



Williams Ohio Valley Midstream LLC  
Park Place Corporate Center 2  
2000 Commerce Drive  
Pittsburgh, PA 15275  
(412) 787-7300  
(412) 787-6002 fax

May 28, 2015  
(Via Federal Express)

Beverly McKeone  
New Source Review Program Manager  
Division of Air Quality  
**West Virginia Department of Environmental Protection**  
601 57th Street SE  
Charleston, WV 25304-2345

**Subject:       Application for 45CSR13 NSR Modification Permit**  
**Williams Ohio Valley Midstream LLC (OVM)**  
**SNYDER COMPRESSOR STATION (CS)**  
**Marshall County, West Virginia**

Dear Ms. McKeone,

Williams Ohio Valley Midstream LLC (OVM) is submitting an Application for 45CSR13 New Source Review (NSR) Modification Permit for the existing Snyder Compressor Station (CS) located off McCreary's Ridge Rd, approx. 5.4 mi east-northeast of Moundsville, in Marshall County, West Virginia.

The existing Cummins GTA855 compressor engine will be replaced with another Cummins GTA855 compressor engine at the site. Although the new engine will result in an emissions decrease and emissions will be below the 45CSR13 permit exemption thresholds, the new engine will be subject to NSPS Subpart JJJJ requirements. Approval to change the engine prior to obtaining a permit modification was granted by Mr. Robert Keatley via e-mail dated May 19, 2015. This approval is contingent upon the submittal of a permit modification application by June 1, 2015. Accordingly, this application for 45CSR13 NSR Modification Permit has been prepared and submitted to request authorization for construction and operation of the facility, as follows:

Beverly McKeone  
WVDEP – Division of Air Quality  
May 28, 2015  
Page 02 of 02

Emission Units

Unit ID	Point ID	Emission Unit Description	Year Installed	Design Capacity
CE-01	1E	68 bhp Arrow VRG-330-A-54 Compressor Engine	2012	68 bhp
CE-02	2E	225 bhp Cummins GTA-855 Compressor Engine	2015	225 bhp
RPC	3E	Rod Packing/Crankcase Leaks	2012	293 bhp (tot)
SSM	4E	Startup/Shutdown/Maintenance (Blowdown (BD))	2012	208 BD/unit/yr
DFT-01	5E	5.0 MMscfd Dehydrator - Flash Tank	2012	5.0 MMscfd
DSV-01	6E	5.0 MMscfd Dehydrator - Regenerator/Still Vent	2012	5.0 MMscfd
RBV-01	7E	0.22 MMBtu/hr Reboiler Vent	2012	0.22 MMBtu/hr
TK-01	8E	Produced Water - Storage Tank	2014	210 bbl
TLO	9E	Produced Water - Truck Load-Out	2014	2,520 bbl/yr
FUG	10E	Piping and Equipment Fugitives	2012	na

(NEW and Modified Units are in Shaded Cells)

The facility continues to qualify as a Minor Source under Non-Attainment New Source Review (NNSR), Prevention of Significant Deterioration (PSD), and Title V Operating Permits. The facility is also an Area Source for Hazardous Air Pollutants (HAP) under the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations.

If you have any questions concerning this submittal or need additional information, please contact me at (412) 787-4259 or danell.zawaski@williams.com.

Sincerely,



R. Danell Zawaski, PE  
Environmental Specialist

Enclosures:

- Application for NSR Modification Permit w/ Attachments A through S
- Check for Application Fee

**APPLICATION FOR 45CSR13  
NEW SOURCE REVIEW (NSR) MODIFICATION PERMIT**

*For the:*

**Williams Ohio Valley Midstream LLC (OVM)  
SNYDER COMPRESSOR STATION (CS)  
Marshall County, West Virginia**

*Submitted to:*



**WEST VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
DIVISION OF AIR QUALITY**

*Submitted by:*



**Williams Ohio Valley Midstream LLC  
Park Place Corporate Center 2  
2000 Commerce Drive  
Pittsburgh, PA 15275**

*Prepared by:*



**EcoLogic Environmental Consultants, LLC  
864 Windsor Court  
Santa Barbara, CA 93111**

**May 2015**

# APPLICATION FOR NEW SOURCE REVIEW (NSR) MODIFICATION PERMIT

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
Marshall County, West Virginia

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APPLICATION FEE

# APPLICATION FOR 45CSR13 NSR MODIFICATION PERMIT

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

**APPLICATION FOR NSR PERMIT  
 AND  
 TITLE V PERMIT REVISION  
 (OPTIONAL)**

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

- CONSTRUCTION**     **MODIFICATION**     **RELOCATION**  
 **CLASS I ADMINISTRATIVE UPDATE**     **TEMPORARY**  
 **CLASS II ADMINISTRATIVE UPDATE**     **AFTER-THE-FACT**

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

- ADMINISTRATIVE AMENDMENT**     **MINOR MODIFICATION**  
 **SIGNIFICANT MODIFICATION**     **NOT APPLICABLE**

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

**FOR TITLE V FACILITIES ONLY:** Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

**Section I. General**

1. Name of applicant ( <i>as registered with the WV Secretary of State's Office</i> ): <b>WILLIAMS OHIO VALLEY MIDSTREAM LLC (OVM)</b>		2. Federal Employer ID No. ( <b>FEIN</b> ): <b>27-0856707</b>	
3. Name of facility ( <i>if different from above</i> ): <b>SNYDER COMPRESSOR STATION (CS)</b>		4. The applicant is the: <input type="checkbox"/> <b>OWNER</b> <input type="checkbox"/> <b>OPERATOR</b> <input checked="" type="checkbox"/> <b>BOTH</b>	
5A. Applicant's mailing address: <b>PARK PLACE CORPORATE CENTER 2 2000 COMMERCE DRIVE, PITTSBURGH, PA 15275</b>		5B. Facility's present physical address: <b>MCCREARY'S RIDGE RD MARSHALL COUNTY, WV 26033</b>	
6. <b>West Virginia Business Registration.</b> Is the applicant a resident of the State of West Virginia? <input type="checkbox"/> <b>YES</b> <input checked="" type="checkbox"/> <b>NO</b> – If <b>YES</b> , provide a copy of the <b>Certificate of Incorporation/Organization/Limited Partnership</b> (one page) including any name change amendments or other Business Registration Certificate as <b>Attachment A</b> . – If <b>NO</b> , provide a copy of the <b>Certificate of Authority/Authority of L.L.C./Registration</b> (one page) including any name change amendments or other Business Certificate as <b>Attachment A</b> .			
7. If applicant is a subsidiary corporation, please provide the name of parent corporation: <b>THE WILLIAMS COMPANIES, INC.</b>			
8. Does the applicant own, lease, have an option to buy, or otherwise have control of the <i>proposed site</i> ? <input checked="" type="checkbox"/> <b>YES</b> <input type="checkbox"/> <b>NO</b> – If <b>YES</b> , please explain: <b>APPLICANT OWNS THE COMPRESSOR STATION (CS)</b> – If <b>NO</b> , you are not eligible for a permit for this source.			
9. Type of plant or facility (stationary source) to be <b>constructed, modified, relocated, administratively updated</b> or temporarily permitted (e.g., coal preparation plant, primary crusher, etc.): <b>NATURAL GAS PRODUCTION FACILITY</b>		10. North American Industry Classification System ( <b>NAICS</b> ) code for the facility: <b>213112 – SUPPORT ACTIVITIES FOR OIL AND GAS OPERATIONS</b>	
11A. DAQ Plant ID No. (existing facilities): <b>051-00166</b>		11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (existing facilities): <b>R13-3210</b>	

12A. Directions to the facility:

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

**DIRECTIONS FROM WHEELING AVE IN MOUNDSVILLE:**

- |   |  |
|---|--|
| <b>A. HEAD EAST ONTO JEFFERSON AVE ~ 0.7 MI;</b>        | <b>D. TURN LEFT ONTO MCCREARY'S RIDGE RD ~ 1.3 MI;</b> |
| <b>B. TURN LEFT ONTO 1ST ST ~ 0.8 MI;</b>               | <b>E. TURN LEFT ONTO GRAVEL ACCESS ROAD ~ 0.4 MI;</b>  |
| <b>C. TURN LEFT ONTO US-250/WAYNESBURG PK ~ 6.2 MI;</b> | <b>F. ENTRANCE TO SITE IS ON THE LEFT.</b>             |

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

12.B. New site address (if applicable): <b>MCCREARY'S RIDGE RD</b>	12C. Nearest city or town: <b>MOUNDSVILLE</b>	12D. County: <b>MARSHALL</b>
12.E. UTM Northing (KM): <b>4,421.38 KM NORTHING</b>	12F. UTM Easting (KM): <b>531.70 km EASTING</b>	12G. UTM Zone: <b>17S</b>
13. Briefly describe the proposed change(s) at the facility: <b>REPLACE ONE (1) EXISTING 225 BHP CUMMINS GTA-855 COMPRESSOR ENGINE (NESHAP ZZZZ AFFECTED UNIT) WITH ONE NEW 225 BHP CUMMINS GTA-855 COMPRESSOR ENGINE (NSPS JJJJ AFFECTED UNIT). ALSO ACCOUNT FOR FUGITIVE EMISSIONS FROM PIPELINE COMPONENTS IN WATER/OIL SERVICE.</b>		
14A. Provide the date of anticipated installation or change: – If this is an <b>After-The-Fact</b> permit application, provide the date upon which the proposed change did happen: <b>NA</b>		14B. Date of anticipated Start-Up if a permit is granted: <b>05/22/15 (per approval from WVDEP e-mail dated 05/19/15)</b>
14C. Provide a <b>Schedule</b> of the planned <b>Installation of/Change</b> to and <b>Start-Up</b> of each of the units proposed in this permit application as <b>Attachment C</b> (if more than one unit is involved).		
15. Provide maximum projected <b>Operating Schedule</b> of activity/activities outlined in this application: Hours Per Day: <b>24</b> Days Per Week: <b>7</b> Weeks Per Year: <b>52</b>		
16. Is demolition or physical renovation at an existing facility involved? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
17. <b>Risk Management Plans.</b> If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see <a href="http://www.epa.gov/ceppo">www.epa.gov/ceppo</a> ), submit your <b>Risk Management Plan (RMP)</b> to U. S. EPA Region III.		
18. <b>Regulatory Discussion.</b> List all Federal and State air pollution control regulations that you believe are applicable to the proposed process ( <i>if known</i> ). A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance ( <i>if known</i> ). Provide this information as <b>Attachment D</b> .		

### ***Section II. Additional attachments and supporting documents.***

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate <b>application fee</b> (per 45CSR22 and 45CSR13).
20. Include a <b>Table of Contents</b> as the first page of your application package.
21. Provide a <b>Plot Plan</b> , e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as <b>Attachment E</b> (Refer to <b>Plot Plan Guidance</b> ). – Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).
22. Provide a <b>Detailed Process Flow Diagram(s)</b> showing each proposed or modified emissions unit, emission point and control device as <b>Attachment F</b> .
23. Provide a <b>Process Description</b> as <b>Attachment G</b> . – Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).
24. Provide <b>Material Safety Data Sheets (MSDS)</b> for all materials processed, used or produced as <b>Attachment H</b> . – For chemical processes, provide a MSDS for each compound emitted to the air.
25. Fill out the <b>Emission Units Table</b> and provide it as <b>Attachment I</b> .
26. Fill out the <b>Emission Points Data Summary Sheet (Table 1 and Table 2)</b> and provide it as <b>Attachment J</b> .
27. Fill out the <b>Fugitive Emissions Data Summary Sheet</b> and provide it as <b>Attachment K</b> .
<i>All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.</i>

28. Check all applicable **Emissions Unit Data Sheets** listed below:

- |   |  |  |
|---|--|--|
| <input checked="" type="checkbox"/> Bulk Liquid Transfer Operations (TLO) | <input type="checkbox"/> Haul Road Emissions     | <input type="checkbox"/> Quarry  |
| <input type="checkbox"/> Chemical Processes                               | <input type="checkbox"/> Hot Mix Asphalt Plant   | <input type="checkbox"/> Solid Materials Sizing, Handling and Storage Facilities |
| <input type="checkbox"/> Concrete Batch Plant                             | <input type="checkbox"/> Incinerator             | <input checked="" type="checkbox"/> Storage Tanks (TK-01)                        |
| <input type="checkbox"/> Grey Iron and Steel Foundry                      | <input type="checkbox"/> Indirect Heat Exchanger |  |

**General Emission Unit, specify:**

**COMPRESSOR/GENERATOR ENGINE – 68 BHP ARROW VRG-330-A-54 COMPRESSOR ENGINE (CE-01)**  
**COMPRESSOR/GENERATOR ENGINE – 225 BHP CUMMINS GTA-855 COMPRESSOR ENGINE (CE-02)**  
**DEHYDRATOR – 5.0 MMSCFD W/ FLASH TANK, REGEN/STILL VENT, AND REBOILER (DFT-01, DSV-01, RBV-01)**

Fill out and provide the Emissions Unit Data Sheet(s) as Attachment L.

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Absorption Systems | <input type="checkbox"/> Baghouse                   | <input type="checkbox"/> Flare                 |
| <input type="checkbox"/> Adsorption Systems | <input type="checkbox"/> Condenser                  | <input type="checkbox"/> Mechanical Collector  |
| <input type="checkbox"/> Afterburner        | <input type="checkbox"/> Electrostatic Precipitator | <input type="checkbox"/> Wet Collecting System |

**Other Collectors, specify:**

**Non-Selective Catalytic Reduction (NSCR)**

Fill out and provide the Air Pollution Control Device Sheet(s) as Attachment M.

30. Provide all **Supporting Emissions Calculations** as Attachment N, or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as Attachment O.

- Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a Class I Legal Advertisement in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and *Example Legal Advertisement* for details). Please submit the Affidavit of Publication as Attachment P immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

- YES     NO

- **If YES,** identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's "Precautionary Notice – Claims of Confidentiality" guidance found in the *General Instructions* as Attachment Q.

### Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable Authority Form below:    **NA**

- |  |   |
|--|---|
| <input type="checkbox"/> Authority of Corporation or Other Business Entity | <input type="checkbox"/> Authority of Partnership         |
| <input type="checkbox"/> Authority of Governmental Agency                  | <input type="checkbox"/> Authority of Limited Partnership |

Submit completed and signed Authority Form as Attachment R.

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.



**35A. Certification of Information.** To certify this permit application, a Responsible Official (45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

**Certification of Truth, Accuracy, and Completeness**

I, the undersigned  **Responsible Official** /  **Authorized Representative**, hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

**Compliance Certification**

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE: Don Wicburg (Please use blue ink) DATE: 5/21/2015 (Please use blue ink)

35B. Printed name of signee: <b>DON WICBURG</b>	35C. Title: <b>VICE PRESIDENT AND GENERAL MANAGER</b>	
35D. E-mail: <b>DON.WICBURG@WILLIAMS.COM</b>	36E. Phone: <b>(304) 843-3158</b>	36F. FAX: <b>(304) 843-3131</b>
36A. Printed name of contact person: <b>R. DANELL ZAWASKI, PE</b>	36B. Title: <b>ENVIRONMENTAL SPECIALIST</b>	
36C. E-mail: <b>DANELL.ZAWASKI@WILLIAMS.COM</b>	36D. Phone: <b>(412) 787-4259</b>	36E. FAX: <b>(412) 787-6002</b>

**PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:**

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> Attachment A: Business Certificate               | <input checked="" type="checkbox"/> Attachment K: Fugitive Emissions Data Summary Sheet            |
| <input checked="" type="checkbox"/> Attachment B: Map(s)                             | <input checked="" type="checkbox"/> Attachment L: Emissions Unit Data Sheet(s)                     |
| <input checked="" type="checkbox"/> Attachment C: Installation and Start Up Schedule | <input checked="" type="checkbox"/> Attachment M: Air Pollution Control Device Sheet(s)            |
| <input checked="" type="checkbox"/> Attachment D: Regulatory Discussion              | <input checked="" type="checkbox"/> Attachment N: Supporting Emissions Calculations                |
| <input checked="" type="checkbox"/> Attachment E: Plot Plan                          | <input checked="" type="checkbox"/> Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans |
| <input checked="" type="checkbox"/> Attachment F: Detailed Process Flow Diagram(s)   | <input checked="" type="checkbox"/> Attachment P: Public Notice                                    |
| <input checked="" type="checkbox"/> Attachment G: Process Description                | <input type="checkbox"/> Attachment Q: Business Confidential Claims) (NA)                          |
| <input checked="" type="checkbox"/> Attachment H: Material Safety Data Sheets (MSDS) | <input type="checkbox"/> Attachment R: Authority Forms) (NA)                                       |
| <input checked="" type="checkbox"/> Attachment I: Emission Units Table               | <input type="checkbox"/> Attachment S: Title V Permit Revision Information) (NA)                   |
| <input checked="" type="checkbox"/> Attachment J: Emission Points Data Summary Sheet | <input checked="" type="checkbox"/> Application Fee  |

*Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.*

**FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:**

- Forward 1 copy of the application to the Title V Permitting Group and
- For Title V Administrative Amendments:
  - NSR permit writer should notify Title V permit writer of draft permit
- For Title V Minor Modifications:
  - Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,
  - NSR permit writer should notify Title V permit writer of draft permit.
- For Title V Significant Modifications processed in parallel with NSR Permit revision:
  - NSR permit writer should notify a Title V permit writer of draft permit,
  - Public notice should reference both 45CSR13 and Title V permits,
  - EPA has 45 day review period of a draft permit.

*All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.*

# ATTACHMENT A

## Business Certificate

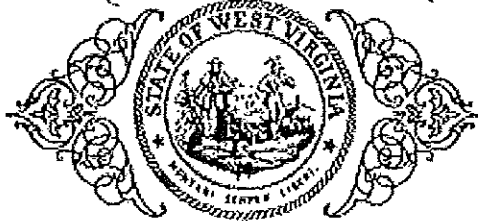
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“6. **West Virginia Business Registration.** Provide a copy of the Certificate of Authority/Authority of L.L.C./Registration (one page) including any name change amendments or other Business Certificate as Attachment A.”

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- Certificate of Amendment to the Certificate of Authority
  - From: CAIMAN EASTERN MIDSTREAM, LLC
  - To: WILLIAMS OHIO VALLEY MIDSTREAM LLC
  - Date: May 15, 2012
  
- Certificate of Authority of a Foreign Limited Liability Company
  - To: CAIMAN EASTERN MIDSTREAM, LLC
  - Date: September 11, 2009

# State of West Virginia



## Certificate

*I, Natalie E. Tennant, Secretary of State of the  
State of West Virginia, hereby certify that*

the attached true and exact copy of the Articles of Amendment to the Articles of Organization of  
**CAIMAN EASTERN MIDSTREAM, LLC**

are filed in my office, signed and verified, as required by the provisions of West Virginia Code  
§31B-2-204 and conform to law. Therefore, I issue this

### **CERTIFICATE OF AMENDMENT TO THE CERTIFICATE OF AUTHORITY**

changing the name of the limited liability company to

**WILLIAMS OHIO VALLEY MIDSTREAM LLC**



*Given under my hand and the  
Great Seal of the State of  
West Virginia on this day of  
May 15, 2012*

*Natalie E. Tennant*

*Secretary of State*

# State of West Virginia



## Certificate

*I, Natalie E. Tennant, Secretary of State of the  
State of West Virginia, hereby certify that*

**CAIMAN EASTERN MIDSTREAM, LLC**

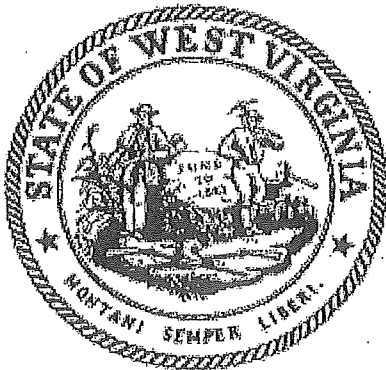
Control Number: 99GIS

a limited liability company, organized under the laws of the State of Texas  
has filed its "Application for Certificate of Authority" in my office according to the provisions  
of West Virginia Code §31B-10-1002. I hereby declare the organization to be registered as a  
foreign limited liability company from its effective date of September 11, 2009, until a  
certificate of cancellation is filed with our office.

Therefore, I hereby issue this

### **CERTIFICATE OF AUTHORITY OF A FOREIGN LIMITED LIABILITY COMPANY**

to the limited liability company authorizing it to transact business in West Virginia



*Given under my hand and the  
Great Seal of the State of  
West Virginia on this day of  
September 11, 2009*

*Natalie E. Tennant*

Secretary of State

# ATTACHMENT B

## Location/Topographic Map

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“12A. For **Modifications, Administrative Updates** or **Temporary** permits at an existing facility, please provide directions to the present location of the facility from the nearest state road. Include a MAP as Attachment B.”

