.7 | Btu/scf | | |
| Max Flow to T-E | 0.09264 | MMSCFD | 811.526 | MMSCF/yr |
| Max BTUs to Flare | 2.55 | MMBtu/hr | 22,341 | MMBtu/yr |

| | | | | |
|---|---|---|---|---|
| NOx | 0.17 | lb/hr | 0.76 | tpy |
| CO | 0.94 | lb/hr | 4.13 | tpy |
| CO2 | 298.11 | lb/hr | 1,305.74 | tpy |
| CO2e | 298.42 | lb/hr | 1,307.09 | tpy |
| VOC | 0.80 | lb/hr | 3.51 | tpy |
| CH4 | 0.01 | lb/hr | 0.0246 | tpy |
| N2O | 0.001 | lb/hr | 0.0025 | tpy |
| PM | 0.029 | lb/hr | 0.128 | tpy |
| Benzene | 0.010 | lb/hr | 0.042 | tpy |
| CHOH | 0.000 | lb/hr | 0.001 | tpy |
| n-Hexane | 0.020 | lb/hr | 0.086 | tpy |
| Toluene | 0.034 | lb/hr | 0.147 | tpy |
| Total HAPs | 0.063 | lb/hr | 0.276 | tpy |

Note: VOCs and HAPs are set at 2% of the still vent emissions in the Glycalc Report.

**Factors Used**

| | | | |
|---|---|---|---|
| **AP-42 Table 13.5-1** | **NOx** | **0.068 lb/MMBTU** | |
| **AP-42 Table 13.5-1** | **CO** | **0.37 lb/MMBTU** | |
| **40 CFR 98 Table C-1** | **CO2** | **116.89 lb/MMBTU** | Global Warming Potential = 1 |
| **40 CFR 98 Table C-2** | **CH4** | **0.0022 lb/MMBTU** | Global Warming Potential = 25 |
| **40 CFR 98 Table C-2** | **N2O** | **0.00022 lb/MMBTU** | Global Warming Potential =298 |
| **AP-42 Table 1.4-2** | **PM** | **7.6 lb/MMSCF** | |
| **AP-42 Table 1.4-3** | **CHOH** | **0.075 lb/MMSCF** | |

# Jay-Bee Oil & Gas, Inc.

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

## TL-1
## Truck Loading - Condensate

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

$$L_L = 12.46 * (SPM/T)$$

Where,

| | | | |
|---|---|---|---|
| Loading Loss | $L_L$= | 2.979 | lb/1000 gallons |
| Saturation Factor | S= | 0.6 | |
| True Vapor Pressure | P= | 3.1 | psia |
| Molecular Weight of Vapors | M= | 66.84 | lb/lb-mol |
| Temperature | T= | 520 | deg R |

| | | |
|---|---|---|
| Maximum Daily Loading | 100 | BBL/day |
| | 4,200 | gpd |
| Hours of Loading | 3 | hr |

| | | | | |
|---|---|---|---|---|
| Total VOC | 8.9 | lb/day | 2.96 | lb/hr |
| Total HAP | 0.5 | lb/day | 0.16 | lb/hr |

| | | |
|---|---|---|
| Maximum Annual Loading | 20,400 | BBL/yr |
| | 856,800 | gpy |

| | | | | |
|---|---|---|---|---|
| Total VOC | 1813.7 | lb/yr | 0.91 | tpy |
| Total HAP | 98.0 | lb/yr | 0.05 | tpy |

Emissions

| | | |
|---|---|---|
| Total VOC | 71.059 | % |
| Total HAP | 3.841 | % |

# Jay-Bee Oil & Gas, Inc.

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

## TL-2
## Truck Loading - Produced Water

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

$$L_L = 12.46 * (SPM/T)$$

Where,

| | | | |
|---|---|---|---|
| Loading Loss | $L_L$= | 0.132 | lb/1000 gallons |
| Saturation Factor | S= | 0.6 | |
| True Vapor Pressure | P= | 0.3 | psia |
| Molecular Weight of Vapors | M= | 30.68 | lb/lb-mol |
| Temperature | T= | 520 | deg R |

| | | |
|---|---|---|
| Maximum Daily Loading | 120 | BBL/day |
| | 5,040 | gpd |
| Hours of Loading | 3 | hr |

| | | | | |
|---|---|---|---|---|
| Total VOC | 0.2 | lb/day | 0.08 | lb/hr |
| Total HAP | 0.0 | lb/day | 0.009 | lb/hr |

| | | |
|---|---|---|
| Maximum Annual Loading | 43,200 | BBL/yr |
| | 1,814,400 | gpy |

| | | | | |
|---|---|---|---|---|
| Total VOC | 87.3 | lb/yr | 0.04 | tpy |
| Total HAP | 9.6 | lb/yr | 0.00 | tpy |

Emissions

| | | |
|---|---|---|
| Total VOC | 36.376 | % |
| Total HAP | 4.009 | % |

# Jay-Bee Oil & Gas, Inc.

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

## Truck Loading
## Fugitive Dust

| Item Number | Description | Number of Wheels | Mean Vehicle Weight (tons) | Mean Vehicle Speed (mph) | Miles per Trip | Maximum Trips per Hour | Truck Capacity (BBL/Truck) | Maximum Trips per Year | Control | Control Efficiency (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Produced Water Transportation Trucks | 18 | 27 | 10 | 0.75 | 1 | 80 | 540 | None | --- |
| 2 | Condensate Transportation Trucks | 18 | 27 | 10 | 0.75 | 1 | 80 | 255 | None | --- |
| | | | 54000 | lbs | | | | | | |

| | | PM | PM-10 |
|---|---|---|---|
| k = | Particle size multiplier | 0.8 | 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 | 27 |
| p = | Number of days per year with precipitation >0.01 in. | 157 | 157 |

E (lb/ vehicle mile traveled) = $k \times 5.9 \times (s \div 12) \times (S \div 30) \times (W \div 3)^{0.7} \times (w \div 4)^{0.5} \times ((365 - p) \div 365)$

| **Item 1 - Produced Water** | | **PM** | **PM-10** | |
|---|---|---|---|---|
| E | lb/vmt | 7.378804125 | 1.220015589 | |
| E | [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr | **5.534** | **0.915** | lb/hr |
| E | [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = t | **1.494** | **0.247** | tpy |

| **Item 2 - Condensate** | | **PM** | **PM-10** | |
|---|---|---|---|---|
| E | lb/vmt | 7.378804125 | 1.220015589 | |
| E | [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr | **5.534** | **0.915** | lb/hr |
| E | [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = t | **0.706** | **0.117** | tpy |

**Jay-Bee Oil & Gas - Larry**

# Flash Emission Calculations - Condensate

Using Gas-Oil Ratio Method

## Un-Controlled

### Site specific data

| | | | | |
|---|---|---|---|---|
| Gas-Oil-ratio | = | 500 | scf/bbl | Using GOW from comparable well pads. |
| Throughput | = | 20,400 | 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 | 562.3396 | $E_{TOT}$ |
| **VOC** | **394.5881** | Sum of C3+ |
| Nitrogen | 1.41E-01 | |
| Carbon Dioxide | 8.83E-01 | |
| Methane | 5.58E+01 | |
| Ethane | 1.11E+02 | |
| Propane | 1.46E+02 | |
| Isobutane | 3.94E+01 | |
| n-Butane | 9.07E+01 | |
| 2,2 Dimethylpropane | 1.11E+00 | |
| Isopentane | 3.10E+01 | |
| n-Pentane | 3.26E+01 | |
| 2,2 Dimethylbutane | 1.18E+00 | |
| Cyclopentane | 0.00E+00 | |
| 2,3 Dimethylbutane | 1.70E+00 | |
| 2 Methylpentane | 9.04E+00 | |
| 3 Methylpentane | 5.40E+00 | |
| n-Hexane | 1.18E+01 | HAP |
| Methylcyclopentane | 8.60E-01 | |
| Benzene | 2.02E-01 | HAP |
| Cyclohexane | 1.22E+00 | |
| 2-Methylhexane | 2.62E+00 | |
| 3-Methylhexane | 2.58E+00 | |
| 2,2,4 Trimethylpentane | 0.00E+00 | |
| Other C7's | 2.45E+00 | |
| n-Heptane | 3.79E+00 | |
| Methylcyclohexane | 2.36E+00 | |
| Toluene | 4.61E-01 | HAP |
| Other C8's | 3.85E+00 | |
| n-Octane | 1.28E+00 | |
| Ethylbenzene | 2.81E-02 | HAP |
| M & P Xylenes | 3.32E-01 | HAP |
| O-Xylene | 4.50E-02 | HAP |
| Other C9's | 1.60E+00 | |
| n-Nonane | 3.82E-01 | |
| Other C10's | 6.02E-01 | |
| n-Decane | 7.87E-02 | |
| Undecanes (11) | 8.44E-02 | |