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Address:

**McCreary Rd  
Moundsville, WV 26033**

Latitude and Longitude:

**39°56'31.0" North x -80°37'44.0" West  
(39.9419° North x -80.6289° West)**

UTM:

**531.70 km Easting x 4,421.38 km Northing x Zone: 17S**

Directions:

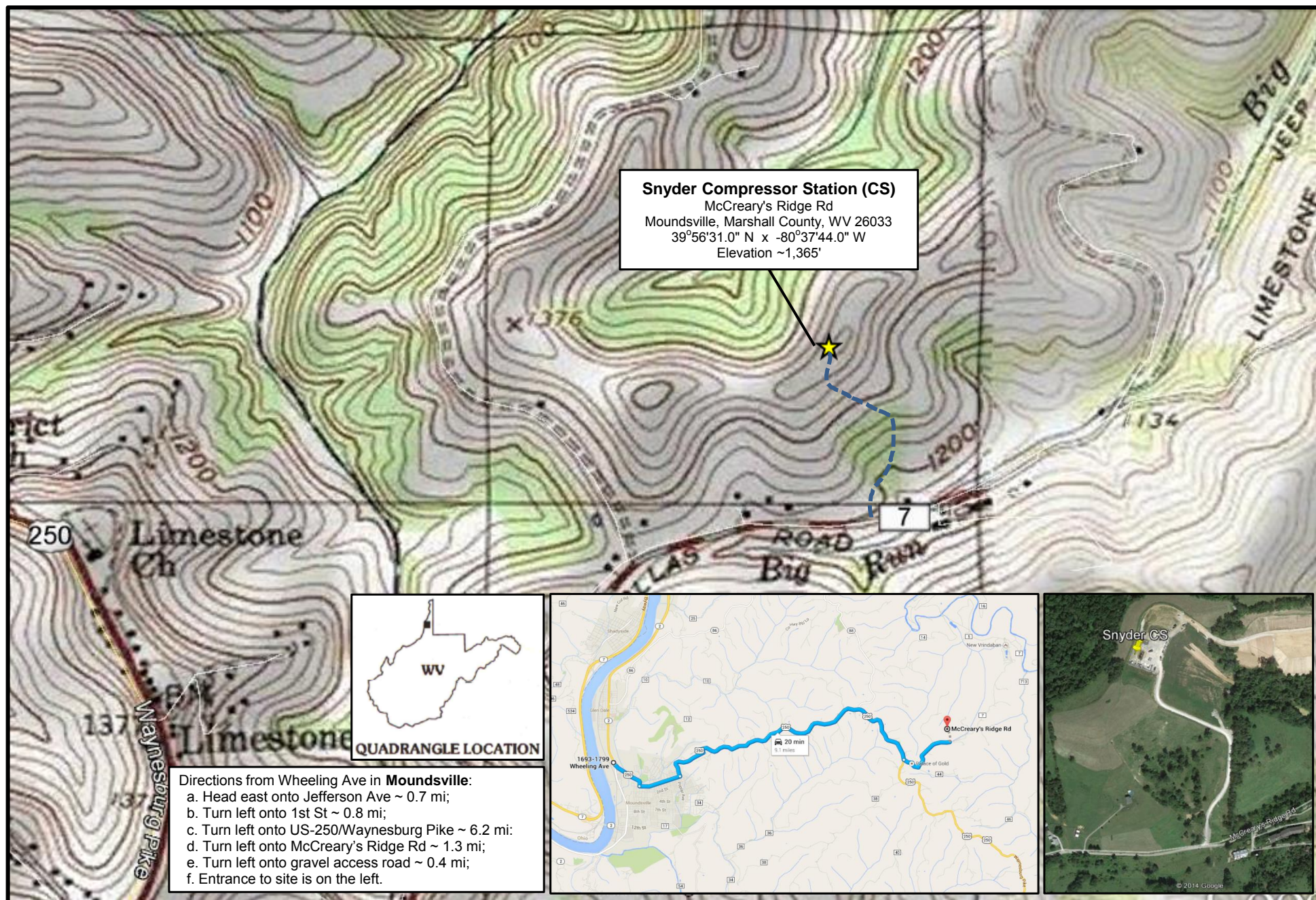
**From Wheeling Ave in Moundsville:**

- a. Head east onto Jefferson Ave ~ 0.7 mi;**
- b. Turn left onto 1<sup>st</sup> St ~ 0.8 mi;**
- c. Turn left onto US-250/Waynesburg Pike ~ 6.2 mi;**
- d. Turn left onto McCreary's Ridge Rd ~ 1.3 mi;**
- e. Turn left onto gravel access road ~ 0.4 mi;**
- f. Entrance to site is on the left.**

- 
- USGS –7.5 Minute Topographic – Moundsville, WV-OH
  - USGS - 7.5 Minute Topographic – Majorsville, WV-PA



**Attachment B - Location/Topographic Map**



# ATTACHMENT C

## Installation and Start-Up Schedule

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“14C. Provide a **Schedule** of the planned **Installation** of/**Change** to and **Start-Up** of each of the units proposed in this permit application as Attachment C.”

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- The OVM Snyder CS is an existing operation, including:
  - One (1) 68 bhp Arrow VRG-330-A-54 Compressor Engine (CE-01)
    - Rod Packing and Crankcase Emissions (RPC)
    - Startup/Shutdown/Maintenance Emissions (SSM)
  - One (1) 225 bhp Cummins GTA-855 Compressor Engine (CE-02)
    - Rod Packing and Crankcase Emissions (RPC)
    - Startup/Shutdown/Maintenance Emissions (SSM)
  - One 5.0 MMscfd TEG Dehydrator (DFT-01 and DSV-01)
  - One (1) 0.22 MMBtu/hr Reboiler (RBV-01)
  - One (1) 210 bbl Produced Water Storage Tank (TK-01)
  - Produced Water Truck Load-out (TLO)
  - Fugitive Emissions from Piping and Equipment (FUG)
  
- OVM proposes to replace the existing Cummins GTA-855 compressor engine with a different Cummins GTA-855 compressor engine:
  
- The new Cummins GTA-855 is anticipated to be installed on May 22, 2015. Approval to change the engine prior to obtaining a permit modification was granted by Mr. Robert Keatley via e-mail dated May 19, 2015 (see following page). This approval is contingent upon the submittal of a permit modification application by June 1, 2015.

**From:** Keatley, Robert L [<mailto:Robert.L.Keatley@wv.gov>]

**Sent:** Tuesday, May 19, 2015 9:20 AM

**To:** Zawaski, Danell

**Cc:** McKeone, Beverly D; Durham, Shanda; Fernald, Don; Adkins, Jesse D; Jarrett, James F; Carey, Angela E; Weisenborn, Eric P

**Subject:** RE: Snyder and Hazlet Engines

Danell,

The DAQ has reviewed your request for a like-kind engine (225 hp) replacement at both Snyder and Hazlet locations prior to obtaining a permit modification. The DAQ approves your request as long as Williams submits permit modification applications by June 1, 2015 and updates the associated permits timely. If you have any questions, please contact myself. Thanks

Rob

**Robert Keatley, PE**

Senior Engineer

Supervisor, Compliance and Enforcement

Division of Air Quality

601 57th Street, SE

Charleston, WV 25304

**Direct** (304) 926-0499 ext. 1695 | **Fax** (304) 926-0479

e-mail: [Robert.L.Keatley@wv.gov](mailto:Robert.L.Keatley@wv.gov)

west virginia department of environmental protection

"Promoting a healthy environment"

**From:** Zawaski, Danell [<mailto:Danell.Zawaski@williams.com>]

**Sent:** Thursday, May 14, 2015 11:01 AM

**To:** Keatley, Robert L

**Cc:** McKeone, Beverly D; Durham, Shanda; Fernald, Don

**Subject:** Snyder and Hazlet Engines

Hi Robert,

The Cummins GTA 855 engines have been installed at our Snyder and Hazlet compressor stations in accordance with Permits R13-3210 and R13-3209. We have found that the units will not work and have been unable to keep the engines running for any length of time. We need to get this problem corrected quickly and the fastest way to do this is to replace the units completely. We have identified two like-kind engines that are the same make and model that should work. The difference is that the replacement engines are newly manufactured units and would be subject to NSPS JJJJ. The existing engines are not subject to NSPS JJJJ. Since the replacement engines are subject to NSPS JJJJ they would require a catalyst and have significantly lower emissions than the current engines. Pedigrees for the replacement engines and existing engines are attached.

New Engines

Pedigree 6736

Pedigree 6737



Old Engines

Pedigree 5102

Pedigree 5103

We understand that this change may require a permit modification and have started working on the permit application. We would like permission to install the new engines before the permit modification is issued by WVDEP. Thank you for your consideration.

Regards,  
Danell

*R. Danell Zawaski, PE*

Environmental Specialist

NEGP Environmental Services

304-843-3133 Moundsville

412/787-4259 Pittsburgh

505/787-7926 cell

412/787-6002 fax

[Danell.zawaski@williams.com](mailto:Danell.zawaski@williams.com)

# **ATTACHMENT D**

## **Regulatory Discussion**

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“18. **Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process (if known). Discuss applicability and proposed demonstration(s) of compliance (if known). Provide this information as Attachment D.”

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- **Regulatory Discussion**
  - A. Applicability of New Source Review (NSR) Regulations
  - B. Applicability of Federal Regulations
  - C. Applicability of Source Aggregation
  - D. Applicability of State Regulations

**Attachment D**  
**Regulatory Discussion**

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
Application for 45CSR13 NSR Modification Permit

A. Applicability of New Source Review (NSR) Regulations

The following New Source Review (NSR) regulations are potentially applicable to natural gas production facilities. Applicability to the subject facility has been determined as follows:

**1. Prevention of Significant Deterioration (PSD)** [Not Applicable]

This rule does not apply. The facility is a “PSD Minor Source” for each regulated pollutant, as follows:

- NOx: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- CO: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- VOC: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- SO<sub>2</sub>: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- PM<sub>10/2.5</sub>: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy

**2. Non-Attainment New Source Review (NNSR)** [Not Applicable]

This rule does not apply. The facility location is designated as either “Maintenance” or “Attainment/Unclassified” for all criteria pollutants.

**3. Major Source of Hazardous Air Pollutants (HAPs)** [Not Applicable]

This rule does not apply. The facility qualifies as a “HAP Area Source” as follows:

- Each HAP: HAP Area Source with Controlled Individual HAP PTE < 10 tpy
- Total HAPs: HAP Area Source with Controlled Total of All HAPs PTE < 25 tpy

**4. Title V Operating Permit (TVOP)** [Not Applicable]

This rule does not apply. The facility qualifies as a “Title V Minor Source” as follows:

- NOx: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- CO: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- VOC: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- SO<sub>2</sub>: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- PM<sub>10/2.5</sub>: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- Each HAP: Title V Natural Minor Source with Pre-Controlled PTE < 10 tpy
- Total HAPs: Title V Natural Minor Source with Pre-Controlled PTE < 25 tpy

## B. Applicability of Federal Regulations

The following federal regulations are potentially applicable to natural gas production facilities. Applicability to the facility has been determined as follows:

### 1. **NSPS Dc, Steam Generating Units**

40CFR§60.40c-§60.48c

[Not Applicable]

This rule does not apply because there is no steam generating unit at the facility with a maximum design heat input capacity  $\geq 10$  MMBtu/hr and  $\leq 100$  MMBtu/hr (§60.40c(a)).

### 2. **NSPS Kb, Volatile Organic Liquid Storage Vessels**

40CFR§60.110b-§60.117b

[Not Applicable]

This rule does not apply because there is no tank used to store volatile organic liquids (VOL) with a design capacity  $\geq 75$  m<sup>3</sup> (19,815 gal, 471.79 bbl) (§60.110b(a)).

### 3. **NSPS GG, Stationary Gas Turbines**

40CFR§60.330-§60.335

[Not Applicable]

This rule does not apply because there is no stationary gas turbine at the facility with a heat input at peak load equal to or greater than 10.7 gigajoules (10 million Btu) per hour, based on the lower heating value of the fuel fired (§60.330).

### 4. **NSPS KKK, Leaks from Natural Gas Processing Plants**

40CFR§60.630-§60.636

[Not Applicable]

This rule does not apply because the facility is not a natural gas processing plant (§60.630(a)).

### 5. **NSPS LLL, Onshore Natural Gas Processing: SO<sub>2</sub> Emissions**

40CFR§60.640-§60.648

[Not Applicable]

This rule does not apply because there is no gas sweetening operation at the facility (§60.640(a)).

### 6. **NSPS IIII, Compression Ignition Reciprocating Internal Combustion Engines**

40CFR§60.4200-§60.4219

[Not Applicable]

This rule does not apply because there is no stationary compression ignition engine at the facility (§60.4200(a)).

### 7. **NSPS JJJJ, Stationary Spark Ignition (SI) Internal Combustion Engines (ICE)**

40CFR§60.4230-§60.4248

[Applicable]

This rule does not apply to the existing 68 bhp Arrow VRG-330-A-54 Compressor Engine (CE-01) because the maximum engine power is less than 500 HP and the manufacture date of the engine is prior to 07/01/08 (§60.4230(a)(4)(iii)). This rule does apply to the NEW 225 bhp Cummins GTA-855 Compressor Engine (CE-02) because the maximum engine power is less than 500 HP and the manufacture date of the engine is after 07/01/08 (§60.4230(a)(4)(iii)).

**8. NSPS KKKK, Stationary Combustion Turbines**

40CFR§60.4300-§60.4420

[Not Applicable]

This rule does not apply because there is no stationary combustion turbine at the facility with a heat input at peak load equal to or greater than 10.7 gigajoules (10 MMBtu) per hour, based on the higher heating value of the fuel (§60.4305).

**9. NSPS OOOO, Crude Oil and Natural Gas Production**

40CFR§60.5360-§60.5430

[Applicable]

This rule does not apply to the reciprocating compressor driven by CE-01 because it commenced construction before 08/23/11 (§60.5360 and §60.5365(c)). This rule does apply to the reciprocating compressor driven by CE-02 because it commenced construction after 08/23/11 (§60.5360 and §60.5365(c)).

This rule does not apply to the produced water storage tank (TK-01) because it does not have the potential to emit > 6 tpy of VOC (§60.5365(d)(3)(e)). However, there is a requirement to maintain documentation that the VOC emission rate is < 6 tpy per tank (§60.5420(b)(6)(ii) and (c)(5)(ii)).

This rule does not apply to the pneumatic controllers because they are located between the wellhead and point of custody transfer, are not located at a natural gas processing plant, and their bleed rate is ≤ 6 scfh (§60.5365(d)(i)).

**10. NESHAP HH, Oil and Natural Gas Production Facilities**

40CFR§63.760-§63.779

[Applicable]

This rule does apply to the triethylene glycol (TEG) dehydrator (DFT-01 and DSV-01). However, because the TEG dehydrator will have an actual annual average benzene emissions < 0.9 megagrams per year, it is exempt from all requirements except to maintain records of actual annual average benzene emissions to demonstrate continuing exemption status (§63.764(e)(1)).

This rule does not apply to storage vessels (tanks), compressors, or ancillary equipment because the facility is an area source of HAP emissions (§63.760(b)(2)). In no case does this rule apply to engines or turbines.

**11. NESHAP HHH, Natural Gas Transmission and Storage Facilities**

40CFR§63.1270-§63.1289

[Not Applicable]

This rule does not apply because the facility is not a natural gas transmission or storage facility transporting or storing natural gas prior to local distribution (§63.1270(a)).

**12. NESHAP YYYY, Stationary Combustion Turbines**

40CFR§63.6080-§63.6175

[Not Applicable]

This rule does not apply because the facility is not a major HAP source (§63.6085).

**13. NESHAP ZZZZ, Stationary Reciprocating Internal Combustion Engines (RICE)**

40CFR§63.6580-§63.6675

[Applicable]

This rule does apply to the existing 68 bhp Arrow VRG-330-A-54 Compressor Engine (CE-01). Requirements include changing oil/filter, and inspecting/replacing spark plugs and hoses/belts on a specified schedule; and the development and implementation of a maintenance plan. Note: There are no emission limitations, no initial or subsequent performance test requirements, and no monitoring, notification, or reporting requirements.

This rule does apply to the NEW 225 bhp Cummins GTA-855 Compressor Engine (CE-02), however; because it is “new” (i.e., construction or reconstruction commenced on or after 06/12/06); the only requirement is compliance with NSPS JJJJ for Spark Ignition Internal Combustion Engines (§63.6590(a)(2)(iii)).

**14. NESHAP DDDDD, Industrial, Commercial, and Institutional Boilers and Process Heaters – Major Sources**

40CFR§63.7480 – §63.7575

[Not Applicable]

This rule does not apply because the facility is not a major source of HAP (§63.7485).

**15. NESHAP JJJJJJ, Industrial, Commercial, and Institutional Boilers and Process Heaters – Area Sources**

40CFR§63.11193 – §63.11237

[Not Applicable]

This rule does not apply because gas-fired boilers are not subject to the requirements of this subpart (§63.11195(e)). Specifically, “boiler” is defined as an enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam and/or hot water

**16. Chemical Accident Prevention Provisions**

40CFR§68.1-§68.220

[Not Applicable]

This rule does not apply because the facility does not store more than a threshold quantity of a regulated substance in a process (§68.115).

**17. Mandatory Greenhouse Gases (GHG) Reporting**

40CFR§98.1-§98.9

[Not Applicable]

This rule does not apply. The facility is not subject to a listed source category and the aggregate maximum heat input capacity is < 30 MMBtu/hr from all stationary fuel combustion sources combined (§98.2(a)).

### C. Applicability of Source Aggregation

For New Source Review (NSR) and Title V permitting, the three-part regulatory criteria to determine whether emissions from two or more facilities should be aggregated and treated as a single source are whether the activities:

- i) Belong to the same industrial grouping; and
- ii) Are located on one or more contiguous or adjacent properties; and
- iii) Are under control of the same person (or persons under common control).

#### i) Same Industrial Grouping

The subject facility will operate under SIC code 1321 (Natural Gas Liquids Extraction).

The upstream gas production wells will operate under SIC code 1311 (Crude Petroleum and Natural Gas). Therefore, the subject facility shares the same two-digit major SIC code of 13 as the upstream gas production wells.

#### ii) Contiguous or Adjacent

The determination of whether two or more facilities are “contiguous” or “adjacent” is made on a case-by-case basis. This determination is proximity based, and it is important to focus on this criteria and whether it meets the common sense notion of a plant. The functional interrelationship of the two or more facilities is not a relevant inquiry in determining whether the facilities are “contiguous” or “adjacent.”

Neither West Virginia nor federal regulations define the terms “contiguous” or “adjacent” or place any definitive restrictions on how distant two emission units can be and still be considered located on contiguous or adjacent properties for the purposes of a single source determination. It is clear, however, that the determination of whether two or more facilities are “contiguous” or “adjacent” is based on the plain meaning of the terms “adjacent” and “contiguous”, which consider the physical distance between the facilities. The term contiguous is defined in the dictionary as being in actual contact; touching along a boundary or at a point. The term “adjacent” is defined in the dictionary as not distant, nearby, having a common endpoint or border.

The location of the subject facility was chosen because of suitable characteristics for construction and operation, such as the availability of a reasonably flat grade and accessibility for large trucks and equipment. Williams’ business model is to construct scalable capacity that contemplates additional production from multiple operators and the initial configuration is merely a foundation for additional opportunities in the area. The subject facility does not need to be located in the immediate vicinity of the upstream wells in order to operate properly. Had suitable land been available elsewhere, the subject facility could have been located further from the upstream wells and could theoretically be moved further from the wells without affecting operations. Therefore, despite the fact that the subject facility is located in close proximity to one or many upstream production sources, aggregation of the Snyder Compressor Station with upstream wells does not meet the common sense notion of a plant.

iii) Common Control

Williams OVM operates under its parent company The Williams Companies, Inc. (Williams) and is the sole operator of the subject facility. The closest Williams-operated facility to the subject facility is the Bardall Compressor Station (CS), which is located approximately 2.7 miles away. The production wells that send natural gas to the subject facility are owned and operated by other companies, which are unaffiliated with Williams. Williams has no ownership stake in any production well that may send natural gas to the subject facility.

Furthermore, neither Williams OVM, nor Williams, exercise operational control over any equipment owned or operated by any natural gas producer upstream of the subject facility. All employees at the subject facility are under the exclusive direction of Williams and are not under the control of any other entity. Similarly, Williams has no authority over employees of the production wells. These companies operate wholly independent of one another. No employees are expected to shuttle back and forth between the subject facility and any production well.

At this time, contracts are in place for the subject facility to process natural gas produced from multiple upstream production wells. As future commercial opportunities are identified, the subject facility will potentially receive gas from other producers. Williams will not have ownership or control of any future wellhead facilities. The producers are, and will be responsible for, any decisions to produce or shut-in wellhead facilities and have no control over the equipment installed, owned, and operated by Williams. Similarly, Williams cannot control the installation or operation of any equipment located at a well site that may be considered an air contamination source.

Summary

The subject facility and the upstream production wells should not be aggregated and treated as a single source of emissions because the subject facility is not under common control with any of the upstream wells. Additionally, the subject facility and the upstream production wells, considered together, do not meet the common sense notion of a plant because the subject facility is expected to service multiple production wells and because the location of the facility was selected for reasons unrelated to the location of the production wells. Accordingly, the subject facility should not be aggregated with the upstream wells in determining major source or PSD status.



#### D. Applicability of State Regulations

The following State regulations are potentially applicable to natural gas production facilities. Applicability to the facility has been determined as follows:

**1. Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers**

45CSR2

[Applicable]

This rule does apply, however, because the dehydrator reboiler (RBV-01) has a maximum design heat input (MDHI) rating < 10 MMBtu/hr, the only requirement is to limit visible emissions to < 10% opacity during normal operations (§45-02-3.1). The reboiler combusts only natural gas which inherently conforms to the visible emission standards.

**2. Prevent and Control the Discharge of Air Pollutants into the Open Air which Causes or Contributes to an Objectionable Odor or Odors**

45CSR4

[Applicable]

This rule does apply and states that an objectionable odor is an odor that is deemed objectionable when in the opinion of a duly authorized representative of the Air Pollution Control Commission (Division of Air Quality), based upon their investigations and complaints, such odor is objectionable. No odors have been deemed objectionable.

**3. Control of Air Pollution from Combustion of Refuse**

45CSR6

[Not Applicable]

This rule does not apply because there is no refuse combustion performed at the facility.

**4. Prevent and Control Air Pollution from the Emission of Sulfur Oxides**

45CSR10

[Not Applicable]

This rule does not apply because there are no “fuel burning units” at the facility w/ a Maximum Design Heat Input (MDHI) rating > 10 MMBtu/hr.

**5. Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation**

45CSR13

[Applicable]

This rule does apply. Williams OVM has published the required Class I legal advertisement notifying the public of their permit application, and paid the appropriate application fee.

**6. Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants**

45CSR14

[Not Applicable]

This rule does not apply because the facility is not a major source of pollutants.

- 7. Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60**  
45CSR16 [Not Applicable]

This rule does not apply because the facility is not subject to any New Source Performance Standards (NSPS).

- 8. Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment**  
45CSR19 [Not Applicable]

This rule does not apply because the facility is a minor (or “deferred”) source of all regulated pollutants.

- 9. Requirements for Operating Permits**  
45CSR30 [Not Applicable]

This rule does not apply because the facility is a minor (or “deferred”) source of all regulated pollutants.