**Jay-Bee Oil & Gas - Larry**

# Flash Emission Calculations - Produced Water

Using Gas-Water Ratio Method

## Un-Controlled

### Site specific data

| | | | | |
|---|---|---|---|---|
| Gas-Water-ratio | = | 4.06 | scf/bbl | Using GOW from comparable well pads. |
| Throughput | = | 43,200 | bbl/yr | |
| Stock tank gas molecular weight | = | 30.68 | 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 | 7.4991 | $E_{TOT}$ |
| **VOC** | **3.8354** | Sum of C3+ |
| Nitrogen | 1.25E-01 | |
| Carbon Dioxide | 1.13E-01 | |
| Methane | 2.22E+00 | |
| Ethane | 1.21E+00 | |
| Propane | 8.62E-01 | |
| Isobutane | 2.15E-01 | |
| n-Butane | 6.07E-01 | |
| 2,2 Dimethylpropane | 9.52E-03 | |
| Isopentane | 3.05E-01 | |
| n-Pentane | 4.24E-01 | |
| 2,2 Dimethylbutane | 1.58E-02 | |
| Cyclopentane | 0.00E+00 | |
| 2,3 Dimethylbutane | 3.05E-02 | |
| 2 Methylpentane | 1.70E-01 | |
| 3 Methylpentane | 1.10E-01 | |
| n-Hexane | 2.96E-01 | HAP |
| Methylcyclopentane | 2.76E-02 | |
| Benzene | 5.40E-03 | HAP |
| Cyclohexane | 3.80E-02 | |
| 2-Methylhexane | 8.26E-02 | |
| 3-Methylhexane | 8.59E-02 | |
| 2,2,4 Trimethylpentane | 0.00E+00 | |
| Other C7's | 7.90E-02 | |
| n-Heptane | 1.44E-01 | |
| Methylcyclohexane | 7.63E-02 | |
| Toluene | 1.18E-02 | HAP |
| Other C8's | 1.31E-01 | |
| n-Octane | 4.11E-02 | |
| Ethylbenzene | 8.25E-04 | HAP |
| M & P Xylenes | 6.75E-03 | HAP |
| O-Xylene | 7.50E-04 | HAP |
| Other C9's | 3.97E-02 | |
| n-Nonane | 7.42E-03 | |
| Other C10's | 8.70E-03 | |
| n-Decane | 1.50E-03 | |
| Undecanes (11) | 1.42E-03 | |

# Jay-Bee Oil & Gas, Inc.

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

## Fugitive VOC Emissions

| | | |
|---|---|---|
| Volatile Organic Compounds, NMNEHC from gas analysis: | 18.40 | weight percent |
| Methane from gas analysis: | 59.35 | weight percent |
| Carbon Dioxide from gas analysis: | 0.32 | weight percent |
| HAPs from gas analysis: | | |
| Hexane | 0.62 | weight percent |
| Gas Density: | 0.0580 | lb/scf |