# ATTACHMENT E

## Plot Plan

---

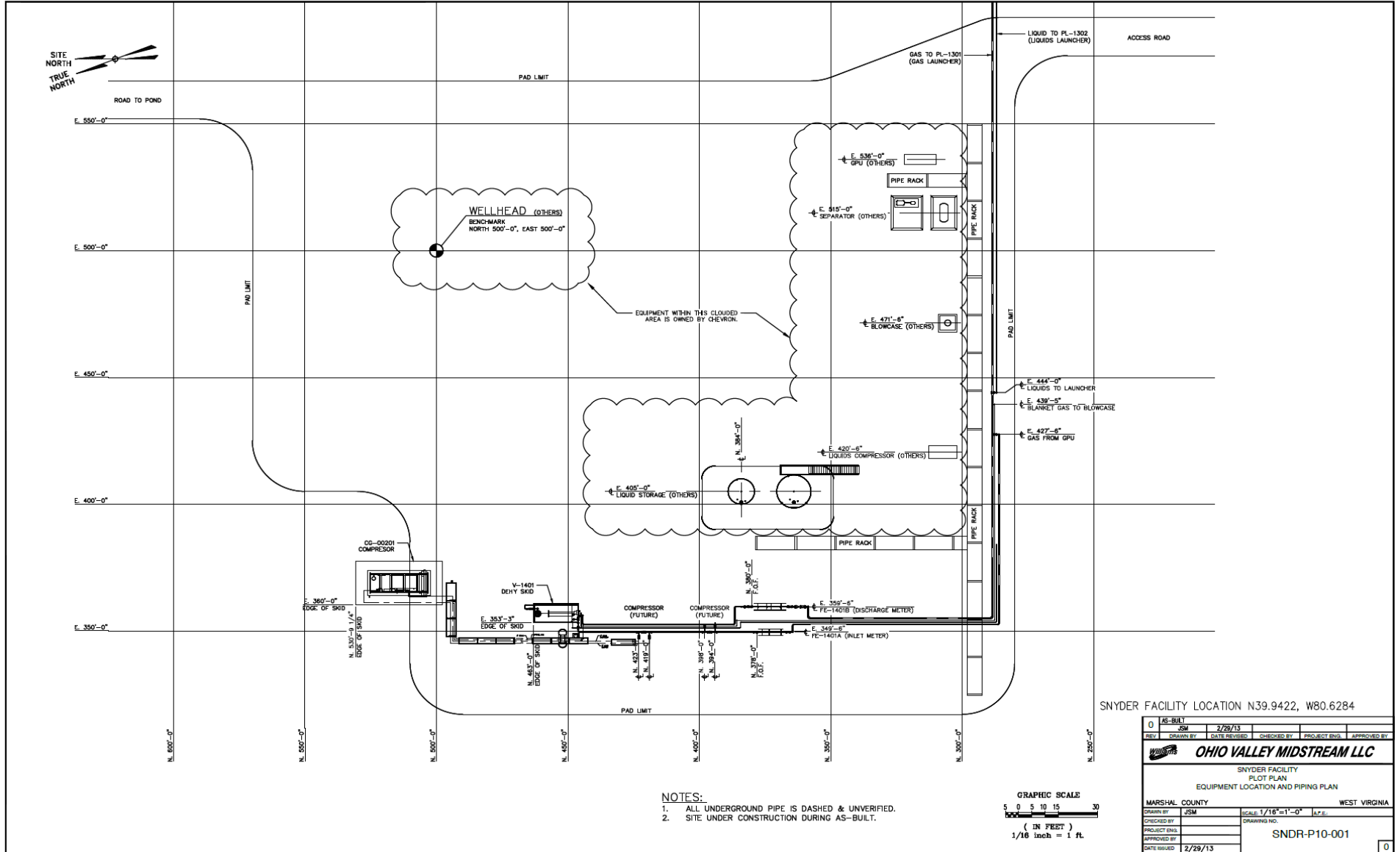
“21. Provide a **Plot Plan**, e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as Attachment E.”

---

- Plot Plan – OVM Snyder CS

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
 Application for 45CSR13 NSR Modification Permit

**Attachment E - Plot Plan**



**NOTES:**  
 1. ALL UNDERGROUND PIPE IS DASHED & UNVERIFIED.  
 2. SITE UNDER CONSTRUCTION DURING AS-BUILT.

**GRAPHIC SCALE**  
 0 5 10 15 30  
 ( IN FEET )  
 1/16 inch = 1 ft.

SNYDER FACILITY LOCATION N39.9422, W80.6284

0	MS-BLJ	2/29/13			
REV	DRAWN BY	DATE REVISION	CHECKED BY	PROJECT ENG.	APPROVED BY
	JSM				
<b>OHIO VALLEY MIDSTREAM LLC</b>					
SNYDER FACILITY PLOT PLAN EQUIPMENT LOCATION AND PIPING PLAN					
MARSHAL COUNTY			WEST VIRGINIA		
DRAWN BY	JSM	SCALE: 1/16"=1'-0"	A.P.S.		
CHECKED BY		DRAWING NO.			
PROJECT ENG.		SNDR-P10-001			
DATE ISSUED	2/29/13				

# ATTACHMENT F

## Detailed Process Flow Diagram

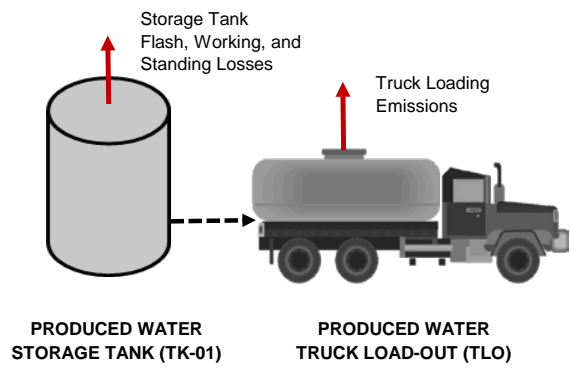
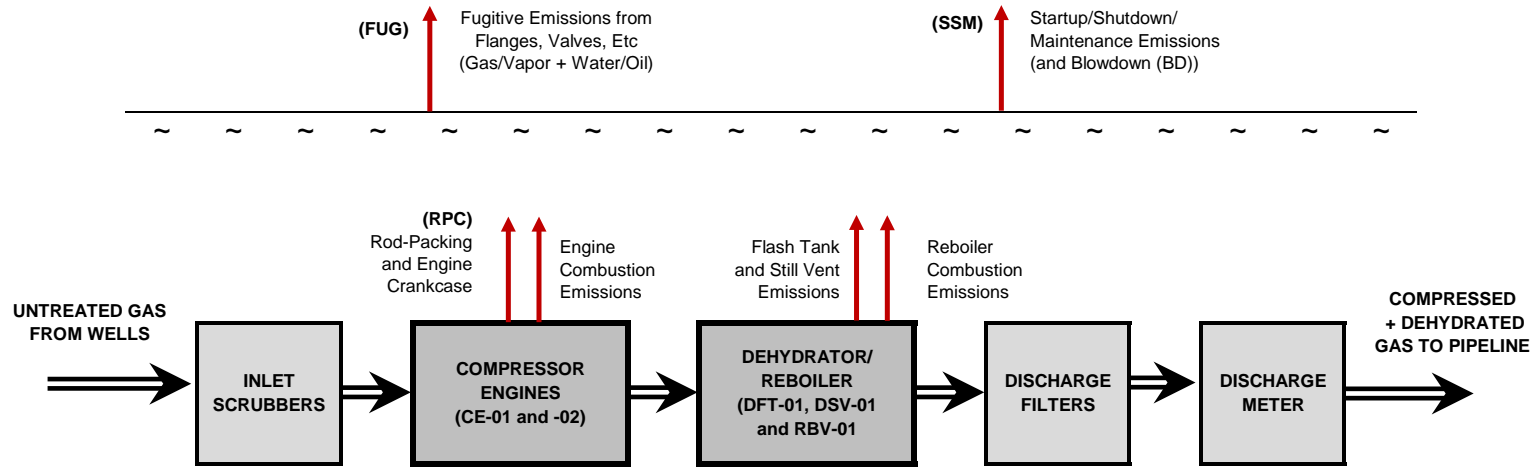
---

“22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as Attachment F.”

---

- Process Flow Diagram (PFD)

**Process Flow Diagram (PFD)**



<u>ID No.</u>	<u>EQUIPMENT</u>
CE-01	68 bhp Arrow VRG-330-A-54 Compressor Engine
CE-02	225 bhp Cummins GTA-855 Compressor Engine
RPC	Compressor Rod-Packing / Reciprocating Engine-Crankcase
SSM	Startup/Shutdown/Maintenance (Includes Blowdown)
DFT-01	5.0 MMscfd TEG Dehydrator Flash Tank
DSV-01	5.0 MMscfd TEG Dehydrator Regenerator/Still Vent
RBV-01	0.22 MMBtu/hr Reboiler
TK-01	210 bbl Produced Water Storage Tank
TLO	Produced Water Truck Load-Out
FUG	Piping and Process Fugitives (Gas/Vapor + Water/Oil)

# ATTACHMENT G

## Process Description

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“23. Provide a **Process Description** as Attachment G. Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable). “

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- **Process Description**

- A. Project Overview
- B. Compressor Engines (CE-01 and -02) (1E and 2E)
- C. Rod Packing/Crankcase Leaks (RPC) (3E)
- D. Startup/Shutdown/Maintenance (SSM) (4E)
- E. Tri-Ethylene Glycol (TEG) Dehydrator (DFT-01 and DSV-01) (5E and 6E)
- F. Reboiler (RBV-01) (7E)
- G. Produced Water Storage Tank (TK-01) (8E)
- H. Produced Water Truck Load-Out (TLO) (9E)
- I. Fugitive Emissions (FUG) (10E)

# **ATTACHMENT G**

## **Process Description**

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
Application for 45CSR13 Modification Permit

### **A. Project Overview**

Williams Ohio Valley Midstream, LLC (OVM) is proposing to replace the existing Cummins GTA-855 compressor engine (CE-02) with a different Cummins GTA-855 compressor engine at the existing Snyder Compressor Station (CS), near Moundsville, in Marshall County, West Virginia. (See Appendix B – Location/Topographic Map). Although the modification will not result in potential emissions exceeding the permit exemption thresholds provided in 45CSR13, the new engine will be subject to NSPS Subpart JJJJ requiring a permit modification.

### **B. Compressor Engines (CE-01 and -02) (1E and 2E)**

One (1) existing 68 bhp Arrow VRG-330-A-54 Natural Gas-fueled Compressor Engine and One (1) NEW 225 bhp Cummins GTA-855 Natural Gas-fueled Compressor Engine will be utilized at the facility.

### **C. Rod Packing and Crankcase Leaks (RPC) (3E)**

The Compressor Rod Packing and Engine Crankcase (RPC) generate emissions from mechanical joints, seals, and rotating surfaces.

### **D. Startup/Shutdown/Maintenance (SSM) (4E)**

During routine operation of the facility the compressor engines will undergo periods of startup and shutdown. Often when the engines are shutdown, the natural gas contained within the compressor and associated piping is vented to atmosphere. Additionally, there will be other infrequent and (often) de-minimis emissions from various maintenance activities at the facility that are not necessarily associated with compressor blowdowns.

### **E. Tri-Ethylene Glycol (TEG) Dehydrator (DFT-01 and DSV-02) (5E and 6E)**

One (1) Tri-Ethylene Glycol (TEG) Dehydrator is utilized at the facility. The dehydrator is comprised of a Contactor/Absorber Tower (no vented emissions), Flash Tank (DFT-01), and Regenerator/Still Vent (DSV-01).

The TEG dehydrator is used to remove water vapor from the inlet wet gas stream to meet pipeline specifications. In the dehydration process, the wet inlet gas stream flows through a contactor tower where the gas is contacted with lean glycol. The lean glycol absorbs the water in the gas stream and becomes rich glycol laden with water and trace amounts of hydrocarbons.

The rich glycol is then routed to a flash tank where the glycol pressure is reduced to liberate the lighter end hydrocarbons. Whenever practical, the lighter end hydrocarbons are routed from the flash tank to the reboiler for use as fuel; otherwise these off-gases are vented to the atmosphere.

The rich glycol is then sent from the flash tank to the regenerator/still where the TEG is heated to drive off the water vapor and any remaining hydrocarbons. Once boiled, the glycol is



returned to a lean state and used again in the process.

**F. Reboiler (RBV-01) (7E)**

One (1) 0.22 MMBtu/hr Reboiler (RBV-01) is utilized to supply heat for the Tri-Ethylene Glycol (TEG) Regeneration/Still (DSV-01).

**G. Produced Water/Condensate Storage Tank (TK-01) (8E)**

The 210 bbl Produced Water Tank (TK-01) receives liquids from the dehydrator and suction scrubber. The inlet separator removes entrained fluids (primarily water) and these liquids are also sent to the atmospheric storage tank.

A HYSYS process simulation was completed, indicating that there are negligible flash gas emissions. A natural gas blanket will be used on the produced water tank to prevent air from entering the tank and causing an explosion.

**H. Produced Water/Condensate Truck Load-Out (TLO) (9E)**

Loading of Produced Water into tanker trucks (TLO) will produce small quantities of VOC emissions.

**I. Fugitive Emissions (FUG) (10E)**

During routine operation of the facility there will be leaks from process piping components such as valves, flanges, connectors, etc. Leaks from the process piping components results in VOC and HAP emissions to the atmosphere.

# **ATTACHMENT H**

## **Material Safety Data Sheets (MSDS)** **(And Representative Gas Analysis)**

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“24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as Attachment H. For chemical processes, provide a MSDS for each compound emitted to the air.”

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- INLET GAS ANALYSIS SUMMARY
- INLET GAS CERTIFICATE OF ANALYSIS
- MATERIAL SAFETY DATA SHEETS (MSDS):
  - Natural Gas
  - Tri-Ethylene Glycol (TEG)
  - Lube Oil
  - Produced Water

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
 Application for 45CSR13 NSR Modification Permit

**ATTACHMENT H - Gas Analysis Summary**

**Gas Analysis for Snyder Master - Sampled 07/02/13**

Component	Formula	Molecular Weight (MW)	Mole % (M%)	Mole Fraction (M%/Sum-M%)	Weighted Sum (MW*MF)	Weight % (WS/Sum-WS)	lb/MMscf (WS/UGC#)
Nitrogen	N2	32.00	0.40880	0.004088	0.1308	0.620	344.71
Hydrogen Sulfide	H2S	34.08	0.00000	0.000000	0.0000	0.000	0.00
Carbon Dioxide	CO2	44.01	0.11040	0.001104	0.0486	0.230	128.03
Methane*	CH4	16.04	75.63650	0.756370	12.1340	57.550	31,975.27
Ethane*	C2H6	30.07	16.03050	0.160306	4.8203	22.862	12,702.19
Propane**	C3H8	44.10	5.34580	0.053458	2.3573	11.180	6,211.84
i-Butane**	C4H10	58.12	0.55090	0.005509	0.3202	1.519	843.78
n-Butane**	C4H10	58.12	1.18030	0.011803	0.6860	3.254	1,807.78
Cyclopentane**	C5H10	70.13	0.00000	0.000000	0.0000	0.000	0.00
i-Pentane**	C5H12	72.15	0.22710	0.002271	0.1639	0.777	431.78
n-Pentane**	C5H12	72.15	0.23570	0.002357	0.1701	0.807	448.13
Cyclohexane**	C6H12	84.16	0.01440	0.000144	0.0121	0.057	31.94
Other Hexanes**	C6H14	86.18	0.09050	0.000905	0.0780	0.370	205.52
Heptanes**	C7H16	100.20	0.05540	0.000554	0.0555	0.263	146.28
Methylcyclohexane**	C7H14	98.19	0.01110	0.000111	0.0109	0.052	28.72
C8+ Heavies**	C8H18	114.23	0.02750	0.000275	0.0314	0.149	82.78
n-Hexane***	C6H14	86.18	0.06550	0.000655	0.0564	0.268	148.74
Benzene***	C6H6	78.11	0.00110	0.000011	0.0009	0.004	2.26
Toluene***	C7H8	92.14	0.00280	0.000028	0.0026	0.012	6.80
Ethylbenzene***	C8H10	106.17	0.00005	0.000001	0.0001	0.000	0.14
Xylenes***	C8H10	106.17	0.00490	0.000049	0.0052	0.025	13.71
2,2,4-Trimethylpentane***	C8H18	114.23	0.00005	0.000001	0.0001	0.000	0.15

<b>Totals:</b>	<b>100.00</b>	<b>1.000</b>	<b>21.08</b>	<b>100.00</b>	<b>55,561</b>
<b>Total VOC:</b>	<b>7.81</b>	<b>0.08</b>	<b>3.95</b>	<b>18.74</b>	<b>10,410</b>
<b>Total HAP:</b>	<b>0.07</b>	<b>0.001</b>	<b>0.07</b>	<b>0.31</b>	<b>172</b>

\* = Hydrocarbon (HC)                      \*\* = also Volatile Organic Compound (VOC)                      \*\*\* = also Hazardous Air Pollutant (HAP)  
 #UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 °F and 14.696 psia.                      Pound "X"/scf = M% of "X" \* MW of "X" / UGC

To be conservative, and to account for potential future changes in the gas quality, the following "worst-case" values were assumed:

Component	Formula	Representative Gas Analysis			Assumed "Worst-Case" Gas Analysis		
		Mole %	Wgt %	lb/MMscf	Mole %	Wgt %	lb/MMscf
Carbon Dioxide	CO2	0.11	0.23	128	0.13	0.28	155
Methane	CH4	75.64	57.55	31,975	100.00	100.00	42,275
VOC	C3 thru C10+	7.81	18.74	10,410	9.38	22.50	12,500
n-Hexane	C6H14	0.0655	0.2677	148.74	0.0793	0.3240	180
Benzene	C6H6	0.0011	0.0041	2.26	0.0024	0.0090	5
Toluene	C7H8	0.0028	0.0122	6.80	0.0041	0.0180	10
Ethylbenzene	C8H10	0.0001	0.0003	0.14	0.0018	0.0090	5
Xylenes	C8H10	0.0049	0.0247	13.71	0.0071	0.0360	20
2,2,4-Trimethylpentane	C8H18	0.0001	0.0003	0.15	0.0017	0.0090	5
Total HAP	C6 thru C8	0.0744	0.3092	171.80	0.0964	0.4050	225

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
 Application for 45CSR13 NSR Modification Permit

**ATTACHMENT Hb - Extended Gas Analysis**

J-W Measurement Company  
 Canonsburg, PA  
 724-749-5180

Good

Customer	: 2259 - WILLIAMS	Date Sampled	: 07/30/2013
Station ID	: 52057-50	Date Analyzed	: 08/06/2013
Cylinder ID	: W1166	Effective Date	: 08/01/2013
Producer	:	Cyl Pressure	: 938
Lease	: SNYDER MASTER	Temp	: 73
Area	: 500 - OHIO VALLEY MID	Cylinder Type	: Spot
State	: WV	Sample By	: JR

<u>COMPONENT</u>	<u>MOL%</u>	<u>GPM@14.73(PsIA)</u>
Oxygen	0.0000	0.000
Nitrogen	0.4088	0.000
Methane	75.6365	0.000
Carbon-Dioxide	0.1104	0.000
Ethane	16.0305	4.302
Propane	5.3458	1.478
Iso-Butane	0.5509	0.181
Normal-Butane	1.1803	0.373
Iso-Pentane	0.2271	0.083
Normal-Pentane	0.2357	0.086
2,2-Dimethylbutane	0.0053	0.002
2,3-Dimethylbutane/CycloC5	0.0100	0.003
2-methylpentane	0.0471	0.020
3-methylpentane	0.0281	0.012
Normal-Hexane	0.0655	0.027
2,2-Dimethylpentane	0.0006	0.000
Methylcyclopentane	0.0080	0.003
BENZENE	0.0011	0.000
3,3-Dimethylpentane	0.0000	0.000
CYCLOHEXANE	0.0064	0.002
2-Methylhexane	0.0181	0.008
2,3-Dimethylpentane	0.0031	0.001
3-Methylhexane	0.0126	0.006
1,t2-DMCYC5 / 2,2,4-TMC5	0.0003	0.000
1,t3-Dimethylcyclopentane	0.0002	0.000
N-Heptane	0.0203	0.009
METHYLCYCLOHEXANE	0.0111	0.005
2,5-Dimethylhexane	0.0008	0.000
2,3-Dimethylhexane	0.0013	0.001
TOLUENE	0.0028	0.001
2-Methylheptane	0.0043	0.002
4-Methylheptane	0.0018	0.001
3-Methylheptane	0.0027	0.001
1,t4-Dimethylcyclohexane	0.0018	0.001
N-OCTANE / 1,T2-DMCYC6	0.0061	0.003
1,t3-DMCYC6/1,C4-DMCYC6/1,C2,C3-TMCYC5	0.0000	0.000
2,4,4 TMC6	0.0006	0.000
2,6-Dimethylheptane / 1,C2-DMCYC6	0.0004	0.000
Ethylcyclohexane	0.0005	0.000
ETHYLBENZENE	0.0000	0.000
M-XYLENE	0.0029	0.001
P-XYLENE	0.0018	0.001
O-XYLENE	0.0002	0.000
NONANE	0.0029	0.002
N-DECANE	0.0027	0.002
N-UNDECANE	0.0026	0.002
<b>TOTAL</b>	<b>100.0000</b>	<b>6.619</b>



# Wellhead Natural Gas

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Revision Date: 10/02/2013

Version: 1.0

### SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY

#### Product Identifier

**Product Form:** Mixture

**Product Name:** Wellhead Natural Gas

**Synonyms:** Wellhead Gas, Raw Gas, Methane, Residue Gas, Natural Gas Sweet, Marsh Gas, Fuel Gas, Petroleum Gas.

#### Intended Use of the Product

**Use of the Substance/Mixture:** Fuel.

#### Name, Address, and Telephone of the Responsible Party

##### Company

Williams, Inc.

One Williams Center

Tulsa, OK 74172, US

T 800-688-7507

[enterprise@williams.com](mailto:enterprise@williams.com)

#### Emergency Telephone Number

**Emergency number** : 800-424-9300

### SECTION 2: HAZARDS IDENTIFICATION

#### Classification of the Substance or Mixture

##### Classification (GHS-US)

Simple Asphy

Flam. Gas 1 H220

Compressed gas H280

#### Label Elements

##### GHS-US Labeling

##### Hazard Pictograms (GHS-US)



##### Signal Word (GHS-US)

: Danger

##### Hazard Statements (GHS-US)

: H220 - Extremely flammable gas  
H280 - Contains gas under pressure; may explode if heated  
May displace oxygen and cause rapid suffocation

##### Precautionary Statements (GHS-US)

: P210 - Keep away from heat, sparks, open flames, hot surfaces. - No smoking.  
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
P381 - Eliminate all ignition sources if safe to do so.  
P403 - Store in a well-ventilated place.  
P410+P403 - Protect from sunlight. Store in a well-ventilated place.

#### Other Hazards

**Other Hazards Not Contributing to the Classification:** Contains hydrogen sulfide. Hydrogen sulfide is a highly flammable, explosive gas under certain conditions, is a toxic gas, and may be fatal. Gas can accumulate in the headspace of closed containers, use caution when opening sealed containers. Heating the product or containers can cause thermal decomposition of the product and release hydrogen sulfide. Exposure may aggravate those with pre existing eye, skin, or respiratory conditions.

**Unknown Acute Toxicity (GHS-US)** Not available

### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

#### Mixture

Name	Product identifier	% (w/w)	Classification (GHS-US)
Methane	(CAS No) 74-82-8	> 75	Simple Asphy

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			Flam. Gas 1, H220 Liquefied gas, H280
Ethane	(CAS No) 74-84-0	< 20	Simple Asphy Flam. Gas 1, H220 Liquefied gas, H280
Propane	(CAS No) 74-98-6	< 10	Simple Asphy Flam. Gas 1, H220 Liquefied gas, H280
Carbon dioxide	(CAS No) 124-38-9	< 10	Simple Asphy Compressed gas, H280
Butane	(CAS No) 106-97-8	< 5	Simple Asphy Flam. Gas 1, H220 Liquefied gas, H280
Nitrogen	(CAS No) 7727-37-9	< 5	Simple Asphy Compressed gas, H280
Hydrogen sulfide	(CAS No) 7783-06-4	<= 0.0004	Flam. Gas 1, H220 Liquefied gas, H280 Acute Tox. 2 (Inhalation:gas), H330 Aquatic Acute 1, H400

Full text of H-phrases: see section 16

### SECTION 4: FIRST AID MEASURES

#### Description of First Aid Measures

**General:** Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible). If frostbite or freezing occurs, immediately flush with plenty of lukewarm water to GENTLY warm the affected area. Do not use hot water. Do not rub affected area. Get immediate medical attention.

**Inhalation:** When symptoms occur: go into open air and ventilate suspected area. Remove to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER/doctor/physician if you feel unwell

**Skin Contact:** Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Obtain medical attention if irritation persists. Thaw frosted parts with lukewarm water. Do not rub affected area.

**Eye Contact:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation persists

**Ingestion:** Rinse mouth. Do NOT induce vomiting. Get immediate medical attention.

#### Most Important Symptoms and Effects Both Acute and Delayed

**General:** May cause frostbite on contact with the liquid. Butane is an asphyxiant. Lack of oxygen can be fatal

**Inhalation:** Gas can be toxic as a simple asphyxiant by displacing oxygen from the air. Asphyxia by lack of oxygen: risk of death. May cause drowsiness or dizziness

**Skin Contact:** Contact with the liquid may cause cold burns/frostbite

**Eye Contact:** This gas is non-irritating; but direct contact with liquefied/pressurized gas or frost particles may produce severe and possibly permanent eye damage from freeze burns

**Ingestion:** Ingestion is not considered a potential route of exposure. Non-irritating; but solid and liquid forms of this material and pressurized gas may cause freeze burns.

**Chronic Symptoms:** Contains a small amount of Hydrogen Sulfide, symptoms of overexposure are headaches, dizziness, nausea, coughing, respiratory irritation, eye irritation, skin irritation, pain in the nose, and loss of consciousness. Heating of the product may release higher amounts of Hydrogen Sulfide (H<sub>2</sub>S).

#### Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention.

### SECTION 5: FIREFIGHTING MEASURES

#### Extinguishing Media

**Suitable Extinguishing Media:** Foam, dry chemical, carbon dioxide, water spray, fog

**Unsuitable Extinguishing Media:** Do not use a heavy water stream. Use of heavy stream of water may spread fire

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### Special Hazards Arising From the Substance or Mixture

**Fire Hazard:** Extremely flammable gas

**Explosion Hazard:** May form flammable/explosive vapor-air mixture. Heating may cause an explosion. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

**Reactivity:** Hazardous reactions will not occur under normal conditions.

### Advice for Firefighters

**Precautionary Measures Fire:** Exercise caution when fighting any chemical fire

**Firefighting Instructions:** Leaking gas fire: Do not extinguish, unless leak can be stopped safely. In case of leaking gas fire, eliminate all ignition sources if safe to do so. Use water spray or fog for cooling exposed containers. In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

**Protection During Firefighting:** Do not enter fire area without proper protective equipment, including respiratory protection.

**Hazardous Combustion Products:** Carbon oxides (CO, CO<sub>2</sub>). Hydrocarbon, sulfur dioxide (SO<sub>2</sub>), and Hydrogen sulfide (H<sub>2</sub>S) fatal and irritating gases

**Other information:** Do not allow run-off from fire fighting to enter drains or water courses

### Reference to Other Sections

Refer to section 9 for flammability properties.

## **SECTION 6: ACCIDENTAL RELEASE MEASURES**

### Personal Precautions, Protective Equipment and Emergency Procedures

**General Measures:** Use special care to avoid static electric charges. Eliminate every possible source of ignition. Keep away from heat/sparks/open flames/hot surfaces - No smoking. Avoid breathing (dust, vapor, mist, gas). Use only outdoors or in a well-ventilated area. Ruptured cylinders may rocket. Do not allow product to spread into the environment

#### For Non-Emergency Personnel

**Protective Equipment:** Use appropriate personal protection equipment (PPE).

**Emergency Procedures:** Evacuate unnecessary personnel.

#### For Emergency Personnel

**Protective Equipment:** Equip cleanup crew with proper protection.

**Emergency Procedures:** Ventilate area.

### Environmental Precautions

Prevent entry to sewers and public waters. Avoid release to the environment

### Methods and Material for Containment and Cleaning Up

**For Containment:** Notify authorities if liquid enters sewers or public waters. Use only non-sparking tools

**Methods for Cleaning Up:** Clear up spills immediately and dispose of waste safely. Isolate area until gas has dispersed. Use water spray to disperse vapors. For water based spills contact appropriate authorities and abide by local regulations for hydrocarbon spills into waterways. Contact competent authorities after a spill

### Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection.

## **SECTION 7: HANDLING AND STORAGE**

### Precautions for Safe Handling

**Additional Hazards When Processed:** Handle empty containers with care because residual vapors are flammable. Extremely flammable gas. Do not pressurize, cut, or weld containers. Do not puncture or incinerate container. Liquid gas can cause frost-type burns. If stored under heat for extended periods or significantly agitated, this material might evolve or release hydrogen sulfide, a toxic, flammable gas, which can raise and widen this material's actual flammability limits and significantly lower its auto-ignition temperature. Hydrogen sulfide can be fatal.

**Hygiene Measures:** Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work. Do not eat, drink or smoke when using this product

**Technical Measures:** Proper grounding procedures to avoid static electricity should be followed. Comply with applicable regulations.

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**Storage Conditions:** Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep in fireproof place. Store in a well-ventilated place. Keep container tightly closed. Keep/Store away from extremely high or low temperatures, ignition sources, direct sunlight, incompatible materials. Store in original container.

**Incompatible Materials:** strong acids, Strong bases, Strong oxidizers, chlorine, Halogenated compounds

**Conditions for Safe Storage, Including Any Incompatibilities** Not available

### Specific End Use(s)

Fuel.

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

### Control Parameters

<b>Hydrogen sulfide (7783-06-4)</b>		
USA ACGIH	ACGIH TWA (ppm)	1 ppm
USA ACGIH	ACGIH STEL (ppm)	5 ppm
USA OSHA	OSHA PEL (Ceiling) (ppm)	20 ppm
USA NIOSH	NIOSH REL (ceiling) (mg/m <sup>3</sup> )	15 mg/m <sup>3</sup>
USA NIOSH	NIOSH REL (ceiling) (ppm)	10 ppm
USA IDLH	US IDLH (ppm)	100 ppm
Alberta	OEL Ceiling (mg/m <sup>3</sup> )	21 mg/m <sup>3</sup>
Alberta	OEL Ceiling (ppm)	15 ppm
Alberta	OEL TWA (mg/m <sup>3</sup> )	14 mg/m <sup>3</sup>
Alberta	OEL TWA (ppm)	10 ppm
British Columbia	OEL Ceiling (ppm)	10 ppm
Manitoba	OEL STEL (ppm)	5 ppm
Manitoba	OEL TWA (ppm)	1 ppm
New Brunswick	OEL STEL (mg/m <sup>3</sup> )	21 mg/m <sup>3</sup>
New Brunswick	OEL STEL (ppm)	15 ppm
New Brunswick	OEL TWA (mg/m <sup>3</sup> )	14 mg/m <sup>3</sup>
New Brunswick	OEL TWA (ppm)	10 ppm
Newfoundland & Labrador	OEL STEL (ppm)	5 ppm
Newfoundland & Labrador	OEL TWA (ppm)	1 ppm
Nova Scotia	OEL STEL (ppm)	5 ppm
Nova Scotia	OEL TWA (ppm)	1 ppm
Nunavut	OEL Ceiling (mg/m <sup>3</sup> )	28 mg/m <sup>3</sup>
Nunavut	OEL Ceiling (ppm)	20 ppm
Nunavut	OEL STEL (mg/m <sup>3</sup> )	21 mg/m <sup>3</sup>
Nunavut	OEL STEL (ppm)	15 ppm
Nunavut	OEL TWA (mg/m <sup>3</sup> )	14 mg/m <sup>3</sup>
Nunavut	OEL TWA (ppm)	10 ppm
Northwest Territories	OEL Ceiling (mg/m <sup>3</sup> )	28 mg/m <sup>3</sup>
Northwest Territories	OEL Ceiling (ppm)	20 ppm
Northwest Territories	OEL STEL (mg/m <sup>3</sup> )	21 mg/m <sup>3</sup>
Northwest Territories	OEL STEL (ppm)	15 ppm
Northwest Territories	OEL TWA (mg/m <sup>3</sup> )	14 mg/m <sup>3</sup>
Northwest Territories	OEL TWA (ppm)	10 ppm
Ontario	OEL STEL (ppm)	15 ppm
Ontario	OEL TWA (ppm)	10 ppm
Prince Edward Island	OEL STEL (ppm)	5 ppm
Prince Edward Island	OEL TWA (ppm)	1 ppm
Québec	VECD (mg/m <sup>3</sup> )	21 mg/m <sup>3</sup>
Québec	VECD (ppm)	15 ppm



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Québec	VEMP (mg/m <sup>3</sup> )	14 mg/m <sup>3</sup>
Québec	VEMP (ppm)	10 ppm
Saskatchewan	OEL STEL (ppm)	15 ppm
Saskatchewan	OEL TWA (ppm)	10 ppm
Yukon	OEL STEL (mg/m <sup>3</sup> )	27 mg/m <sup>3</sup>
Yukon	OEL STEL (ppm)	15 ppm
Yukon	OEL TWA (mg/m <sup>3</sup> )	15 mg/m <sup>3</sup>
Yukon	OEL TWA (ppm)	10 ppm

### Propane (74-98-6)

USA ACGIH	ACGIH TWA (ppm)	1000 ppm
USA OSHA	OSHA PEL (TWA) (mg/m <sup>3</sup> )	1800 mg/m <sup>3</sup>
USA OSHA	OSHA PEL (TWA) (ppm)	1000 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m <sup>3</sup> )	1800 mg/m <sup>3</sup>
USA NIOSH	NIOSH REL (TWA) (ppm)	1000 ppm
USA IDLH	US IDLH (ppm)	2100 ppm (10% LEL)
Alberta	OEL TWA (ppm)	1000 ppm
British Columbia	OEL TWA (ppm)	1000 ppm
Manitoba	OEL TWA (ppm)	1000 ppm
Newfoundland & Labrador	OEL TWA (ppm)	1000 ppm
Nova Scotia	OEL TWA (ppm)	1000 ppm
Ontario	OEL TWA (ppm)	1000 ppm
Prince Edward Island	OEL TWA (ppm)	1000 ppm
Québec	VEMP (mg/m <sup>3</sup> )	1800 mg/m <sup>3</sup>
Québec	VEMP (ppm)	1000 ppm
Saskatchewan	OEL STEL (ppm)	1250 ppm
Saskatchewan	OEL TWA (ppm)	1000 ppm

### Butane (106-97-8)

USA ACGIH	ACGIH TWA (ppm)	1000 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m <sup>3</sup> )	1900 mg/m <sup>3</sup>
USA NIOSH	NIOSH REL (TWA) (ppm)	800 ppm
Alberta	OEL TWA (ppm)	1000 ppm
British Columbia	OEL STEL (ppm)	750 ppm
British Columbia	OEL TWA (ppm)	600 ppm
Manitoba	OEL TWA (ppm)	1000 ppm
New Brunswick	OEL TWA (mg/m <sup>3</sup> )	1900 mg/m <sup>3</sup>
New Brunswick	OEL TWA (ppm)	800 ppm
Newfoundland & Labrador	OEL TWA (ppm)	1000 ppm
Nova Scotia	OEL TWA (ppm)	1000 ppm
Nunavut	OEL STEL (mg/m <sup>3</sup> )	2576 mg/m <sup>3</sup>
Nunavut	OEL STEL (ppm)	1000 ppm
Nunavut	OEL TWA (mg/m <sup>3</sup> )	1901 mg/m <sup>3</sup>
Nunavut	OEL TWA (ppm)	800 ppm
Northwest Territories	OEL STEL (mg/m <sup>3</sup> )	2576 mg/m <sup>3</sup>
Northwest Territories	OEL STEL (ppm)	1000 ppm
Northwest Territories	OEL TWA (mg/m <sup>3</sup> )	1901 mg/m <sup>3</sup>
Northwest Territories	OEL TWA (ppm)	800 ppm
Ontario	OEL TWA (ppm)	800 ppm
Prince Edward Island	OEL TWA (ppm)	1000 ppm
Québec	VEMP (mg/m <sup>3</sup> )	1900 mg/m <sup>3</sup>

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Québec	VEMP (ppm)	800 ppm
Saskatchewan	OEL STEL (ppm)	1250 ppm
Saskatchewan	OEL TWA (ppm)	1000 ppm
Yukon	OEL STEL (mg/m <sup>3</sup> )	1600 mg/m <sup>3</sup>
Yukon	OEL STEL (ppm)	750 ppm
Yukon	OEL TWA (mg/m <sup>3</sup> )	1400 mg/m <sup>3</sup>
Yukon	OEL TWA (ppm)	600 ppm
<b>Carbon dioxide (124-38-9)</b>		
USA ACGIH	ACGIH TWA (ppm)	5000 ppm
USA ACGIH	ACGIH STEL (ppm)	30000 ppm
USA OSHA	OSHA PEL (TWA) (mg/m <sup>3</sup> )	9000 mg/m <sup>3</sup>
USA OSHA	OSHA PEL (TWA) (ppm)	5000 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m <sup>3</sup> )	9000 mg/m <sup>3</sup>
USA NIOSH	NIOSH REL (TWA) (ppm)	5000 ppm
USA NIOSH	NIOSH REL (STEL) (mg/m <sup>3</sup> )	54000 mg/m <sup>3</sup>
USA NIOSH	NIOSH REL (STEL) (ppm)	30000 ppm
USA IDLH	US IDLH (ppm)	40000 ppm
Alberta	OEL STEL (mg/m <sup>3</sup> )	54000 mg/m <sup>3</sup>
Alberta	OEL STEL (ppm)	30000 ppm
Alberta	OEL TWA (mg/m <sup>3</sup> )	9000 mg/m <sup>3</sup>
Alberta	OEL TWA (ppm)	5000 ppm
British Columbia	OEL STEL (ppm)	15000 ppm
British Columbia	OEL TWA (ppm)	5000 ppm
Manitoba	OEL STEL (ppm)	30000 ppm
Manitoba	OEL TWA (ppm)	5000 ppm
New Brunswick	OEL STEL (mg/m <sup>3</sup> )	54000 mg/m <sup>3</sup>
New Brunswick	OEL STEL (ppm)	30000 ppm
New Brunswick	OEL TWA (mg/m <sup>3</sup> )	9000 mg/m <sup>3</sup>
New Brunswick	OEL TWA (ppm)	5000 ppm
Newfoundland & Labrador	OEL STEL (ppm)	30000 ppm
Newfoundland & Labrador	OEL TWA (ppm)	5000 ppm
Nova Scotia	OEL STEL (ppm)	30000 ppm
Nova Scotia	OEL TWA (ppm)	5000 ppm
Nunavut	OEL STEL (mg/m <sup>3</sup> )	27000 mg/m <sup>3</sup>
Nunavut	OEL STEL (ppm)	15000 ppm
Nunavut	OEL TWA (mg/m <sup>3</sup> )	9000 mg/m <sup>3</sup>
Nunavut	OEL TWA (ppm)	5000 ppm
Northwest Territories	OEL STEL (mg/m <sup>3</sup> )	27000 mg/m <sup>3</sup>
Northwest Territories	OEL STEL (ppm)	15000 ppm
Northwest Territories	OEL TWA (mg/m <sup>3</sup> )	9000 mg/m <sup>3</sup>
Northwest Territories	OEL TWA (ppm)	5000 ppm
Ontario	OEL STEL (ppm)	30000 ppm
Ontario	OEL TWA (ppm)	5000 ppm
Prince Edward Island	OEL STEL (ppm)	30000 ppm
Prince Edward Island	OEL TWA (ppm)	5000 ppm
Québec	VECD (mg/m <sup>3</sup> )	54000 mg/m <sup>3</sup>
Québec	VECD (ppm)	30000 ppm
Québec	VEMP (mg/m <sup>3</sup> )	9000 mg/m <sup>3</sup>
Québec	VEMP (ppm)	5000 ppm
Saskatchewan	OEL STEL (ppm)	30000 ppm

# Wellhead Natural Gas

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Saskatchewan	OEL TWA (ppm)	5000 ppm
Yukon	OEL STEL (mg/m <sup>3</sup> )	27000 mg/m <sup>3</sup>
Yukon	OEL STEL (ppm)	15000 ppm
Yukon	OEL TWA (mg/m <sup>3</sup> )	9000 mg/m <sup>3</sup>
Yukon	OEL TWA (ppm)	5000 ppm
<b>Nitrogen (7727-37-9)</b>		
<b>Methane (74-82-8)</b>		
USA ACGIH	ACGIH TWA (ppm)	1000 ppm
British Columbia	OEL TWA (ppm)	1000 ppm
Manitoba	OEL TWA (ppm)	1000 ppm
Newfoundland & Labrador	OEL TWA (ppm)	1000 ppm
Nova Scotia	OEL TWA (ppm)	1000 ppm
Ontario	OEL TWA (ppm)	1000 ppm
Prince Edward Island	OEL TWA (ppm)	1000 ppm
Saskatchewan	OEL STEL (ppm)	1250 ppm
Saskatchewan	OEL TWA (ppm)	1000 ppm
<b>Ethane (74-84-0)</b>		
USA ACGIH	ACGIH TWA (ppm)	1000 ppm
Alberta	OEL TWA (ppm)	1000 ppm
British Columbia	OEL TWA (ppm)	1000 ppm
Manitoba	OEL TWA (ppm)	1000 ppm
Newfoundland & Labrador	OEL TWA (ppm)	1000 ppm
Nova Scotia	OEL TWA (ppm)	1000 ppm
Ontario	OEL TWA (ppm)	1000 ppm
Prince Edward Island	OEL TWA (ppm)	1000 ppm
Saskatchewan	OEL STEL (ppm)	1250 ppm
Saskatchewan	OEL TWA (ppm)	1000 ppm

### Exposure Controls

**Appropriate Engineering Controls:** Gas detectors should be used when flammable gases/vapours may be released. Ensure adequate ventilation, especially in confined areas. Proper grounding procedures to avoid static electricity should be followed. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Use explosion-proof equipment

**Personal Protective Equipment:** Protective goggles. Protective clothing. Respiratory protection of the dependent type. Insulated gloves



**Materials for Protective Clothing:** Chemically resistant materials and fabrics. Wear fire/flammable resistant/retardant clothing

**Hand Protection:** Wear chemically resistant protective gloves. Insulated gloves

**Eye Protection:** Chemical goggles or face shield.

**Skin and Body Protection:** Not available

**Respiratory Protection:** Use a NIOSH-approved self-contained breathing apparatus whenever exposure may exceed established Occupational Exposure Limits.

**Thermal Hazard Protection:** Wear suitable protective clothing.

**Other Information:** When using, do not eat, drink or smoke.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### Information on Basic Physical and Chemical Properties

**Physical State** : Gas

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<b>Appearance</b>	: Clear, Colorless gas
<b>Odor</b>	: Contains Ethyl Mercaptan for leak detection, which has a skunk-like odor, odorless.
<b>Odor Threshold</b>	: Not available
<b>pH</b>	: Not available
<b>Relative Evaporation Rate (butylacetate=1)</b>	: Not available
<b>Melting Point</b>	: Not available
<b>Freezing Point</b>	: Not available
<b>Boiling Point</b>	: -157 °C (-250.6°F)
<b>Flash Point</b>	: -187 °C (-304.6°F)
<b>Auto-ignition Temperature</b>	: > 288 °C (>550.4°F)
<b>Decomposition Temperature</b>	: Not available
<b>Flammability (solid, gas)</b>	: Extremely flammable gas
<b>Lower Flammable Limit</b>	: 3 %
<b>Upper Flammable Limit</b>	: 17 %
<b>Vapor Pressure</b>	: 40 mm Hg @25°C (77°F)
<b>Relative Vapor Density at 20 °C</b>	: 0.6
<b>Relative Density</b>	: Not available
<b>Specific Gravity</b>	: Not available
<b>Solubility</b>	: Not available
<b>Log Pow</b>	: Not available
<b>Log Kow</b>	: Not available
<b>Viscosity, Kinematic</b>	: Not available
<b>Viscosity, Dynamic</b>	: Not available
<b>Explosion Data – Sensitivity to Mechanical Impact</b>	: Not available
<b>Explosion Data – Sensitivity to Static Discharge</b>	: Not available

### SECTION 10: STABILITY AND REACTIVITY

**Reactivity:** Hazardous reactions will not occur under normal conditions.

**Chemical Stability:** Extremely flammable gas. Stable at standard temperature and pressure.

**Possibility of Hazardous Reactions:** Hazardous polymerization will not occur.

**Conditions to Avoid:** Direct sunlight. Extremely high or low temperatures. Open flame. Overheating. Heat. Sparks. Incompatible materials. Avoid ignition sources

**Incompatible Materials:** Strong acids. Strong bases. Strong oxidizers. Halogenated compounds. Chlorine

**Hazardous Decomposition Products:** Carbon oxides (CO, CO<sub>2</sub>). hydrocarbons. Sulfur dioxide and hydrogen sulfide are fatal and irritating gases.

### SECTION 11: TOXICOLOGICAL INFORMATION

#### Information on Toxicological Effects - Product

**Acute Toxicity** : Not classified

**LD50 and LC50 Data** Not available

**Skin Corrosion/Irritation:** Not classified

**Serious Eye Damage/Irritation:** Not classified

**Respiratory or Skin Sensitization:** Not classified

**Germ Cell Mutagenicity:** Not classified

**Teratogenicity:** Not available

**Carcinogenicity:** Not classified

**Specific Target Organ Toxicity (Repeated Exposure):** Not classified

**Reproductive Toxicity:** Not classified

**Specific Target Organ Toxicity (Single Exposure):** Not classified

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**Aspiration Hazard:** Not classified

**Symptoms/Injuries After Inhalation:** Gas can be toxic as a simple asphyxiant by displacing oxygen from the air. Asphyxia by lack of oxygen: risk of death. May cause drowsiness or dizziness.