| Emission Source: | Count | Oil & Gas Production* | VOC % | VOC (lb/hr) | VOC (tpy) | CO2 (lb/hr) | CO2 (tpy) | CH4 (lb/hr) | CH4 (tpy) | CO2e (tpy) | Hexane (tpy) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pump Seals:** | | | | | | | | | | | |
| Gas: | 1 | 0.00529 lb/hr | 18.4 | 0.001 | 0.004 | 0.000 | 0.000 | 0.003 | 0.0138 | 0.344 | 0.000 |
| **Valves:** | | | | | | | | | | | |
| Gas/Vapor: | 38 | 0.02700 scf/hr | 18.4 | 0.011 | 0.048 | 0.000 | 0.001 | 0.035 | 0.1546 | 3.867 | 0.002 |
| Light Liquid: | 18 | 0.05000 scf/hr | 100.0 | 0.052 | 0.229 | | | | | | |
| Low Bleed Pneumatic | - | 1.39000 scf/hr | 18.4 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.0000 | 0.000 | 0.000 |
| **Relief Valves:** | 3 | 0.04000 scf/hr | 18.4 | 0.001 | 0.006 | 0.000 | 0.000 | 0.004 | 0.0181 | 0.452 | 0.000 |
| **Open-ended Lines, gas:** | 20 | 0.06100 scf/hr | 18.4 | 0.013 | 0.057 | 0.000 | 0.001 | 0.042 | 0.1839 | 4.598 | 0.002 |
| **Sampling Connectors:** | | | | | | | | | | | |
| Gas: | 11 | 0.03300 lb/hr | 18.4 | 0.067 | 0.293 | 0.001 | 0.005 | 0.215 | 0.9436 | 23.595 | 0.010 |
| Light Liquid: | 6 | 0.03300 lb/hr | 100.0 | 0.198 | 0.867 | | | | | | |
| **Connectors:** | | | | | | | | | | | |
| Gas: | 177 | 0.00300 scf/hr | 18.4 | 0.006 | 0.025 | 0.000 | 0.000 | 0.018 | 0.0800 | 2.001 | 0.001 |
| Light Liquid: | 60 | 0.00700 scf/hr | 100.0 | 0.024 | 0.107 | | | | | | |
| **Compressor Seals, Gas:** | 1 | 0.01940 lb/hr | 18.4 | 0.004 | 0.016 | 0.000 | 0.000 | 0.012 | 0.0504 | 1.261 | 0.001 |
| **Flanges:** | | | | | | | | | | | |
| Gas: | 80 | 0.00086 lb/hr | 18.4 | 0.013 | 0.055 | 0.000 | 0.001 | 0.041 | 0.1788 | 4.472 | 0.002 |
| Light Liquid: | 40 | 0.00300 scf/hr | 100.0 | 0.007 | 0.030 | | | | | | |

Blowdowns:

| | Pressure (psig) | Internal Volume (scf) | Projected Blowdown Events (per year) | Gas Released Per Year (scf) | Gas Released Per Year (lbs) | Composition of Gas (% by volume) | Released (lb/hr) | Released (tpy) | CO2e (tpy) |
|---|---|---|---|---|---|---|---|---|---|
| **VOC** | 300 | 65 | 16 | 1040 | 124.8 | 0.70 | 0.0100 | 0.0438 | |
| **CH4** | 300 | 65 | 16 | 1040 | 44.0 | 0.10 | 0.0005 | 0.0022 | 0.0546 |
| **HAPs** | 300 | 65 | 16 | 1040 | 116.3 | 0.02 | 0.0003 | 0.0013 | |

***Fugitive Calculations:***

| | lb/hr | tpy |
|---|---|---|
| VOC | **0.406** | **1.780** |
| CH4 | **0.371** | **1.625** |
| CO2 | **0.002** | **0.009** |
| CO2e | **9.280** | **40.645** |
| HAPs | **0.004** | **0.018** |

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

# Jay-Bee Oil & Gas, Inc.

**Larry 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 | - | - | - | - | | | - | | - | |
| Helium, He | - | - | - | - | | | - | | - | |
| Oxygen, O2 | - | - | - | - | | | - | | - | |
| Methane, CH4 | 77.080 | 12.366 | 0.427 | 59.347 | 701.0 | 778.5 | 7.346 | | 0.7693 | |
| Ethane, C2H6 | 14.832 | 4.460 | 0.154 | 21.405 | 240.1 | 262.5 | 2.474 | | 0.1471 | 3.945 |
| Propane | 4.967 | 2.190 | 0.076 | 10.512 | 115.0 | 125.0 | 1.183 | 10.512 | 0.0488 | 1.361 |
| Iso-Butane | 0.616 | 0.358 | 0.012 | 1.718 | 18.5 | 20.0 | 0.191 | 1.718 | 0.0060 | 0.200 |
| Normal Butane | 1.210 | 0.703 | 0.024 | 3.375 | 36.4 | 39.5 | 0.375 | 3.375 | 0.0117 | 0.379 |
| Iso Pentane | 0.266 | 0.192 | 0.007 | 0.921 | 9.8 | 10.6 | 0.101 | 0.921 | 0.0027 | 0.097 |
| Normal Pentane | 0.262 | 0.189 | 0.007 | 0.907 | 9.7 | 10.5 | 0.100 | 0.907 | 0.0026 | 0.094 |
| Hexane | 0.151 | 0.130 | 0.004 | 0.625 | 6.6 | 7.2 | 0.068 | 0.625 | 0.0015 | 0.062 |
| Heptane | 0.071 | 0.071 | 0.002 | 0.341 | 3.6 | 3.9 | 0.037 | 0.341 | 0.0007 | 0.033 |
| | 100.000 | 20.837 | 0.719 | | 1,140.8 | 1,257.7 | 11.875 | 18.400 | 0.9958 | 6.172 |

**Gas Density (STP) = 0.058**

| | |
|---|---|
| Ideal Gross (HHV) | 1,257.7 |
| Ideal Gross (sat'd) | 1,236.6 |
| GPM | - |
| Real Gross (HHV) | 1,263.0 |
| Real Net (LHV) | 1,145.6 |

# Jay-Bee Oil & Gas, Inc.

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

## Condensate Tank Flash Vapor 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 | 0.036 | 0.009 | 0.000 | 0.022 | | | - | | 0.0003 | |
| Carbon Dioxide, CO2 | 0.141 | 0.041 | 0.001 | 0.103 | | | - | | 0.0009 | |
| Hydrogen Sulfide, H2S | - | 0.000 | 0.000 | 0.000 | 0.0 | 0.0 | 0.000 | | 0.0000 | |
| Helium, He | - | - | - | - | | | - | | - | |
| Oxygen, O2 | - | - | - | - | | | - | | - | |
| Methane, CH4 | 24.485 | 3.370 | 0.116 | 8.458 | 191.0 | 212.2 | 2.002 | | 0.2096 | |
| Ethane, C2H6 | 25.943 | 8.112 | 0.280 | 20.358 | 436.7 | 477.4 | 4.500 | | 0.2676 | 7.176 |
| Propane | 23.253 | 11.311 | 0.391 | 28.386 | 593.8 | 645.4 | 6.110 | 28.386 | 0.2520 | 7.030 |
| Iso-Butane | 4.773 | 3.064 | 0.106 | 7.690 | 158.2 | 171.4 | 1.633 | 7.690 | 0.0512 | 1.715 |
| Normal Butane | 10.980 | 6.916 | 0.239 | 17.357 | 358.3 | 388.2 | 3.685 | 17.357 | 0.1150 | 3.731 |
| Iso Pentane | 3.135 | 2.367 | 0.082 | 5.941 | 121.4 | 131.3 | 1.250 | 5.941 | 0.0328 | 1.195 |
| Normal Pentane | 3.175 | 2.307 | 0.080 | 5.791 | 118.5 | 128.2 | 1.219 | 5.791 | 0.0320 | 1.152 |
| Hexane | 2.378 | 1.531 | 0.053 | 3.841 | 78.2 | 84.5 | 0.804 | 3.841 | 0.0175 | 0.726 |
| Heptane | 1.701 | 0.818 | 0.028 | 2.052 | 41.6 | 44.9 | 0.428 | 2.052 | 0.0081 | 0.374 |
| | 100.000 | 39.846 | 1.376 | | 2,097.7 | 2,283.4 | 21.630 | 71.059 | 0.9872 | 23.100 |

**Gas Density (STP) = 0.111**

| | |
|---|---|
| Ideal Gross (HHV) | 2,283.4 |
| Ideal Gross (sat'd) | 2,244.3 |
| GPM | - |
| Real Gross (HHV) | 2,313.1 |
| Real Net (LHV) | 2,124.9 |