**Symptoms/Injuries After Skin Contact:** Contact with the liquid may cause cold burns/frostbite.

**Symptoms/Injuries After Eye Contact:** This gas is non-irritating; but direct contact with liquefied/pressurized gas or frost particles may produce severe and possibly permanent eye damage from freeze burns.

**Symptoms/Injuries After Ingestion:** Ingestion is not considered a potential route of exposure. Non-irritating; but solid and liquid forms of this material and pressurized gas may cause freeze burns.

### Information on Toxicological Effects - Ingredient(s)

#### LD50 and LC50 Data

<b>Hydrogen sulfide (7783-06-4)</b>	
LC50 Inhalation Rat (mg/l)	0.99 mg/l (Exposure time: 1 h)
ATE (gases)	100.000 ppmV/4h
<b>Propane (74-98-6)</b>	
LC50 Inhalation Rat (mg/l)	658 mg/l (Exposure time: 4 h)
<b>Butane (106-97-8)</b>	
LC50 Inhalation Rat (mg/l)	658 mg/l (Exposure time: 4 h)
<b>Ethane (74-84-0)</b>	
LC50 Inhalation Rat (mg/l)	658 mg/l (Exposure time: 4 h)

## SECTION 12: ECOLOGICAL INFORMATION

### Toxicity

<b>Wellhead Natural Gas (CAS Mixture)</b>	
LC50 Fish 1	0.002 mg/l (Exposure time: 96 h - Species: Coregonus clupeaformis)
<b>Hydrogen sulfide (7783-06-4)</b>	
LC50 Fish 1	0.0448 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [flow-through])
EC50 Daphnia 1	0.022 mg/l (Exposure time: 96 h - Species: Gammarus pseudolimnaeus)
LC 50 Fish 2	0.016 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

### Persistence and Degradability

<b>Wellhead Natural Gas</b>	
Persistence and Degradability	Not established.

### Bioaccumulative Potential

<b>Wellhead Natural Gas</b>	
Bioaccumulative Potential	Not established.
<b>Hydrogen sulfide (7783-06-4)</b>	
BCF fish 1	(no bioaccumulation expected)
Log Pow	0.45 (at 25 °C)
<b>Propane (74-98-6)</b>	
Log Pow	2.3
<b>Butane (106-97-8)</b>	
Log Pow	2.89
<b>Carbon dioxide (124-38-9)</b>	
BCF fish 1	(no bioaccumulation)
Log Pow	0.83
<b>Ethane (74-84-0)</b>	
Log Pow	<= 2.8

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**Mobility in Soil** Not available

### **Other Adverse Effects**

**Other adverse effects:** Can cause frost damage to vegetation. Has photochemical ozone creation potential.

**Other Information:** Avoid release to the environment.

## **SECTION 13: DISPOSAL CONSIDERATIONS**

**Waste Disposal Recommendations:** Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

**Additional Information:** Handle empty containers with care because residual vapors are flammable. Empty gas cylinders should be returned to the vendor for recycling or refilling.

## **SECTION 14: TRANSPORT INFORMATION**

In Accordance With ICAO/IATA/DOT/TDG

### **UN Number**

UN-No.(DOT): 1971

DOT NA no.: UN1971

### **UN Proper Shipping Name**

DOT Proper Shipping Name : Natural gas, compressed  
(with high methane content)

Hazard Labels (DOT) : 2.1 - Flammable gases



DOT Packaging Exceptions (49 CFR 173.xxx) : 306

DOT Packaging Non Bulk (49 CFR 173.xxx) : 302

DOT Packaging Bulk (49 CFR 173.xxx) : 302

### **Additional Information**

Emergency Response Guide (ERG) Number : 115

### **Transport by sea**

DOT Vessel Stowage Location : E - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length, but is prohibited from carriage on passenger vessels in which the limiting number of passengers is exceeded.

DOT Vessel Stowage Other : 40 - Stow "clear of living quarters"

### **Air transport**

DOT Quantity Limitations Passenger Aircraft/Rail (49 CFR 173.27) : Forbidden

DOT Quantity Limitations Cargo Aircraft Only (49 CFR 175.75) : 150 kg

## **SECTION 15: REGULATORY INFORMATION**

### **US Federal Regulations**

<b>Wellhead Natural Gas</b>	
<b>SARA Section 311/312 Hazard Classes</b>	Fire hazard Immediate (acute) health hazard Sudden release of pressure hazard
<b>Hydrogen sulfide (7783-06-4)</b>	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 302 (Specific toxic chemical listings) Listed on SARA Section 313 (Specific toxic chemical listings)	
<b>SARA Section 302 Threshold Planning Quantity (TPQ)</b>	500
<b>SARA Section 313 - Emission Reporting</b>	1.0 %

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<b>Propane (74-98-6)</b>
Listed on the United States TSCA (Toxic Substances Control Act) inventory
<b>Butane (106-97-8)</b>
Listed on the United States TSCA (Toxic Substances Control Act) inventory
<b>Carbon dioxide (124-38-9)</b>
Listed on the United States TSCA (Toxic Substances Control Act) inventory
<b>Nitrogen (7727-37-9)</b>
Listed on the United States TSCA (Toxic Substances Control Act) inventory
<b>Methane (74-82-8)</b>
Listed on the United States TSCA (Toxic Substances Control Act) inventory
<b>Ethane (74-84-0)</b>
Listed on the United States TSCA (Toxic Substances Control Act) inventory
<b>US State Regulations</b>
<b>Hydrogen sulfide (7783-06-4)</b>
<p>U.S. - California - SCAQMD - Toxic Air Contaminants - Non-Cancer Acute          U.S. - California - SCAQMD - Toxic Air Contaminants - Non-Cancer Chronic          U.S. - California - Toxic Air Contaminant List (AB 1807, AB 2728)          U.S. - Colorado - Hazardous Wastes - Discarded Chemical Products, Off-Specification Species, Container and Spill Residues          U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)          U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)          U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities          U.S. - Delaware - Accidental Release Prevention Regulations - Threshold Quantities          U.S. - Delaware - Accidental Release Prevention Regulations - Toxic Endpoints          U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities          U.S. - Hawaii - Occupational Exposure Limits - STELs          U.S. - Hawaii - Occupational Exposure Limits - TWAs          U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations          U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Emission Levels (ELs)          U.S. - Idaho - Occupational Exposure Limits - Acceptable Maximum Peak Above the Ceiling Concentration for an 8-Hour Shift          U.S. - Idaho - Occupational Exposure Limits - Ceilings          U.S. - Idaho - Occupational Exposure Limits - TWAs          U.S. - Louisiana - Reportable Quantity List for Pollutants          U.S. - Maine - Air Pollutants - Hazardous Air Pollutants          U.S. - Massachusetts - Allowable Ambient Limits (AALs)          U.S. - Massachusetts - Allowable Threshold Concentrations (ATCs)          U.S. - Massachusetts - Oil &amp; Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1          U.S. - Massachusetts - Oil &amp; Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2          U.S. - Massachusetts - Oil &amp; Hazardous Material List - Reportable Quantity          U.S. - Massachusetts - Oil &amp; Hazardous Material List - Soil Reportable Concentration - Reporting Category 1          U.S. - Massachusetts - Oil &amp; Hazardous Material List - Soil Reportable Concentration - Reporting Category 2          U.S. - Massachusetts - Right To Know List          U.S. - Massachusetts - Threshold Effects Exposure Limits (TELEs)          U.S. - Michigan - Occupational Exposure Limits - STELs          U.S. - Michigan - Occupational Exposure Limits - TWAs          U.S. - Michigan - Polluting Materials List          U.S. - Michigan - Process Safety Management Highly Hazardous Chemicals          U.S. - Minnesota - Chemicals of High Concern          U.S. - Minnesota - Hazardous Substance List          U.S. - Minnesota - Permissible Exposure Limits - STELs          U.S. - Minnesota - Permissible Exposure Limits - TWAs</p>



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U.S. - Montana - Ambient Air Quality Standards  
 U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour  
 U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual  
 U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances  
 U.S. - New Jersey - Environmental Hazardous Substances List  
 U.S. - New Jersey - Right to Know Hazardous Substance List  
 U.S. - New Jersey - Special Health Hazards Substances List  
 U.S. - New Jersey - TCPA - Extraordinarily Hazardous Substances (EHS)  
 U.S. - New Mexico - Air Quality - Ambient Air Quality Standards  
 U.S. - New York - Occupational Exposure Limits - TWAs  
 U.S. - New York - Reporting of Releases Part 597 - List of Hazardous Substances  
 U.S. - North Carolina - Control of Toxic Air Pollutants  
 U.S. - North Dakota - Ambient Air Quality Standards - Maximum Permissible Concentrations  
 U.S. - North Dakota - Hazardous Wastes - Discarded Chemical Products, Off-Specification Species, Container and Spill Residues  
 U.S. - Ohio - Accidental Release Prevention - Threshold Quantities  
 U.S. - Ohio - Extremely Hazardous Substances - Threshold Quantities  
 U.S. - Oregon - Permissible Exposure Limits - Ceilings  
 U.S. - Oregon - Permissible Exposure Limits - STELs  
 U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List  
 U.S. - Pennsylvania - RTK (Right to Know) List  
 U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - 1-Hour  
 U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - 24-Hour  
 U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - Annual  
 U.S. - South Carolina - Toxic Air Pollutants - Maximum Allowable Concentrations  
 U.S. - South Carolina - Toxic Air Pollutants - Pollutant Categories  
 U.S. - Tennessee - Occupational Exposure Limits - STELs  
 U.S. - Tennessee - Occupational Exposure Limits - TWAs  
 U.S. - Texas - Drinking Water Standards - Secondary Constituent Levels (SCLs)  
 U.S. - Texas - Effects Screening Levels - Long Term  
 U.S. - Texas - Effects Screening Levels - Short Term  
 U.S. - Vermont - Hazardous Waste - Hazardous Constituents  
 U.S. - Vermont - Permissible Exposure Limits - STELs  
 U.S. - Vermont - Permissible Exposure Limits - TWAs  
 U.S. - Virginia - Water Quality Standards - Chronic Freshwater Aquatic Life  
 U.S. - Virginia - Water Quality Standards - Chronic Saltwater Aquatic Life  
 U.S. - Washington - Dangerous Waste - Dangerous Waste Constituents List  
 U.S. - Washington - Dangerous Waste - Discarded Chemical Products List  
 U.S. - Washington - Permissible Exposure Limits - STELs  
 U.S. - Washington - Permissible Exposure Limits - TWAs  
 U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 25 Feet to Less Than 40 Feet  
 U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 40 Feet to Less Than 75 Feet  
 U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 75 Feet or Greater  
 U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights Less Than 25 Feet  
 U.S. - Wyoming - Process Safety Management - Highly Hazardous Chemicals  
 U.S. - Alaska - Water Quality Standards - Chronic Aquatic Life Criteria for Fresh Water  
 U.S. - Alaska - Water Quality Standards - Chronic Aquatic Life Criteria for Marine Water

### Propane (74-98-6)

U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)  
 U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)  
 U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities  
 U.S. - Delaware - Accidental Release Prevention Regulations - Threshold Quantities  
 U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities



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U.S. - Hawaii - Occupational Exposure Limits - TWAs  
 U.S. - Idaho - Occupational Exposure Limits - TWAs  
 U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1  
 U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2  
 U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity  
 U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1  
 U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2  
 U.S. - Massachusetts - Right To Know List  
 U.S. - Michigan - Occupational Exposure Limits - TWAs  
 U.S. - Minnesota - Hazardous Substance List  
 U.S. - Minnesota - Permissible Exposure Limits - TWAs  
 U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances  
 U.S. - New Jersey - Environmental Hazardous Substances List  
 U.S. - New Jersey - Right to Know Hazardous Substance List  
 U.S. - New Jersey - Special Health Hazards Substances List  
 U.S. - New Jersey - TCPA - Extraordinarily Hazardous Substances (EHS)  
 U.S. - New York - Occupational Exposure Limits - TWAs  
 U.S. - Ohio - Accidental Release Prevention - Threshold Quantities  
 U.S. - Oregon - Permissible Exposure Limits - TWAs  
 U.S. - Pennsylvania - RTK (Right to Know) List  
 U.S. - Tennessee - Occupational Exposure Limits - TWAs  
 U.S. - Texas - Effects Screening Levels - Long Term  
 U.S. - Texas - Effects Screening Levels - Short Term  
 U.S. - Vermont - Permissible Exposure Limits - TWAs  
 U.S. - Washington - Permissible Exposure Limits - STELs  
 U.S. - Washington - Permissible Exposure Limits - TWAs

### Butane (106-97-8)

U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)  
 U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)  
 U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities  
 U.S. - Delaware - Accidental Release Prevention Regulations - Threshold Quantities  
 U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities  
 U.S. - Hawaii - Occupational Exposure Limits - TWAs  
 U.S. - Maine - Chemicals of High Concern  
 U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1  
 U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2  
 U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity  
 U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1  
 U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2  
 U.S. - Massachusetts - Right To Know List  
 U.S. - Michigan - Occupational Exposure Limits - TWAs  
 U.S. - Minnesota - Chemicals of High Concern  
 U.S. - Minnesota - Hazardous Substance List  
 U.S. - Minnesota - Permissible Exposure Limits - TWAs  
 U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances  
 U.S. - New Jersey - Environmental Hazardous Substances List  
 U.S. - New Jersey - Right to Know Hazardous Substance List  
 U.S. - New Jersey - Special Health Hazards Substances List  
 U.S. - New Jersey - TCPA - Extraordinarily Hazardous Substances (EHS)  
 U.S. - Ohio - Accidental Release Prevention - Threshold Quantities  
 U.S. - Oregon - Permissible Exposure Limits - TWAs  
 U.S. - Pennsylvania - RTK (Right to Know) List

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U.S. - Tennessee - Occupational Exposure Limits - TWAs  
 U.S. - Texas - Effects Screening Levels - Long Term  
 U.S. - Texas - Effects Screening Levels - Short Term  
 U.S. - Vermont - Permissible Exposure Limits - TWAs  
 U.S. - Washington - Permissible Exposure Limits - STELS  
 U.S. - Washington - Permissible Exposure Limits - TWAs

### Carbon dioxide (124-38-9)

U.S. - Hawaii - Occupational Exposure Limits - STELS  
 U.S. - Hawaii - Occupational Exposure Limits - TWAs  
 U.S. - Idaho - Occupational Exposure Limits - TWAs  
 U.S. - Maine - Air Pollutants - Greenhouse Gases (GHG)  
 U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity  
 U.S. - Massachusetts - Right To Know List  
 U.S. - Massachusetts - Volatile Organic Compounds Exempt From Requirements  
 U.S. - Michigan - Occupational Exposure Limits - STELS  
 U.S. - Michigan - Occupational Exposure Limits - TWAs  
 U.S. - Minnesota - Hazardous Substance List  
 U.S. - Minnesota - Permissible Exposure Limits - STELS  
 U.S. - Minnesota - Permissible Exposure Limits - TWAs  
 U.S. - New Jersey - Right to Know Hazardous Substance List  
 U.S. - New York - Occupational Exposure Limits - TWAs  
 U.S. - Oregon - Permissible Exposure Limits - TWAs  
 U.S. - Pennsylvania - RTK (Right to Know) List  
 U.S. - Tennessee - Occupational Exposure Limits - STELS  
 U.S. - Tennessee - Occupational Exposure Limits - TWAs  
 U.S. - Texas - Effects Screening Levels - Long Term  
 U.S. - Texas - Effects Screening Levels - Short Term  
 U.S. - Vermont - Permissible Exposure Limits - STELS  
 U.S. - Vermont - Permissible Exposure Limits - TWAs  
 U.S. - Washington - Permissible Exposure Limits - STELS  
 U.S. - Washington - Permissible Exposure Limits - TWAs

### Nitrogen (7727-37-9)

U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity  
 U.S. - Massachusetts - Right To Know List  
 U.S. - Minnesota - Hazardous Substance List  
 U.S. - New Jersey - Right to Know Hazardous Substance List  
 U.S. - Pennsylvania - RTK (Right to Know) List  
 U.S. - Washington - Permissible Exposure Limits - Simple Asphyxiants

### Methane (74-82-8)

U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities  
 U.S. - Delaware - Accidental Release Prevention Regulations - Threshold Quantities  
 U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities  
 U.S. - Delaware - Volatile Organic Compounds Exempt from Requirements  
 U.S. - Maine - Air Pollutants - Greenhouse Gases (GHG)  
 U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1  
 U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2  
 U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity  
 U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1  
 U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2  
 U.S. - Massachusetts - Right To Know List  
 U.S. - Massachusetts - Volatile Organic Compounds Exempt From Requirements

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U.S. - Minnesota - Hazardous Substance List  
 U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances  
 U.S. - New Jersey - Environmental Hazardous Substances List  
 U.S. - New Jersey - Excluded Volatile Organic Compounds  
 U.S. - New Jersey - Right to Know Hazardous Substance List  
 U.S. - New Jersey - Special Health Hazards Substances List  
 U.S. - New Jersey - TCPA - Extraordinarily Hazardous Substances (EHS)  
 U.S. - Ohio - Accidental Release Prevention - Threshold Quantities  
 U.S. - Oregon - Permissible Exposure Limits - TWAs  
 U.S. - Pennsylvania - RTK (Right to Know) List  
 U.S. - Texas - Effects Screening Levels - Long Term  
 U.S. - Texas - Effects Screening Levels - Short Term  
 U.S. - Washington - Permissible Exposure Limits - Simple Asphyxiants

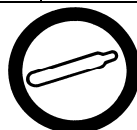
### Ethane (74-84-0)

U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)  
 U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)  
 U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities  
 U.S. - Delaware - Accidental Release Prevention Regulations - Threshold Quantities  
 U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities  
 U.S. - Delaware - Volatile Organic Compounds Exempt from Requirements  
 U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1  
 U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2  
 U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity  
 U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1  
 U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2  
 U.S. - Massachusetts - Right To Know List  
 U.S. - Massachusetts - Volatile Organic Compounds Exempt From Requirements  
 U.S. - Minnesota - Hazardous Substance List  
 U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances  
 U.S. - New Jersey - Environmental Hazardous Substances List  
 U.S. - New Jersey - Excluded Volatile Organic Compounds  
 U.S. - New Jersey - Right to Know Hazardous Substance List  
 U.S. - New Jersey - Special Health Hazards Substances List  
 U.S. - New Jersey - TCPA - Extraordinarily Hazardous Substances (EHS)  
 U.S. - Ohio - Accidental Release Prevention - Threshold Quantities  
 U.S. - Oregon - Permissible Exposure Limits - TWAs  
 U.S. - Pennsylvania - RTK (Right to Know) List  
 U.S. - Texas - Effects Screening Levels - Long Term  
 U.S. - Texas - Effects Screening Levels - Short Term  
 U.S. - Washington - Permissible Exposure Limits - Simple Asphyxiants

### Canadian Regulations

#### Wellhead Natural Gas

WHMIS Classification	Class B Division 1 - Flammable Gas Class A - Compressed Gas
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#### Hydrogen sulfide (7783-06-4)

Listed on the Canadian DSL (Domestic Substances List) inventory.  
 Listed on the Canadian Ingredient Disclosure List

# Wellhead Natural Gas

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

WHMIS Classification	Class A - Compressed Gas Class B Division 1 - Flammable Gas Class D Division 1 Subdivision A - Very toxic material causing immediate and serious toxic effects Class D Division 2 Subdivision B - Toxic material causing other toxic effects
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### Propane (74-98-6)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification	Class A - Compressed Gas Class B Division 1 - Flammable Gas
----------------------	--

### Butane (106-97-8)

Listed on the Canadian DSL (Domestic Substances List) inventory.

Listed on the Canadian Ingredient Disclosure List

WHMIS Classification	Class A - Compressed Gas Class B Division 1 - Flammable Gas
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### Carbon dioxide (124-38-9)

Listed on the Canadian DSL (Domestic Substances List) inventory.

Listed on the Canadian Ingredient Disclosure List

WHMIS Classification	Class A - Compressed Gas
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### Nitrogen (7727-37-9)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification	Class A - Compressed Gas
----------------------	--------------------------

### Methane (74-82-8)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification	Class A - Compressed Gas Class B Division 1 - Flammable Gas
----------------------	--

### Ethane (74-84-0)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification	Class A - Compressed Gas Class B Division 1 - Flammable Gas
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This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by CPR.

## SECTION 16: OTHER INFORMATION

**Revision date** : 10/02/2013

**Other Information** : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200

### GHS Full Text Phrases:

Acute Tox. 2 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 2
Aquatic Acute 1	Hazardous to the aquatic environment - Acute Hazard Category 1
Compressed gas	Gases under pressure Compressed gas
Flam. Gas 1	Flammable gases Category 1
Liquefied gas	Gases under pressure Liquefied gas
Simple Asphy	Simple Asphyxiant
H220	Extremely flammable gas
H280	Contains gas under pressure; may explode if heated
H330	Fatal if inhaled
H400	Very toxic to aquatic life

### Party Responsible for the Preparation of This Document

# Wellhead Natural Gas

## Safety Data Sheet

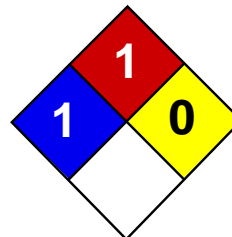
according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

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Williams, Inc.  
One Williams Center  
Tulsa, OK 74172, US  
800-688-7507

*This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product*

North America GHS US 2012 & WHMIS



Health	1
Fire	1
Reactivity	0
Personal Protection	J

## Material Safety Data Sheet

### Triethylene glycol MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Triethylene glycol

**Catalog Codes:** SLT2644

**CAS#:** 112-27-6

**RTECS:** YE4550000

**TSCA:** TSCA 8(b) inventory: Triethylene glycol

**CI#:** Not available.

**Synonym:** 2,2'-[1,2-Ethanediy]bis(oxy)]bisethanol

**Chemical Formula:** C<sub>6</sub>H<sub>14</sub>O<sub>4</sub>

**Contact Information:**

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Triethylene glycol	112-27-6	100

**Toxicological Data on Ingredients:** Triethylene glycol: ORAL (LD50): Acute: 17000 mg/kg [Rat].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of eye contact (irritant), of ingestion. Slightly hazardous in case of inhalation. Inflammation of the eye is characterized by redness, watering, and itching.

**Potential Chronic Health Effects:**

Very hazardous in case of eye contact (irritant). Slightly hazardous in case of inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system. Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:** No known effect on skin contact, rinse with water for a few minutes.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** 371°C (699.8°F)

**Flash Points:** CLOSED CUP: 177°C (350.6°F). OPEN CUP: 165.5°C (329.9°F).

**Flammable Limits:** LOWER: 0.9% UPPER: 9.2%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Absorb with an inert material and put the spilled material in an appropriate waste disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

## Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Avoid contact with eyes. If ingested, seek medical advice immediately and show the container or the label.

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:** Splash goggles. Lab coat.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:** Not available.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid. (Hygroscopic liquid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 150.18 g/mole

**Color:** Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 285°C (545°F)

**Melting Point:** -5°C (23°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.1274 (Water = 1)

**Vapor Pressure:** Not available.

**Vapor Density:** 5.17 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water.

**Solubility:** Easily soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.



**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Eye contact. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 17000 mg/kg [Rat].

**Chronic Effects on Humans:** The substance is toxic to kidneys, the nervous system.

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion. Slightly hazardous in case of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

Pennsylvania RTK: Triethylene glycol TSCA 8(b) inventory: Triethylene glycol

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):** Not controlled under WHMIS (Canada).

**DSCL (EEC):** R41- Risk of serious damage to eyes.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** j

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Not applicable. Lab coat. Not applicable. Splash goggles.

**Section 16: Other Information**

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:31 PM

**Last Updated:** 05/21/2013 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*

# Material Safety Data Sheet



## SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

### Chevron Lubricating Oil FM 32, 46, 68

**Product Use:** Industrial Oil

**Product Number(s):** CPS232103, CPS255110, CPS255150

**Company Identification**

Chevron Products Company  
a division of Chevron U.S.A. Inc.  
6001 Bollinger Canyon Rd.  
San Ramon, CA 94583  
United States of America  
www.chevronlubricants.com

**Transportation Emergency Response**

CHEMTREC: (800) 424-9300 or (703) 527-3887

**Health Emergency**

Chevron Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623

**Product Information**

email : lubemsds@chevron.com  
Product Information: (800) LUBE TEK

## SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
White mineral oil	8042-47-5	90 - 100 %weight

## SECTION 3 HAZARDS IDENTIFICATION

**IMMEDIATE HEALTH EFFECTS**

**Eye:** Not expected to cause prolonged or significant eye irritation.

**Skin:** Contact with the skin is not expected to cause prolonged or significant irritation. Contact with the skin is not expected to cause an allergic skin response. Not expected to be harmful to internal organs if absorbed through the skin. High-Pressure Equipment Information: Accidental high-velocity injection under the skin of materials of this type may result in serious injury. Seek medical attention at once should an accident like this occur. The initial wound at the injection site may not appear to be serious at first; but, if left untreated, could result in disfigurement or amputation of the affected part.

**Ingestion:** Not expected to be harmful if swallowed.

**Inhalation:** Not expected to be harmful if inhaled. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory

irritation may include coughing and difficulty breathing.

**SECTION 4 FIRST AID MEASURES**

**Eye:** No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.

**Skin:** No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

**Ingestion:** No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.

**Inhalation:** No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

**Note to Physicians:** In an accident involving high-pressure equipment, this product may be injected under the skin. Such an accident may result in a small, sometimes bloodless, puncture wound. However, because of its driving force, material injected into a fingertip can be deposited into the palm of the hand. Within 24 hours, there is usually a great deal of swelling, discoloration, and intense throbbing pain. Immediate treatment at a surgical emergency center is recommended.

**SECTION 5 FIRE FIGHTING MEASURES**

Leaks/ruptures in high pressure system using materials of this type can create a fire hazard when in the vicinity of ignition sources (eg. open flame, pilot lights, sparks, or electric arcs).

**FLAMMABLE PROPERTIES:**

**Flashpoint:** (Cleveland Open Cup) 192 °C (378 °F) Minimum

**Autoignition:** No data available

**Flammability (Explosive) Limits (% by volume in air):** Lower: Not Applicable Upper: Not Applicable

**EXTINGUISHING MEDIA:** Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

**PROTECTION OF FIRE FIGHTERS:**

**Fire Fighting Instructions:** This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

**Combustion Products:** Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

**SECTION 6 ACCIDENTAL RELEASE MEASURES**

**Protective Measures:** Eliminate all sources of ignition in vicinity of spilled material.

**Spill Management:** Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

**Reporting:** Report spills to local authorities as appropriate or required.

## SECTION 7 HANDLING AND STORAGE

**Precautionary Measures:** DO NOT USE IN HIGH PRESSURE SYSTEMS in the vicinity of flames, sparks and hot surfaces. Use only in well ventilated areas. Keep container closed.

**General Handling Information:** Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.

**Static Hazard:** Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

**Container Warnings:** Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

## SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

### GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

### ENGINEERING CONTROLS:

Use in a well-ventilated area.

### PERSONAL PROTECTIVE EQUIPMENT

**Eye/Face Protection:** No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

**Skin Protection:** No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Neoprene, Nitrile Rubber, Silver Shield, Viton.

**Respiratory Protection:** No respiratory protection is normally required. If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

**Occupational Exposure Limits:**

Component	Country/ Agency	TWA	STEL	Ceiling	Notation
White mineral oil	ACGIH	5 mg/m3	10 mg/m3	--	--

Consult local authorities for appropriate values.

**SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES**

**Attention: the data below are typical values and do not constitute a specification.**

**Color:** Colorless

**Physical State:** Liquid

**Odor:** Petroleum odor

**pH:** Not Applicable

**Vapor Pressure:** <0.01 mmHg @ 37.8 °C (100 °F)

**Vapor Density (Air = 1):** >1

**Boiling Point:** >315°C (599°F)

**Solubility:** Soluble in hydrocarbons; insoluble in water

**Freezing Point:** Not Applicable

**Density:** 0.867 kg/l @ 15.6°C (60.1°F) (Typical)

**Viscosity:** 61.2 cSt @ 40°C (104°F) Minimum

**Evaporation Rate:** No data available

**SECTION 10 STABILITY AND REACTIVITY**

**Chemical Stability:** This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

**Incompatibility With Other Materials:** May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

**Hazardous Decomposition Products:** None known (None expected)

**Hazardous Polymerization:** Hazardous polymerization will not occur.

**SECTION 11 TOXICOLOGICAL INFORMATION**

**IMMEDIATE HEALTH EFFECTS**

**Eye Irritation:** The eye irritation hazard is based on evaluation of data for similar materials or product components.

**Skin Irritation:** The skin irritation hazard is based on evaluation of data for similar materials or product components.

**Skin Sensitization:** The skin sensitization hazard is based on evaluation of data for similar materials or product components.

**Acute Dermal Toxicity:** The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.

**Acute Oral Toxicity:** The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.

**Acute Inhalation Toxicity:** The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.

**SECTION 12 ECOLOGICAL INFORMATION**

**ECOTOXICITY**

This material is not expected to be harmful to aquatic organisms. The ecotoxicity hazard is based on an evaluation of data for the components or a similar material.

**ENVIRONMENTAL FATE**

**Ready Biodegradability:** This material is not expected to be readily biodegradable. The biodegradability of this material is based on an evaluation of data for the components or a similar material.

**SECTION 13 DISPOSAL CONSIDERATIONS**

Use material for its intended purpose or recycle if possible. Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

**SECTION 14 TRANSPORT INFORMATION**

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

**DOT Shipping Description:** PETROLEUM LUBRICATING OIL, NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR

**IMO/IMDG Shipping Description:** PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER THE IMDG CODE

**ICAO/IATA Shipping Description:** PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER ICAO TI OR IATA DGR

**SECTION 15 REGULATORY INFORMATION**

**REGULATORY LISTS SEARCHED:**

- 01-1=IARC Group 1
- 01-2A=IARC Group 2A
- 01-2B=IARC Group 2B

The following components of this material are found on the regulatory lists indicated.

White mineral oil 01-1

**CHEMICAL INVENTORIES:**

All components comply with the following chemical inventory requirements: AICS (Australia), DSL (Canada), EINECS (European Union), ENCS (Japan), IECSC (China), KECI (Korea), PICCS (Philippines), TSCA (United States).

**EU RISK AND SAFETY PHRASES:** S61: Avoid release to the environment. Refer to special instructions/Safety data sheets.

**WHMIS CLASSIFICATION:**

This product is not considered a controlled product according to the criteria of the Canadian Controlled

Products Regulations.

**SECTION 16 OTHER INFORMATION**

**NFPA RATINGS:** Health: 0 Flammability: 1 Reactivity: 0

**HMIS RATINGS:** Health: 0 Flammability: 1 Reactivity: 0  
(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, \*- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

**LABEL RECOMMENDATION:**  
Label Category : INDUSTRIAL OIL 1 - IND1

**REVISION STATEMENT:** This is a new Material Safety Data Sheet.  
**Revision Date:** OCTOBER 28, 2010

**ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:**

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Governmental Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	MSDS - Material Safety Data Sheet
CVX - Chevron	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration

Prepared according to the International Standard (ISO 11014-1) & (NBR 14725) by the Chevron Energy Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.



**SECTION 1 – MATERIAL IDENTIFICATION AND USE****Material Name:** PRODUCED WATER (SWEET - FROM CRUDE OIL OR DEEP GAS PRODUCTION)**Use:** Process stream, waste**WHMIS Classification:** Class B, Div. 2; Class D, Div. 2, Sub-Div. A and B**NFPA:** Fire: 3 Reactivity: 0 Health: 2**TDG:** UN: 1267 Class: 3 Packing Group: II**Shipping Name:** PETROLEUM CRUDE OIL**Manufacturer/Supplier:** ENCANA CORPORATION#1800, 855 - 2<sup>nd</sup> Street S.W., P.O. BOX 2850

CALGARY, ALBERTA, T2P 2S5

**Emergency Telephone:** (403) 645-3333**Chemical Family:** Water with C5+ aliphatic and aromatic hydrocarbons.**SECTION 2 – HAZARDOUS INGREDIENTS OF MATERIAL**

<b>Hazardous Ingredients</b>	<b>Approximate Concentrations (%)</b>	<b>C.A.S. Nos.</b>	<b>LD50/LC50 (Incl. Species &amp; Route)</b>	<b>Exposure Limits</b>
Sodium chloride	5-20	7647-14-05	N.Av.	N.Av.
n-Hexane	0.1-1	110-54-3	LD50, rat, oral, 28.7 g/kg	50 ppm (OEL, TLV)
Benzene	0.1-1	71-43-2	LD50, rat, oral, 930 mg/kg LC50, rat, 4 hr, 13200 ppm	0.5 ppm (OEL) 0.5 ppm (TLV)

OEL = 8 hr. Alberta Occupational Exposure Limit; TLV = Threshold Limit Value (8 hrs)

**SECTION 3 – PHYSICAL DATA FOR MATERIAL****Physical State:** Liquid**Specific Gravity:** 1.0 - 1.1 @ 20 degrees C**Vapour Density (air=1):** 2.5-3.0**Percent Volatiles, by volume:** 100**pH:** N.Av.**Coefficient of Water/Oil Distribution:** >100 / 1**Odour & Appearance:** colorless/straw coloured liquid, hydrocarbon odour

(N.A.V. = not available N.App. = not applicable)

**Vapour Pressure (mmHg):** 20 @ 20 deg. C.**Odour Threshold (ppm):** N.Av.**Evaporation Rate:** N.Av.**Boiling Pt. (deg.C):** 50 to 100**Freezing Pt. (deg.C):** -10 to 0 (est.)**SECTION 4 – FIRE AND EXPLOSION****Flammability:** Yes **Conditions:** Bulk of material is water, and will not ignite. However, sufficient hydrocarbon vapour may be present to cause flash fire at normal temperatures\*.**Means of Extinction:** Foam, CO2, dry chemical. Explosive accumulations can build up in areas of poor ventilation\*.**Special Procedures:** Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited. If safe to do so, cut off supply and allow flame to burn out\*.**Flash Point (deg.C) & Method:** <-40 (TCC) (hydrocarbons)\***Upper Explosive Limit (% by vol.):** 8\***Lower Explosive Limit (% by vol.):** 1\***Auto Ignition Temp. (deg.C):** 260\***Hazardous Combustion Products:** Carbon monoxide, carbon dioxide\***Sensitivity to Impact:** No**Sensitivity to Static Discharge:** Yes, may ignite\***TDG Flammability Classification:** Class 3\*

\*Assuming hydrocarbon content is high enough to ignite. Hydrocarbons may derive from the original produced water or contamination through transportation in a tank that had previously contained crude oil.

## SECTION 5 – REACTIVITY DATA

**Chemical Stability:** Yes **Conditions:** Heat

**Incompatibility:** Yes **Substances:** Oxidizing agents (e.g. chlorine, compressed oxygen)

**Reactivity:** Yes **Conditions:** Heat, strong sunlight

**Hazardous Decomposition Products:** Carbon monoxide, carbon dioxide

## SECTION 6 – TOXICOLOGICAL PROPERTIES OF PRODUCT

**Routes of Entry:**

**Skin Absorption:** Yes

**Skin Contact:** Yes (liquid)

**Eye Contact:** Yes

**Inhalation: Acute:** Yes

**Chronic:** Yes

**Ingestion:** Yes

**Effects of Acute Exposure:** Vapour may cause irritation of eyes, nose and throat, dizziness and drowsiness. Contact with skin may cause irritation and possibly dermatitis. Hydrocarbons absorbed through intact skin. Contact of liquid with eyes may cause severe irritation.

**Effects of Chronic Exposure:** Due to presence of benzene and n-hexane, long term exposure may increase the risk of anaemia, leukaemia and nervous system damage.

**Sensitization to Product:** N.Av.

**Exposure Limits of Product:** 0.5 ppm (8 hr Alberta OEL for benzene)

**Irritancy:** Yes

**Synergistic Materials:** None reported

**Carcinogenicity:** Yes **Reproductive Effects:** Possibly **Teratogenicity:** Possibly **Mutagenicity:** Possibly

## SECTION 7 – PREVENTIVE MEASURES

**Personal Protective Equipment:** Use positive pressure self-contained breathing apparatus, supplied air breathing apparatus, or cartridge respirator approved for organic vapours where concentrations may exceed exposure limits.

**Gloves:** Viton (nitrile adequate for short exposure to liquid)

**Respiratory:** SCBA, SABA or cartridge respirator approved for organic vapours.

**Eye:** Chemical splash goggles

**Footwear:** As per safety policy. **Clothing:** As per fire protection policy.

**Engineering Controls:** Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment must be explosion proof.

**Leaks & Spills:** Stop leak if safe to do so. Use personal protective equipment. Use water spray to cool containers.

Remove all ignition sources. Provide explosion-proof clearing ventilation, if possible. Prevent from entering confined spaces, or from contaminating land and water courses. Dyke and pump into containers for recycling or disposal. Notify appropriate regulatory authorities.

**Waste Disposal:** Contact appropriate regulatory authorities for disposal requirements.

**Handling Procedures & Equipment:** Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers.

Avoid sparking conditions.

**Storage Requirements:** Store in a cool, dry, well ventilated area away from heat, strong sunlight, and ignition sources.

**Special Shipping Information:** N.Av.

## SECTION 8 – FIRST AID MEASURES

**Skin:** Flush skin with water, removing contaminated clothing. Get medical attention if irritation persists or large areas of contact.

**Eye:** Immediately flush with large amounts of luke warm water for 15 minutes, lifting upper and lower lids at intervals. Get medical attention if irritation persists.

**Inhalation:** Ensure own safety. Remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed. Get immediate medical attention.

**Ingestion:** Give 2-3 glasses of milk or water to drink. DO NOT INDUCE VOMITING. Keep warm and at rest. Get immediate medical attention.

## SECTION 9 – PREPARATION DATE OF MSDS

Prepared By: Encana Environment, Health and Safety (EHS)

Phone Number: (403) 645-2000 Preparation Date: July 1, 2011 Expiry Date: July 1, 2014

# ATTACHMENT I

## Emission Units Table

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“25. Fill out the **Emission Units Table** and provide it as Attachment I.”

---

- Emissions Unit Table



# ATTACHMENT J

## Emission Points Data Summary Sheet

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“26. Fill out the **Emission Points Data Summary Sheet** (Table 1 and Table 2) and provide it as Attachment J.”

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- Table 1 – Emissions Data
- Table 2 – Release Parameter Data

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
 Application for 45CSR13 NSR Modification Permit

**ATTACHMENT J - EMISSION POINTS DATA SUMMARY SHEET**

Table 1: Emissions Data																	
Unit ID	Type <sup>1</sup>	Emission Unit		Control Device		Vent Time		Pollutant <sup>3</sup>	Pre-Controlled <sup>4</sup>		Controlled <sup>5</sup>		Emission Phase	Est. Method <sup>6</sup>	Concentration <sup>7</sup>		
		Point	Source	ID	Type	Term <sup>2</sup>	hr/yr		lb/hr	ton/yr	lb/hr	ton/yr					
CE-01	Upward Vertical Stack	1E	68 bhp Arrow VRG-330-A-54 4SRB@1,800 rpm Compressor Engine				na	na	C	8,760	NOX	2.59	11.35	2.59	11.35	gas	Vendor
			CO	2.93	12.84	2.93					12.84	gas	Vendor				
			VOC	0.02	0.10	0.02					0.10	gas	Vendor				
			SO2	4.0E-04	1.7E-03	4.0E-04					1.7E-03	gas	AP-42				
			PM10/2.5	0.01	0.06	0.01					0.06	solid/gas	AP-42				
			HCHO	0.02	0.07	0.02					0.07	gas	Vendor				
			n-Hexane	---	---	---					---	gas	AP-42				
			Benzene	1.1E-03	0.00	1.1E-03					0.00	gas	AP-42				
			Toluene	3.8E-04	1.7E-03	3.8E-04					1.7E-03	gas	AP-42				
			E-benzene	1.7E-05	7.4E-05	1.7E-05					7.4E-05	gas	AP-42				
			Xylenes	1.3E-04	5.8E-04	1.3E-04					5.8E-04	gas	AP-42				
Total HAP	0.02	0.10	0.02	0.10	gas	AP-42											
CO2e	123	538	123	538	gas	Vendor											
CE-02	Upward Vertical Stack	2E	225 bhp Cummins GTA855 4SRB@1,800 rpm Compressor Engine				01-NSCR	NSCR	C	8,760	NOX	6.00	26.29	0.50	2.17	gas	Vendor
			CO	1.44	6.30	0.99					4.35	gas	Vendor				
			VOC	0.17	0.73	0.17					0.73	gas	Vendor				
			SO2	1.2E-03	0.01	1.2E-03					0.01	gas	AP-42				
			PM10/2.5	0.04	0.18	0.04					0.18	solid/gas	AP-42				
			HCHO	0.04	0.19	0.04					0.19	gas	Vendor				
			n-Hexane	---	---	---					---	gas	AP-42				
			Benzene	3.3E-03	0.01	3.3E-03					0.01	gas	AP-42				
			Toluene	1.2E-03	0.01	1.2E-03					0.01	gas	AP-42				
			E-benzene	5.3E-05	2.3E-04	5.3E-05					2.3E-04	gas	AP-42				
			Xylenes	4.1E-04	1.8E-03	4.1E-04					1.8E-03	gas	AP-42				
Total HAP	0.07	0.30	0.07	0.30	gas	AP-42											
CO2e	324	1,420	85	1,420	gas	Vendor											
RPC	na	3E	Compressor Rod Packing and Engine Crankcase Leaks (TOTAL Site-Wide)				na	na	C	8,760	VOC	1.30	5.68	1.30	5.68	gas	EE
			HCHO	9.4E-04	4.1E-03	9.4E-04					4.1E-03	gas	EE				
			n-Hexane	0.00	6.8E-03	0.00					6.8E-03	gas	EE				
			Benzene	0.00	2.1E-02	0.00					2.1E-02	gas	EE				
			Toluene	0.00	2.1E-02	0.00					2.1E-02	gas	EE				
			E-benzene	0.00	2.1E-02	0.00					2.1E-02	gas	EE				
			Xylenes	0.00	2.1E-02	0.00					2.1E-02	gas	EE				
			Total HAP	0.02	0.11	0.02					0.11	gas	EE				
CO2e	116	510	116	510	gas	EE											
SSM	na	4E	Startup/Shutdown/Maintenance (and Blowdown (BD)) (TOTAL Site-Wide)				na	na	Ave 3.0 BD/wk @ 30 Min/BD	Approx. 78	n-Hexane	---	0.06	---	0.06	gas	MB
			Benzene	---	1.7E-03	---					1.7E-03	gas	MB				
			Toluene	---	3.3E-03	---					3.3E-03	gas	MB				
			E-benzene	---	1.7E-03	---					1.7E-03	gas	MB				
			Xylenes	---	0.01	---					0.01	gas	MB				
			Total HAP	---	0.08	---					0.08	gas	MB				
			CO2e	---	354	---					354	gas	MB				
			VOC	---	4.19	---					4.19	gas	MB				
DFT-01	Upward Vertical Stack	5E	5.0 MMscfd TEG Dehydrator Flash Tank				na	na	C	8,760	VOC	2.93	12.83	2.93	12.83	gas	GLYCalc
			n-Hexane	0.06	0.25	0.06					0.25	gas	GLYCalc				
			Benzene	5.8E-03	0.03	5.8E-03					2.6E-02	gas	GLYCalc				
			Toluene	0.02	0.07	1.6E-02					7.1E-02	gas	GLYCalc				
			E-benzene	2.3E-03	1.0E-02	2.3E-03					1.0E-02	gas	GLYCalc				
			Xylenes	2.3E-02	0.10	2.3E-02					1.0E-01	gas	GLYCalc				
			Total HAP	0.11	0.46	0.11					0.46	gas	GLYCalc				
			CO2e	147	646	147					646	gas	GLYCalc				

**ATTACHMENT J - EMISSION POINTS DATA SUMMARY SHEET - Continued**

Table 1: Emissions Data																
Unit ID	Type <sup>1</sup>	Emission Unit		Control Device		Vent Time		Pollutant <sup>3</sup>	Pre-Controlled <sup>4</sup>		Controlled <sup>5</sup>		Emission Phase	Est. Method <sup>6</sup>	Concentration <sup>7</sup>	
		Point	Source	ID	Type	Term <sup>2</sup>	hr/yr		lb/hr	ton/yr	lb/hr	ton/yr				
DSV-01	Upward Vertical Stack	5.0 MMscfd TEG Dehydrator Regenerator/Still Vent				na	na	C	8,760	VOC	1.59	6.97	1.59	6.97	gas	GLYCalc
		n-Hexane	0.02	0.09	0.02					0.09	gas	GLYCalc				
		Benzene	0.05	0.24	0.05					0.24	gas	GLYCalc				
		Toluene	0.23	1.00	0.23					1.00	gas	GLYCalc				
		E-benzene	0.01	0.03	0.01					0.03	gas	GLYCalc				
		Xylenes	0.78	3.44	0.78					3.44	gas	GLYCalc				
		Total HAP	1.09	4.78	1.09					4.78	gas	GLYCalc				
		CO2e	1.65	7.22	1.65					7.22	gas	GLYCalc				
RBV-01	Upward Vertical Stack	0.22 MMBtu/hr TEG Reboiler				na	na	C	8,760	NOX	0.02	0.10	0.02	0.10	gas	AP-42
		CO	0.02	0.08	0.02					0.08	gas	AP-42				
		VOC	1.2E-03	0.01	1.2E-03					0.01	gas	AP-42				
		SO2	1.3E-04	5.7E-04	1.3E-04					5.7E-04	gas	AP-42				
		PM10/2.5	1.7E-03	0.01	1.7E-03					0.01	solid/gas	AP-42				
		HCHO	1.6E-05	7.2E-05	1.6E-05					7.2E-05	gas	AP-42				
		n-Hexane	3.9E-04	1.7E-03	3.9E-04					1.7E-03	gas	AP-42				
		Benzene	4.6E-07	2.0E-06	4.6E-07					2.0E-06	gas	AP-42				
		Toluene	7.4E-07	3.2E-06	7.4E-07					3.2E-06	gas	AP-42				
		Total HAP	4.1E-04	1.8E-03	4.1E-04					1.8E-03	gas	AP-42				
CO2e	26	114	26	114	gas	40CFR98										
TK-01	Upward Vertical Stack	210 bbl Produced Water and Condensate Storage Tank				na	na	C	8,760	VOC	1.1E-02	1.3E-01	1.1E-02	1.3E-01	gas	EE
		n-Hexane	5.6E-04	2.7E-03	5.6E-04					2.7E-03	gas	EE				
		Benzene	5.6E-04	2.7E-03	5.6E-04					2.7E-03	gas	EE				
		Toluene	5.6E-04	2.7E-03	5.6E-04					2.7E-03	gas	EE				
		E-benzene	5.6E-04	2.7E-03	5.6E-04					2.7E-03	gas	EE				
		Xylenes	5.6E-04	2.7E-03	5.6E-04					2.7E-03	gas	EE				
		Total HAP	2.8E-03	1.4E-02	2.8E-03					1.4E-02	gas	EE				
TLO	Upward Vertical Stack	Produced Water and Condensate Truck Load-Out				na	na	Ave 1.0 TLO/wk @ 15 Min/TLO	Approx. 13	VOC	---	0.26	---	0.26	gas	AP-42
		n-Hexane	---	0.01	---					0.01	gas	AP-42				
		Benzene	---	0.01	---					0.01	gas	AP-42				
		Toluene	---	0.01	---					0.01	gas	AP-42				
		E-benzene	---	0.01	---					0.01	gas	AP-42				
		Xylenes	---	0.01	---					0.01	gas	AP-42				
		Total HAP	---	0.06	---					0.01	gas	AP-42				

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

1 Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

2 Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk)

3 List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS2, VOCs, H2S, Inorganics, Lead, Organics, O3, NO, NO2, SO2, SO3, all applicable Greenhouse Gases (including CO2 and methane), etc. DO NOT LIST H2, H2O, N2, O2, and Noble Gases.