# Jay-Bee Oil & Gas, Inc.

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

## Water Tank Flash Vapor 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 | 1.821 | 0.161 | 0.006 | 0.652 | | | - | | 0.0057 | |
| Carbon Dioxide, CO2 | 1.049 | 0.705 | 0.024 | 2.855 | | | - | | 0.0160 | |
| Hydrogen Sulfide, H2S | - | 0.000 | 0.000 | 0.000 | 0.0 | 0.0 | 0.000 | | 0.0000 | |
| Helium, He | - | - | - | - | | | - | | - | |
| Oxygen, O2 | - | - | - | - | | | - | | - | |
| Methane, CH4 | 56.602 | 11.902 | 0.411 | 48.188 | 674.7 | 749.3 | 7.070 | | 0.7404 | |
| Ethane, C2H6 | 16.424 | 2.946 | 0.102 | 11.929 | 158.6 | 173.4 | 1.634 | | 0.0972 | 2.606 |
| Propane | 8.000 | 1.933 | 0.067 | 7.827 | 101.5 | 110.3 | 1.044 | 7.827 | 0.0431 | 1.202 |
| Iso-Butane | 1.516 | 1.070 | 0.037 | 4.332 | 55.2 | 59.9 | 0.570 | 4.332 | 0.0179 | 0.599 |
| Normal Butane | 4.274 | 1.187 | 0.041 | 4.808 | 61.5 | 66.6 | 0.633 | 4.808 | 0.0197 | 0.641 |
| Iso Pentane | 1.784 | 0.942 | 0.033 | 3.812 | 48.3 | 52.2 | 0.497 | 3.812 | 0.0131 | 0.475 |
| Normal Pentane | 2.405 | 0.670 | 0.023 | 2.711 | 34.4 | 37.2 | 0.354 | 2.711 | 0.0093 | 0.334 |
| Hexane | 2.953 | 0.990 | 0.034 | 4.009 | 50.6 | 54.6 | 0.520 | 4.009 | 0.0114 | 0.470 |
| Heptane | 3.172 | 2.192 | 0.076 | 8.877 | 111.6 | 120.4 | 1.147 | 8.877 | 0.0218 | 1.004 |
| | 100.000 | 24.699 | 0.853 | | 1,296.4 | 1,424.0 | 13.469 | 36.376 | 0.9954 | 7.331 |

**Gas Density (STP) = 0.069**

| | |
|---|---|
| Ideal Gross (HHV) | 1,424.0 |
| Ideal Gross (sat'd) | 1,399.9 |
| GPM | - |
| Real Gross (HHV) | 1,430.5 |
| Real Net (LHV) | 1,302.3 |

# Jay-Bee Oil & Gas, Inc.

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

## Still Vent 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 | 0.158 | 0.044 | 0.002 | 0.211 | 0.0 | 0.0 | - | | 0.0016 | |
| Carbon Dioxide, CO2 | 0.164 | 0.072 | 0.002 | 0.343 | 0.0 | 0.0 | 0.012 | | 0.0016 | |
| Hydrogen Sulfide, H2S | - | - | - | - | 0.0 | 0.0 | - | | - | |
| Water | 54.800 | 9.864 | 0.341 | 46.930 | 0.0 | 0.0 | - | | 0.5483 | |
| Oxygen, O2 | - | - | - | - | 0.0 | 0.0 | - | | - | |
| Methane, CH4 | 30.600 | 4.909 | 0.170 | 23.356 | 278.3 | 309.1 | 5.104 | | 0.3054 | |
| Ethane, C2H6 | 7.680 | 2.309 | 0.080 | 10.987 | 124.3 | 135.9 | 1.829 | | 0.0762 | 2.043 |
| Propane | 3.300 | 1.455 | 0.050 | 6.923 | 76.4 | 83.0 | 1.022 | 6.923 | 0.0324 | 0.904 |
| Iso-Butane | 0.506 | 0.294 | 0.010 | 1.399 | 15.2 | 16.5 | 0.157 | 1.399 | 0.0049 | 0.165 |
| Normal Butane | 1.190 | 0.692 | 0.024 | 3.291 | 35.8 | 38.8 | 0.454 | 3.291 | 0.0115 | 0.373 |
| Iso Pentane | 0.278 | 0.201 | 0.007 | 0.954 | 10.3 | 11.1 | 0.113 | 0.954 | 0.0028 | 0.101 |
| Normal Pentane | 0.328 | 0.237 | 0.008 | 1.126 | 12.2 | 13.1 | 0.133 | 1.126 | 0.0033 | 0.118 |
| Hexane | 0.406 | 0.350 | 0.012 | 1.665 | 17.9 | 19.3 | 0.197 | 1.665 | 0.0040 | 0.166 |
| Heptane | 0.590 | 0.591 | 0.020 | 2.813 | 30.1 | 32.5 | 1.310 | 2.813 | 0.0059 | 0.271 |
| | 100.000 | 21.018 | 0.726 | | 600.4 | 659.3 | 10.330 | 18.172 | 0.9979 | 4.141 |