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

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

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

7 Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv). If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO2, use units of ppmv (See 45CSR10).





# ATTACHMENT K

## Fugitive Emissions Data Summary Sheet

---

“27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as Attachment K.”

---

- Table 1 – Emissions Data
- Application Forms Checklist
- Fugitive Emissions Summary

**ATTACHMENT K - FUGITIVE EMISSIONS SUMMARY SHEET**

Table 1: Emissions Data																							
Unit ID	Type <sup>1</sup>	Emission Unit		Control Device		Vent Time		Pollutant <sup>3</sup>	Pre-Controlled <sup>4</sup>		Controlled <sup>5</sup>		Emission Phase	Est. Method <sup>6</sup>	Concentration <sup>7</sup>								
		Point	Source	ID	Type	Term <sup>2</sup>	hr/yr		lb/hr	ton/yr	lb/hr	ton/yr											
FUG	Fugitive (Gas + Oil/Water)	10E	Station Piping	na	na	C	8,760	VOC	2.10	9.19	2.10	9.19	gas	AP-42									
								Process Piping and Equipment Fugitives - GAS + WATER/OIL								n-Hexane	0.10	0.45	0.10	0.45	gas	AP-42	
								Benzene	0.03	0.12	0.03	0.12	gas	AP-42									
								Toluene	0.03	0.12	0.03	0.12	gas	AP-42									
								E-benzene	0.03	0.12	0.03	0.12	gas	AP-42									
								Xylenes	0.03	0.12	0.03	0.12	gas	AP-42									
								Total HAP	0.24	1.06	0.24	1.06	gas	AP-42									
								CO2e	136	595	136	595	gas	AP-42									

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

1 Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

2 Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk)

3 List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS2, VOCs, H2S, Inorganics, Lead, Organics, O3, NO, NO2, SO2, SO3, all applicable Greenhouse Gases (including CO2 and methane), etc. DO NOT LIST H2, H2O, N2, O2, and Noble Gases.

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

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

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

7 Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv). If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO2, use units of ppmv (See 45CSR10).

**ATTACHMENT K - FUGITIVE EMISSIONS DATA SUMMARY SHEET**

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.  
 Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

**APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS**

1.) Will there be haul road activities?

Yes       No

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

2.) Will there be Storage Piles?

Yes       No

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

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

Yes       No

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

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

Yes       No

If Yes, then complete the GENERAL EMISSIONS UNIT DATA SHEET.

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

Yes       No

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

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

Yes       No

If Yes, then complete the GENERAL EMISSIONS UNIT DATA SHEET.

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

Yes       No

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

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

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants Chemical Name/CAS <sup>1</sup>	Maximum Potential Pre-Controlled Emissions <sup>2</sup>		Maximum Potential Controlled Emissions <sup>3</sup>		Est. Method Used <sup>4</sup>
		lb/hr	ton/yr	lb/hr	ton/yr	
Paved Haul Roads	na	---	---	---	---	---
Unpaved Haul Roads	na	---	---	---	---	---
Storage Pile Emissions	na	---	---	---	---	---
Liquid Loading (TLO)	VOC	---	0.26	---	0.26	AP
	n-Hexane, BTEX (ea)	---	0.01	---	0.01	AP
	Total HAP	---	0.06	---	0.06	AP
Wastewater Treatment	na	---	---	---	---	---
Equipment Leaks - (FUG-G and FUG-W) (10E) (Note, the facility is NOT subject to LDAR)	VOC	2.10	9.19	2.10	9.19	EE
	n-Hexane	0.10	0.45	0.10	0.45	EE
	Benzene	0.03	0.12	0.03	0.12	EE
	Toluene	0.03	0.12	0.03	0.12	EE
	E-Benzene	0.03	0.12	0.03	0.12	EE
	Xylenes	0.03	0.12	0.03	0.12	EE
	Total HAP	0.24	1.06	2.4E-01	1.06	EE
	CO2e	136	595	136	595	EE
General Clean-up VOC Emissions	na	---	---	---	---	---
Other	na	---	---	---	---	---

1. List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS2, VOCs, H2S, Inorganics, Lead, Organics, O3, NO, NO2, SO2, SO3, all applicable Greenhouse Gases, etc. DO NOT LIST H2, H2O, N2, O2, and Noble Gases.

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

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

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

# **ATTACHMENT L**

## **Emissions Unit Data Sheet(s)**

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“28. Fill out the **Emissions Unit Data Sheet(s)** as Attachment L.”

---

- Compressor/Generator Engine Data Sheet
  - Specs – 68 bhp Arrow VRG-330-A-54 Compressor Engine (CE-01)
  - Specs – 225 bhp Cummins GTA-855 Compressor Engine (CE-02)
- Natural Gas Glycol Dehydration Unit Data Sheets
  - TEG Dehydrator Flash Tank (DFT-01)
  - TEG Dehydrator Regenerator/Still Vent (DSV-01)
  - TEG Dehydrator Reboiler (RBV-01)
- 40 CFR Part 63; Subpart HH & HHH Registration Form
  - TEG Dehydrator (DFT-01 and DSV-01)
- Storage Tank Data Sheet
  - Emission Unit Data Sheet – Storage Tank (TK-01)
  - Emission Unit Data Sheet – Bulk Transfer Operations (TLO)
- Leak Source Data Sheet (FUG)

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
 Application for 45CSR13 NSR Modification Permit

**ATTACHMENT L - COMPRESSOR/GENERATOR ENGINE DATA SHEET**

Compressor Station		Snyder CS					
Source Identification Number <sup>1</sup>		<b>CE-01</b>		<b>CE-02</b>			
Engine Manufacturer and Model		<b>Arrow VRG-330-A-54</b>		<b>Cummins GTA855</b>			
Manufacturer's Rated bhp/rpm		<b>68 / 1,800</b>		<b>225 / 1,800</b>			
Source Status <sup>2</sup>		<b>ES</b>		<b>NS</b>			
Date Installed/Modified/Removed <sup>3</sup>		<b>2012</b>		<b>2015</b>			
Manufactured/Reconstruction Date <sup>4</sup>		<b>01/03/03</b>		<b>01/01/15</b>			
Certified Engine (NSPS JJJJ) <sup>5</sup>		<b>No</b>		<b>No</b>			
Engine, Fuel and Combustion Data	Engine Type <sup>6</sup>	<b>RB4S</b>		<b>RB4S</b>			
	APCD Type <sup>7</sup>	<b>None</b>		<b>NSCR</b>			
	Fuel Type <sup>8</sup>	<b>RG</b>		<b>RG</b>			
	H <sub>2</sub> S (gr/100 scf)	<b>0.2</b>		<b>0.2</b>			
	Operating bhp/rpm	<b>68 / 1,800</b>		<b>225 / 1,800</b>			
	BSFC (Btu/bhp-hr)	<b>9,000</b>		<b>8,496</b>			
	Fuel (ft <sup>3</sup> /hr)	<b>665</b>		<b>2,078</b>			
	Fuel (MMft <sup>3</sup> /yr)	<b>5.83</b>		<b>18.20</b>			
	Operation (hrs/yr)	<b>8,760</b>		<b>8,760</b>			
Reference <sup>9</sup>	PTE <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr		
<b>MD</b>	NOX	<b>2.59</b>	<b>11.35</b>	<b>0.50</b>	<b>2.17</b>		
<b>MD</b>	CO	<b>2.93</b>	<b>12.84</b>	<b>0.99</b>	<b>4.35</b>		
<b>MD</b>	VOC	<b>0.02</b>	<b>0.10</b>	<b>0.17</b>	<b>0.73</b>		
<b>AP</b>	SO <sub>2</sub>	<b>4.0E-04</b>	<b>1.7E-03</b>	<b>1.2E-03</b>	<b>0.01</b>		
<b>AP</b>	PM <sub>10/2.5</sub>	<b>0.01</b>	<b>0.06</b>	<b>0.04</b>	<b>0.18</b>		
<b>MD</b>	HCHO	<b>0.02</b>	<b>0.07</b>	<b>0.04</b>	<b>0.19</b>		
<b>MD/AP</b>	Total HAP	<b>0.02</b>	<b>0.10</b>	<b>0.07</b>	<b>0.30</b>		

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
Application for 45CSR13 NSR Modification Permit

**ATTACHMENT L - COMPRESSOR/GENERATOR ENGINE DATA SHEET - Continued**

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Notes to **NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET**

1. Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion compressor/generator engine located at the compressor station. Multiple compressor engines should be designated CE-1, CE-2, CE-3 etc. Generator engines should be designated GE-1, GE-2, GE-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 = Removal of Source
3. Enter the date (or anticipated date) of the engine's installation (construction of source), modification 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 JJJJ. If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance according to 40CFR§60.4243a(2)(i) through (iii), as appropriate.  
**Provide a manufacturer's data sheet for all engines being registered.**
6. Enter the Engine Type designation(s) using the following codes:
  - LB2S = Lean Burn Two Stroke
  - RB4S = Rich Burn Four Stroke
  - LB4S = Lean Burn Four Stroke
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 = Non-Selective Catalytic Reduction
  - SCR = Lean Burn & Selective Catalytic Reduction
8. Enter the Fuel Type using the following codes:
  - PQ = Pipeline Quality Natural Gas
  - RG = Raw Natural Gas
9. Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this Compressor/Generator Data Sheet(s).
  - MD = Manufacturer's Data
  - AP = AP-42
  - GR = GRI-HAPCalcTM
  - 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.



ENGINE MODEL:	K-6	C-46	C-66	C-96	C-101	C-106	C-255	L-795	A-42 (VRG 260)	A-54 (VRG 330)	A-54 CF (VRG 330 CF)	A-62 (VRG 380)	A-62 YA (VRG 380 TA)
Rich/Lean Burn	Rich	Rich	Rich	Rich	Rich	Rich	Rich	Lean	Rich	Rich	Rich	Rich	Rich
2 or 4 Cycle	4	4	4	4	4	4	4	2	4	4	4	4	4
Bore	4.00	5.00	5.25	7.00	7.50	7.50	7.50	7.50	4.134	3.875	3.875	4.134	4.134
Stroke	4.50	6.25	7.50	8.50	8.50	8.50	7.50	9.00	4.724	4.665	4.665	4.724	4.724
Displacement (Cl.)	56.5	122.7	195	327	376	376	660	795	253	330	330	380.8	380.8
No. Cylinders	1	1	1	1	1	1	2	2	4	6	6	6	6
RPM Max/Min.	800/400	800/400	700/350	600/300	800/400	800/400	750/400	600/300	1800/1000	1800/1000	1800/1000	1800/1000	1800/1000
Max HP (cont.)	4.8	9	13	19	24.5	32	55	65	47	68	72	80	115
BMEP	84	73	75	77	65	84	88	54	82	91	96	92	133
BSFC (BTU/HP-HR)	14950	11640	11450	13000	13050	10350	11900	13500	8900	9000	8800	8268	8580
<b>Exhaust Stack</b>													
NPT Dia. (in.)	1 1/4"	1 1/2"	2"	2 1/2"	2 1/2"	2 1/2"	4"	4"	2"	2 1/2"	2 1/2"	3"	3"
Height (in.) **	Ø28.5"	5.5"	7.5"	11"	11"	11"	Ø20"	Ø7"	27"	28"	27 1/4"	28"	29 1/2"
Temp. (Deg. F)	1260	1300	1300	1300	1275	1302	1300	900	1230	1238	1238	1230	1350
Flow (acfm)	31	70	97	139	210	213	350	625	310	406	406	466	1331
<b>Emissions (g/hp-hr)</b>													
Pre-Cat Nox	N/A	N/A	N/A	N/A	N/A	14	IP	1.89	12.8	14.4	12.3	14.7	15.5
Pre-Cat CO	N/A	N/A	N/A	N/A	N/A	11.5	IP	2.58	5.1	16.3	11	5.8	11.15
Pre-Cat VOC	N/A	N/A	N/A	N/A	N/A	N/A	IP	N/A	0.04	0.04	0.04	0.04	0.10
Pre-Cat HCHO	N/A	N/A	N/A	N/A	N/A	N/A	IP	N/A	0.09	0.09	0.09	0.09	0.09
Post Cat Nox	*6@	*6@	*6@	*6@	*6@	*2.8	*2.8	*2.8	*2.8	*2.8	*2.8	*2.8	*1.0
Post Cat CO	*455@	*455@	*455@	*455@	*455@	*4.8	*4.8	*4.8	*4.8	*4.8	*4.8	*4.8	*2.0
Post Cat VOC	N/A	N/A	N/A	N/A	N/A	N/A	IP	N/A	0.02	0.05	0.02	0.02	.06/**0.7
Post Cat HCHO	N/A	N/A	N/A	N/A	N/A	N/A	IP	N/A	0	0	0	0	0
Max. Exhaust Back Pressure ("W.C.)	20	20	20	20	20	20	20	TE	20	20	20	20	20
Weight (lb.)Dry	670	1360	1640	2580	2690	2690	3980	4510	1234	1000	1000	1851	1900

\* = EPA emission regulation limits as of March 1, 2011. Check with your local DEQ, as they maybe lower than the EPA requirements.

\*\* = Stack height is from the base of the mounting feet to the exhaust manifold outlet.

\* = Catalyst equipped engines.

@ = MUF-1 standard muffler outlet height.

TE = Tuned Exhaust.

IP = In Process

Emissions vary depending on AFR set point and emission equipment from engine to engine. This information is for reference only.

Ø = Center of exhaust outlet

N/A = Not available at this time.

@ = Does not require a catalyst to meet the current requirements

BSFC (BTU/HP-HR) @ max rated RPM



# Emissions Report

05/13/2015

**USA Compression Unit 6736 GTA855/JGQ2**

Engine Serial Number :	25398582	Engine Manufactured Date :	01/01/2015
Max HP :	225	Max RPM :	1800
Number of Engine Cylinders :	6	Total Displacement (in3) :	855
Combustion Type & Setting :	4 Stroke Rich Burn	Fuel Delivery Method:	Carburetor
Compression Ratio :	8.5:1	Combustion Air Treatment :	Turbocharged and Aftercooled
Engine Modified/Reconstructed? :	Tier 2 - EMD after 1/1/11		
Compressor Frame Serial # :	F49532	Unit Packaged Date :	03/26/2015
Compressor Frame Max RPM :	1800	# of Compressor Throws :	2

**AIR ENVIRONMENTAL REGULATIONS**

County and State Selected for Quote:	Marshall	WV	
NSPS JJJJ	NOx 1.00 g/hp-hr	CO 2.0 g/hp-hr	VOC 0.7 g/hp-hr
Ozone Non-Attainment / General Permit	NOx g/hp-hr	CO g/hp-hr	VOC g/hp-hr CH2O g/hp-hr

**RAW ENGINE EMISSIONS**

(based on assumption of burning 900-970 LHV BTU/SCF or 80-85 Fuel Methane # Fuel Gas with little to no H2S)

Fuel Consumption :	9,420 HHV BTU/bhp-hr
	<u>g/bhp-hr</u> <u>lb/MMBTU</u> <u>lb/hr</u> <u>TPY</u>
Nitrogen Oxides (NOx) :	12.10      6.002      26.289
Carbon Monoxide (CO) :	2.90      1.438      6.298
Volatile Organic Compounds (NMNEHC excluding CH2O) :	0.03      0.063      0.276
Formaldehyde (CH2O) :	0.02      0.043      0.188
Particulate Matter (PM) Filterable+Condensable :	0.0194      0.041      0.180
Sulfur Dioxide (SO2) :	0.0006      0.001      0.005
	<u>g/bhp-hr</u> <u>lb/MMBTU</u> <u>lb/hr</u> <u>Metric Tonne/yr</u>
Carbon Dioxide (CO2) :	524.00      259.92      1,032.61
Methane (CH4) :	0.23      0.49      1.94

**CONTROLLED EMISSIONS**

Catalytic Converter Make and Model:	VXC-1610-05-HSG
Catalyst Element Type:	3-Way
Number of Catalyst Elements currently in Housing:	1
Air/Fuel Ratio Control :	Yes
Other Engine Emissions Control Equipment :	None

	% Reduction Required to Comply with		
	<u>JJJJ &amp; Non-Attainment / General Permit Limits</u>	<u>lb/hr</u>	<u>TPY</u>
Nitrogen Oxides (NOx) :	92	0.496	2.173
Carbon Monoxide (CO) :	31	0.992	4.345
Volatile Organic Compounds (NMNEHC excluding CH2O) :	0	0.063	0.276
Formaldehyde (CH2O) :	0	0.043	0.188
Particulate Matter (PM) Filterable+Condensable :	0	0.041	0.180
Sulfur Dioxide (SO2) :	0	0.001	0.005
	% Reduction Required to Comply with		
	<u>JJJJ &amp; Non-Attainment / General Permit Limits</u>	<u>lb/hr</u>	<u>Metric Tonne/yr</u>
Carbon Dioxide (CO2) :	0	259.92	1,032.61
Methane (CH4) :	0	0.49	1.94

1) g/bhp-hr are based on Engine Manufacturer Specifications assuming a "Pipeline Quality" fuel gas composition, 1200 ft elevation, and 100- 110 F Max Air Inlet. Note that g/bhp-hr values are based on 100% engine load operation and some g/hp-hr values are Nominal and are not representative of Not- To-Exceed values. It is recommended to apply safety factor (i.e. increase the value by a nominal percentage) to the g/hp-hr values for Air Permitting to allow for operational flexibility and variations in fuel gas composition .

2) lb/MMBTU emission Factors are based on EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combustion Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines).





# Engine Performance Data

Cummins Inc

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

Industrial

**GTA855**

FR10688

**225 BHP (168 kW) @ 1800 RPM**

Att L - 657155 @ 1800 RPM  
**657 lb-ft (891 N-m) @ 1800 RPM**

Configuration  
D253007CX02

CPL Code  
10183

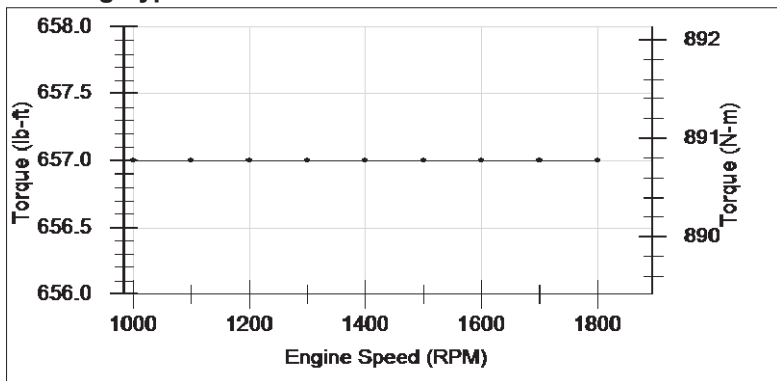
Revision  
26-May-2011

Compression Ratio: **8.5:1**  
Fuel System: **Field Gas, Dry Processed Nat Gas**  
Emission Certification: **Non-certified, Catalyst**

Displacement: **855 in3 (14.0 L)**  
Aspiration: **Turbocharged and Aftercooled**

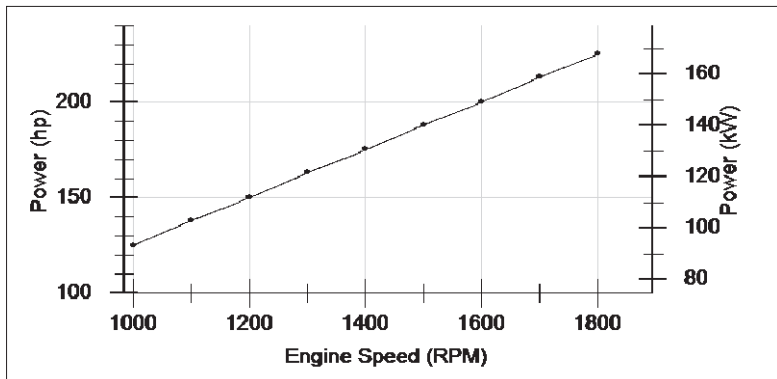
All data is based on the engine operating with fuel system, water pump, and 8 in H2O (1.99 kPa) inlet air restriction with 5 in (127 mm) inner diameter, and with 1.1 in Hg (4 kPa) exhaust restriction with 4 in (102 mm) inner diameter; not included are alternator, fan, optional equipment and driven components. Coolant flows and heat rejection data based on coolants as 50% ethylene glycol/50% water. All data is subject to change without notice.