**Gas Density (STP) = 0.058**

| | |
|---|---|
| Ideal Gross (HHV) | 659.3 |
| Ideal Gross (sat'd) | 648.7 |
| GPM | - |
| Real Gross (HHV) | 660.7 |
| Real Net (LHV) | 601.7 |

## Jay-Bee Oil & Gas, Inc.

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 | H20 | 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 |

## ATTACHMENT U – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET

List all sources of emissions in this table. Use extra pages if necessary.

| Emission Point ID# | $NO_x$ | | CO | | VOC | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | $CH_4$ | | GHG ($CO_2e$) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| 1E | 0.15 | 0.66 | 0.13 | 0.55 | 0.01 | 0.04 | <0.01 | <0.01 | 0.01 | 0.05 | 0.01 | 0.05 | <0.01 | 0.02 | 181.1 | 793 |
| 2E | 0.15 | 0.66 | 0.13 | 0.55 | 0.01 | 0.04 | <0.01 | <0.01 | 0.01 | 0.05 | 0.01 | 0.05 | <0.01 | 0.02 | 181.1 | 793 |
| 3E | 0.15 | 0.66 | 0.13 | 0.55 | 0.01 | 0.04 | <0.01 | <0.01 | 0.01 | 0.05 | 0.01 | 0.05 | <0.01 | 0.02 | 181.1 | 793 |
| 4E | 0.05 | 0.22 | 0.04 | 0.18 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | 0.02 | <0.01 | 0.02 | <0.01 | 0.01 | 60.4 | 264 |
| 5E | | | | | 2.96 | 0.91 | | | | | | | | | | |
| 6E | | | | | 0.08 | 0.04 | | | | | | | | | | |
| 7E | 0.19 | 0.81 | 0.37 | 1.62 | 0.04 | 0.18 | <0.01 | <0.01 | 0.01 | 0.06 | 0.01 | 0.06 | 0.13 | 0.55 | 89.7 | 393 |
| 8E | <0.01 | 0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 1.6 | 7 |
| 9E | 0.29 | 1.25 | 1.10 | 4.81 | 1.84 | 0.43 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.26 | 0.07 | 446.7 | 1956 |
| 10E | 0.05 | 0.22 | 0.04 | 0.18 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | 0.02 | <0.01 | 0.02 | <0.01 | 0.01 | 60.4 | 264.5 |
| 11E | 0.27 | 1.19 | 1.03 | 4.5 | 0.81 | 3.54 | <0.01 | <0.01 | 0.04 | 0.16 | 0.04 | 0.16 | 0.01 | 0.03 | 417.4 | 1828.1 |
| 12E | | | | | 1.83 | 8.03 | | | | | | | 0.26 | 1.14 | 6.5 | 28 |
| 13E | 1.52 | 6.66 | 0.52 | 2.27 | 1.40 | 6.13 | <0.01 | 0.03 | 0.11 | 0.50 | 0.11 | 0.50 | 12.32 | 53.97 | 1,750 | 7,666 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| **TOTAL** | 2.82 | 12.33 | 3.48 | 15.23 | 7.16 | 19.38 | 0.01 | 0.05 | 0.22 | 0.97 | 0.22 | 0.97 | 12.73 | 55.81 | 3,376 | 14,787 |

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.
According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

## ATTACHMENT U – FACILITY-WIDE HAP CONTROLLED EMISSIONS SUMMARY SHEET

List all sources of emissions in this table. Use extra pages if necessary.

| Emission Point ID# | Formaldehyde | | Benzene | | Toluene | | Ethylbenzene | | Xylenes | | Hexane | | Total HAPs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| 1E | | | | | | | | | | | <0.01 | 0.01 | <0.01 | 0.01 |
| 2E | | | | | | | | | | | <0.01 | 0.01 | <0.01 | 0.01 |
| 3E | | | | | | | | | | | <0.01 | 0.01 | <0.01 | 0.01 |
| 4E | | | | | | | | | | | <0.01 | <0.01 | <0.01 | <0.01 |
| 5E | | | | | | | | | | | 0.16 | 0.05 | 0.16 | 0.05 |
| 6E | | | | | | | | | | | 0.01 | <0.01 | 0.01 | <0.01 |
| 7E | 0.015 | 0.065 | <0.01 | <0.01 | | | | | | | | | 0.02 | 0.10 |
| 8E | | | | | | | | | | | | | | |
| 9E | <0.01 | <0.01 | | | | | | | | | <0.01 | 0.01 | <0.01 | 0.02 |
| 10E | <0.01 | <0.01 | | | | | | | | | <0.01 | <0.01 | <0.01 | <0.01 |
| 11E | <0.01 | <0.01 | 0.01 | 0.04 | 0.03 | 0.15 | | | | | 0.02 | 0.09 | 0.06 | 0.28 |
| 12E | | | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.06 | 0.24 | 0.06 | 0.26 |
| 13E | 0.32 | 1.41 | <0.01 | 0.02 | <0.01 | 0.02 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | 0.06 | 0.53 | 2.31 |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| **TOTAL** | 0.34 | 1.48 | 0.02 | 0.07 | 0.04 | 0.18 | <0.01 | <0.01 | <0.01 | 0.02 | 0.27 | 0.50 | 0.86 | 3.07 |

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.
According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

## ATTACHMENT V – CLASS I LEGAL ADVERTISEMENT

Publication of a proper Class I legal advertisement is a requirement of the G70-D registration process. In the event the applicant's legal advertisement fails to follow the requirements of 45CSR13, Section 8 or the requirements of Chapter 59, Article 3, of the West Virginia Code, the application will be considered incomplete and no further review of the application will occur until this is corrected.

The applicant, utilizing the format for the Class I legal advertisement example provided on the following page, shall have the legal advertisement appear a minimum of one (1) day in the newspaper most commonly read in the area where the facility exists or will be constructed. The notice must be published no earlier than five (5) working days of receipt by this office of your application. The original affidavit of publication must be received by this office no later than the last day of the public comment period.

The advertisement shall contain, at a minimum, the name of the applicant, the type and location of the source, the type and amount of air pollutants that will be discharged (excluding fugitive emissions), the nature of the permit being sought, the proposed start-up date for the source, and a contact telephone number for more information.

The location of the source should be as specific as possible starting with: 1.) the street address of the source; 2.) the nearest street or road; 3.) the nearest town or unincorporated area, 4.) the county, and 5.) latitude and longitude coordinates in decimal format.

Types and amounts of pollutants discharged **must include** all regulated pollutants (Nitrogen Oxides, Carbon Monoxide, Particulate Matter-2.5, Particulate Matter-10, Volatile Organic Compounds, Sulfur Dioxide, Carbon Dioxide Equivalents, Methane, Formaldehyde, Benzene, Toluene, Ethylbenzene, Xylenes, Hexane, Total Hazardous Air Pollutants and their potential to emit or the permit level being sought in units of tons per year.

In the event the 30th day is a Saturday, Sunday, or legal holiday, the comment period will be extended until 5:00 p.m. on the following regularly scheduled business day.

A list of qualified newspapers that are eligible to publish legal ads may be found:

http://www.sos.wv.gov/elections/resource/Documents/Qualified%20Newspapers.pdf

# 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 modification of the G70-C General Permit Registration and conversion to a G70-D General Permit Registration for its Larry Well Pad Production Facility located off Klondike Acres Rd near Middlebourne in Tyler County, West Virginia. The latitude and longitude coordinates are: 39.47509, -80.88063.

The applicant estimates an increase in potential emissions of the following regulated air pollutants:

6.66 tons of Nitrogen Oxides per year
6.15 tons of Volatile Organics per year
2.27 tons of Carbon Monoxide per year
0.50 tons of Particulate Matter per year
0.03 tons of Sulfur Dioxide per year
1.41 tons of Formaldehyde per year
0.02 tons of Benzene per year
0.06 tons of n-Hexane per year
0.01 tons of Xylene per year
0.02 tons of Toluene per year
2.31 tons of Total Hazardous Air Pollutants per year
54.04 tons of Methane per year
7,668 tons of Greenhouse Gases per year

Startup of operation is planned to begin on or about the 24th day of January, 2017. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th 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.