## Rating Type: Continuous/WMR



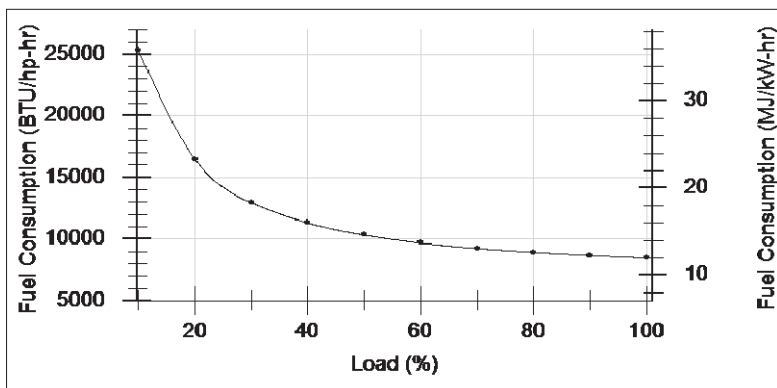
### Torque Output

RPM	lb-ft	N-m
1,000	657	891
1,100	657	891
1,200	657	891
1,300	657	891
1,400	657	891
1,500	657	891
1,600	657	891
1,700	657	891
1,800	657	891



### Power Output

RPM	hp	kW
1,000	125	93
1,100	138	103
1,200	150	112
1,300	163	122
1,400	175	130
1,500	188	140
1,600	200	149
1,700	213	159
1,800	225	168



### Fuel Consumption @ 1,800 RPM

hp	kW	% Load	BTU/hp-hr	MJ/kW-hr
225	168	100	8,479	12
203	151	90	8,675	12.27
180	134	80	8,921	12.62
158	118	70	9,236	13.07
135	101	60	9,678	13.69
113	84	50	10,323	14.6
90	67	40	11,309	16
68	51	30	12,953	18.33
45	34	20	16,457	23.28
23	17	10	25,282	35.77

Data represents gross engine capabilities obtained and corrected in accordance with SAE J1995 using dry processed natural gas fuel with 930 BTU per standard cubic foot lower heating value. Deration may be required due to altitude, temperature and type of fuel. Consult Cummins Customer Engineering with operating questions.

### STATUS FOR CURVES AND DATA: Beta-(Measured data)

Tolerance: Within +/- 5%

### CHIEF ENGINEER:

Alfred S Weber

Bold entries revised after 1-Mar-2010

**Intake Air System**

Maximum allowable air temperature rise over ambient at Intake Manifold (Naturally Aspirated Engines) or Turbo Compressor inlet (Turbo-charged Engines): (This parameter impacts emissions, LAT and/or altitude capability) 15 delta deg F 8.3 delta deg C

**Low Temperature Aftercooling System**

Coolant temperature from the Aftercooler outlet @ Maximum engine coolant out temperature at Limiting Ambient Temperature  
 Maximum coolant temperature into the Aftercooler @ 25C (77F) ambient  
 Maximum coolant temperature into Aftercooler @ Limiting Ambient conditions 130 deg F 54 deg C  
 Maximum coolant temperature for engine protection controls 212 deg F 100 deg C  
 Maximum coolant operating temperature at engine outlet (max. top tank temp): 204 deg F 96 deg C

**Exhaust System**

Maximum exhaust back pressure: 2 in-Hg 7 kPa  
 Recommended exhaust piping size (inner diameter): 4 in 102 mm

**Lubrication System**

Nominal operating oil pressure  
 @ minimum low idle 15 psi 103 kPa  
 @ maximum rated speed 60 psi 414 kPa  
 Minimum engine oil pressure for engine protection devices  
 @ minimum low idle 15 psi 103 kPa

**Fuel System**

Minimum fuel inlet pressure: 0 psi 2 kPa  
 Maximum fuel inlet pressure: 1 psi 5 kPa

**Performance Data**

Engine low idle speed: 900 RPM  
 Maximum low idle speed: 1,980 RPM  
 Minimum low idle speed: 850 RPM  
 Engine high idle speed 1,800 RPM  
 Governor break speed:  
 Maximum torque available at closed throttle low idle speed: 0 lb-ft 0 N-m

	100% Load		75% Load		50% Load	
<b>Engine Speed</b>	<b>1,800 RPM</b>		1,800 RPM		1,800 RPM	
<b>Output Power</b>	<b>225 hp</b>	168 kW	169 hp	126 kW	113 hp	84 kW
Torque	657 lb-ft	891 N-m	493 lb-ft	668 N-m	330 lb-ft	447 N-m
Intake Manifold Pressure	9 in-Hg	30 kPa	2 in-Hg	7 kPa	-3 in-Hg	-11 kPa
Turbo Comp. Outlet Pressure	22 in-Hg	73 kPa	15 in-Hg	49 kPa	8 in-Hg	28 kPa
Turbo Comp. Outlet Temperature	235 deg F	113 deg C	196 deg F	91 deg C	159 deg F	71 deg C
Inlet Air Flow	411 ft3/min	194 L/s	329 ft3/min	155 L/s	236 ft3/min	111 L/s
<b>Exhaust Gas Flow</b>	<b>945 ft3/min</b>	446 L/s	757 ft3/min	357 L/s	553 ft3/min	261 L/s
<b>Exhaust Gas Temperature</b>	<b>1,304 deg F</b>	707 deg C	1,254 deg F	679 deg C	1,195 deg F	646 deg C
Heat Rejection to Coolant	11,445 BTU/min	201 kW	9,835 BTU/min	173 kW	8,237 BTU/min	145 kW
Heat Reject to Aftercooler Coolant	807 BTU/min	14 kW	584 BTU/min	10 kW	401 BTU/min	7 kW
Heat Rejection to Ambient	1,904 BTU/min	33 kW	1,707 BTU/min	30 kW	1,742 BTU/min	31 kW
Heat Rejection to Exhaust	8,137 BTU/min	143 kW	6,320 BTU/min	111 kW	4,287 BTU/min	75 kW
<b>Fuel Consumption</b>	<b>8,478 BTU/hp-hr</b>	12 MJ/kW-hr	9,077 BTU/hp-hr	13 MJ/kW-hr	10,323 BTU/hp-hr	15 MJ/kW-hr
Air Fuel Ratio (dry)	16.6 vol/vol		16.5 vol/vol		15.6 vol/vol	
Ignition timing (BTDC)	26 deg	26 deg	26 deg	26 deg	26 deg	26 deg
<b>Total Hydrocarbons</b>	<b>1.43 g/hp-hr</b>		1.35 g/hp-hr		1.49 g/hp-hr	
VOC ppm w/o Catalyst						
VOC ppm with Catalyst						
<b>NOx</b>	<b>12.1 g/hp-hr</b>	16.23 g/kW-hr	10.8 g/hp-hr	14.48 g/kW-hr	8.4 g/hp-hr	11.26 g/kW-hr
NOx ppm w/o Catalyst						
NOx ppm with Catalyst						
<b>CO</b>	<b>2.9 g/hp-hr</b>	3.89 g/kW-hr	4.4 g/hp-hr	5.9 g/kW-hr	4.5 g/hp-hr	6.03 g/kW-hr
CO ppm w/o Catalyst						
CO ppm with Catalyst						
<b>CO2</b>	<b>524 g/hp-hr</b>	703 g/kW-hr	555 g/hp-hr	744 g/kW-hr	588 g/hp-hr	789 g/kW-hr
O2	0.41 %		0.42 %		0.42 %	

Bold entries revised after 1-Mar-2010

**Cranking System (Cold Starting Capability)**

Unaided Cold Start:

Minimum cranking speed

150 RPM

Breakaway torque at minimum unaided cold start temperature:

375 lb-ft

508 N-m

Cold starting aids available

**Block Heater, Oil Pan Heater**

Maximum parasitic load at 10 deg F @

**Noise Emissions**

Top

94.2 dBa

Right Side

91 dBa

Left Side

93.4 dBa

Front

92.9 dBa

Exhaust noise emissions

106.9 dBa

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

**Aftercooler Heat Rejection - Heat Load on Aftercooler**

BTU/min (kW)

Ambient Temp deg F (deg C)

Altitude ft (m)	Ambient Temp deg F (deg C)					
	<b>120 (49)</b>	<b>110 (43)</b>	<b>100 (38)</b>	<b>90 (32)</b>	<b>80 (27)</b>	<b>70 (21)</b>
<b>0 (0)</b>	896 (15.8)	839 (14.8)	775 (13.6)	718 (12.6)	654 (11.5)	597 (10.5)
<b>1000 (305)</b>	944 (16.6)	880 (15.5)	823 (14.5)	759 (13.3)	702 (12.3)	638 (11.2)
<b>2000 (610)</b>	993 (17.5)	928 (16.3)	863 (15.2)	807 (14.2)	742 (13.0)	686 (12.1)
<b>3000 (914)</b>	1,041 (18.3)	976 (17.2)	912 (16.0)	855 (15.0)	791 (13.9)	726 (12.8)
<b>4000 (1219)</b>	1,081 (19.0)	1,025 (18.0)	960 (16.9)	896 (15.8)	831 (14.6)	767 (13.5)
<b>5000 (1524)</b>	1,138 (20.0)	1,073 (18.9)	1,009 (17.7)	944 (16.6)	879 (15.5)	815 (14.3)
<b>6000 (1829)</b>	1,138 (20.0)	1,073 (18.9)	1,008 (17.7)	944 (16.6)	879 (15.5)	815 (14.3)
<b>7000 (2134)</b>	1,138 (20.0)	1,073 (18.9)	1,008 (17.7)	944 (16.6)	879 (15.5)	815 (14.3)
<b>8000 (2438)</b>	1,138 (20.0)	1,073 (18.9)	1,008 (17.7)	944 (16.6)	879 (15.5)	815 (14.3)
<b>9000 (2743)</b>	1,138 (20.0)	1,073 (18.9)	1,008 (17.7)	944 (16.6)	879 (15.5)	815 (14.3)
<b>10000 (3048)</b>	1,138 (20.0)	1,073 (18.9)	1,008 (17.7)	944 (16.6)	879 (15.5)	815 (14.3)

**Change Log**

Date	Author	Change Description
7/3/2007	Cary A McFarden	Add noise data

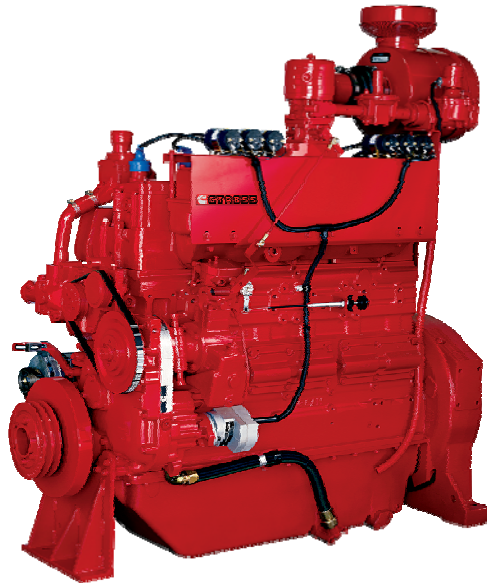
End of Report

Bold entries revised after 1-Mar-2010



# G855 & GTA855

## Gas Compression Applications



The demands of wellhead and gathering compression applications require an engine that is reliable and durable. For dependable operations and world class support, you need the Cummins G855 and GTA855 – a high-performance natural gas engine that shares the proven heritage of the Cummins diesel engines and many of the same heavy-duty components. You can depend on Cummins engines to keep maintenance costs down and the gas flowing. Every day.

### General Specifications

#### Inline 6-cylinder, 4-Cycle, Natural Gas

Bore	5.5 in (140 mm)
Stroke	6.0 in (152 mm)
Displacement	14.0 L (855 cubic in)
Engine Power*	157-286 hp (117-213 kW)
Compression Ratio	NA: 10:1 TA: 8.5:1
Aspiration	Naturally aspirated or turbocharged aftercooled
Exhaust Type	Watercooled manifold
Weight**	2970 lb (1347 kg)
Coolant Capacity	5.5 gal (20.8 L)
Lube Oil Capacity	15.0 gal (57.0 L)
Rotation	Counterclockwise

\* Rating dependent

\*\* Weight is approximate and varies with options.

### Features

Designed for the oil and gas market, the G855 and GTA855 deliver exceptional dependability and low cost of operation.

**Base Engine** – Most major components, including block, crank, cam, gears and liners are common with the proven N series diesel.

**Emissions** – The G855 and GTA855 have catalyst ratings available to allow the engine to be operated as a rich burn engine and can be customer equipped with an AFR and catalyst to meet NSPS emissions requirements. The GTA855 also has export only ratings available.

**Air Handling** – The naturally aspirated G855 and turbocharged and aftercooled GTA855 deliver reliable performance and life.

**Fuel System** – Impco carburetor provides stable operation and fuel tracking through all load ranges.

**Speed Control** – Adjustable pressure-compensated hydraulic governor provides precise and stable rpm control under all load conditions.

**Ignition System** – Altronic V integral electronic ignition system with easily accessible spark plug location and single coil per cylinder for lower maintenance costs.

**Lubrication System** – High-capacity oil pan and combination full-flow and bypass oil filter reduces maintenance costs and extend service intervals.

**Warranty** – Cummins one year, unlimited hours. Backed by a worldwide distributor network.

# Rating Details.

Model	Curve Number	Rating	Emissions	Combustion
G855	FR-10523	157 hp @ 1500 rpm	(1)	Rich
G855	FR-10526	188 hp @ 1800 rpm	(1)	Rich
<b>GTA855</b>	FR-10688	<b>225 hp @ 1800 rpm</b>	<b>(1)</b>	<b>Rich</b>
GTA855	FR-10533	256 hp @ 1800 rpm	Export Only	Standard
GTA855	FR-10531	281 hp @ 1800 rpm	Export Only	Standard
GTA855	FR-10529	286 hp @ 1800 rpm	Export Only	Standard
GTA855	FR-10539	213 hp @ 1500 rpm	Export Only	Standard
GTA855	FR-10537	234 hp @ 1500 rpm	Export Only	Standard
GTA855E	FR-10535	238 hp @ 1500 rpm	Export Only	Standard

(1) NSPS compliant with customer installed Air-fuel ratio (AFR) controller and catalyst.

\* Requires EPA site validation testing.

## Standard Equipment.

### Air Inlet System

- Factory installed heavy duty air cleaner

### Cooling System

- Two pump / two loop cooling system – GTA855
- Gear driven jacket water pump
- Gear driven auxiliary coolant pump – GTA855
- Thermostat controlled jacket water circuit
- Coolant filter for added corrosion protection
- Auxiliary coolant pump optional for compressor cooling - G855

### Exhaust System

- Watercooled manifold

### Fuel System

- Impco carburetor
- Maxitrol regulator

### Speed Control System

- Gear driven Woodard hydraulic / mechanical governor
- Electronic governor optional

### Ignition System

- Altronic V ignition system
- Altronic III ignition system optional
- Altronic V shielded ignition optional
- Altronic III shielded ignition optional

### Lube Oil System

- Crankcase breather
- High capacity oil pan for extended oil drain intervals
- Combination full flow and bypass oil filter

### Safety Shutoff Protection

- Electric fuel valve

### Mounting Arrangement

- Front and rear engine mounting
- Lift provisions on engine

### Flywheel and Flywheel Housing

- Flywheel SAE #1
- Flywheel housing – SAE #1 Cast-iron, machined to accommodate starter mounting

### Electrical System

- 24-volt alternator

### Starting System

- 24-volt starter
- Gas starter optional

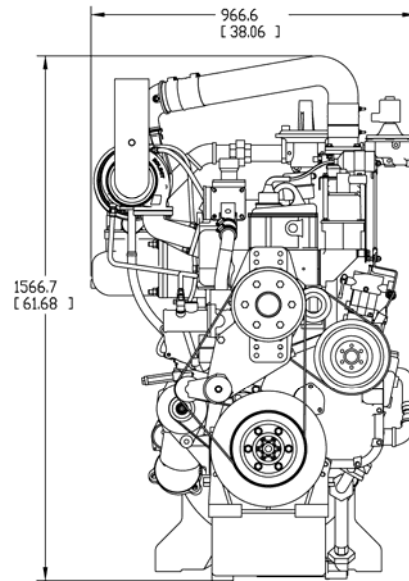
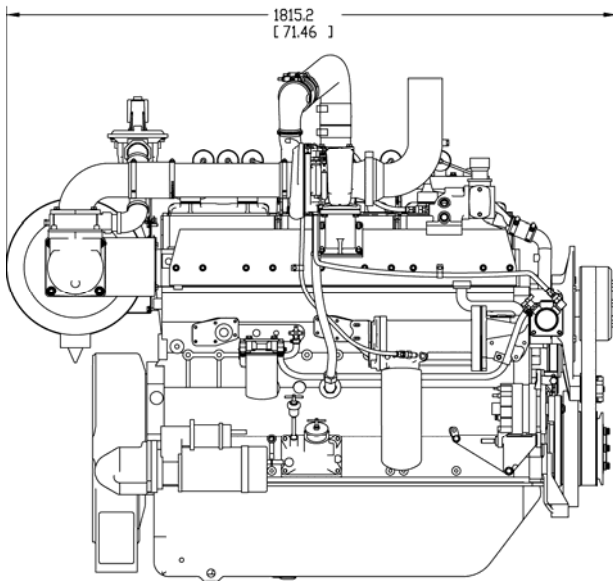
### Power Take-Off

- Front crankshaft pulley

# Engine Technical Data.

Model		G855	GTA855	GTA855
<b>Curve Number</b>		FR-10523 (2)	FR-10688 (2)	FR-10529 (2)
<b>Exhaust Type</b>		Dry Manifold	Wet Manifold	Wet Manifold
<b>Output Power (1)</b>				
100%	HP (kW)	188 (140)	225 (168)	286 (213)
75%	HP (kW)	141 (105)	169 (126)	215 (160)
<b>Engine Speed</b>				
100%	RPM	1800	1800	1800
Max Turn Down	RPM	1350	1350	1350
<b>After-Cooler Water Inlet Temperature</b>				
	°F (°C)	N/A	130 (54.4)	130 (54.4)
<b>Compression Ratio</b>				
		10:1	8.5:1	8.5:1
<b>Emissions Data – Engine-Out Emissions (1)</b>				
NOx	g/hp-hr (g-kW-hr)	5.9 (7.91)	12.1 (16.23)	7.6 (10.2)
CO	g/hp-hr (g-kW-hr)	26.7 (35.81)	2.9 (3.89)	1.1 (1.48)
NMHC	g/hp-hr			
THC	g/hp-hr	1.90	1.43	0.52
O <sub>2</sub>	%	0.54	0.41	4.20
<b>Fuel Consumption (1)</b>				
100%	BTU/hp-hr (MJ/kW-hr)	8605 (12.2)	8478 (12.0)	8224 (11.6)
75%	BTU/hp-hr (MJ/kW-hr)	9870 (14.0)	9077 (12.8)	8631 (12.2)
<b>Heat Rejection (1)</b>				
Jacket Water	BTU/min (kW)	8154 (143.38)	11445 (201.3)	12677 (223)
After-cooler	BTU/min (kW)	N/A	807 (14.19)	1902 (33.5)
Exhaust	BTU/min (kW)	5674 (99.77)	8137 (143.08)	11792 (207.4)
<b>Exhaust System (1)</b>				
Flow Rate	ft <sup>3</sup> /min (L/s)	866 (409)	945 (446)	1851 (874)
Stack temp	°F (°C)	1196 (647)	1304 (707)	1337 (725)
Max Back Pres.	in-Hg	2	2	2
<b>Intake System (1)</b>				
Flow Rate	ft <sup>3</sup> /min (L/s)	260 (123)	411 (194)	605 (286)
Max Restriction	in-H <sub>2</sub> O	15	15	15
<b>Gas Pressure</b>				
Min - Max	psi	10-20	10-20	10-20

# General Dimensions.



Turbocharged model pictured above

Dimensions*		NA	TA
Length	Inches (mm)	67.7 (1718)	71.5 (1815)
Width	Inches (mm)	35.9 (912)	38.1 (966)
Height	Inches (mm)	53.9 (1368)	61.7 (1567)

\* Dimensions are approximate and vary with options.

## Disclaimers.

(2) All data is based on the engine operating with fuel system, water pump, and 8 in H<sub>2</sub>O (1.991 kPa) inlet air restriction with 5 in (127 mm) inner diameter, and with 1.1 in Hg (4 kPa) exhaust restriction with 4 in (102 mm) inner diameter; not included are alternator, fan, optional equipment and driven components. Coolant flows and heat rejection data based on coolants as 50% ethylene glycol/50% water. All data is subject to change without notice.



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Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
 Application for 45CSR13 NSR Modification Permit

**ATTACHMENT L - NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET**

General Glycol Dehydration Unit Data		Compressor Station		Snyder CS			
		Manufacturer and Model		TBD			
		Max Dry Gas Flow Rate (MMscfd)		5.0			
		Heat Input (MMBtu/hr) - HHV		0.22			
		Design Type (DEG or TEG)		TEG			
		Source Status <sup>2</sup>		ES			
		Date Installed/Modified/Removed <sup>3</sup>		2012			
		Regenerator Still Vent APCD <sup>4</sup>		None			
		Fuel HV (Btu/scf) - HHV		1,020			
		H <sub>2</sub> S Content (gr/100 scf)		0.2			
		Operation (hrs/yr)		8,760			
Source ID # <sup>1</sup>	Vent	Reference <sup>5</sup>	PTE <sup>6</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr
<b>DFT-01</b>	Dehydrator 01 Flash Tank  (50% "Recycle" as Fuel in the Reboiler)	GRI-GLYCalc	VOC	<b>2.93</b>	<b>12.83</b>		
		GRI-GLYCalc	n-Hexane	<b>0.06</b>	<b>0.25</b>		
		GRI-GLYCalc	Benzene	<b>5.8E-03</b>	<b>0.03</b>		
		GRI-GLYCalc	Toluene	<b>0.02</b>	<b>0.07</b>		
		GRI-GLYCalc	Ethylbenzene	<b>0.00</b>	<b>0.01</b>		
		GRI-GLYCalc	Xylenes	<b>0.02</b>	<b>0.10</b>		
		GRI-GLYCalc	Tot HAP	<b>0.11</b>	<b>0.46</b>		
		GRI-GLYCalc	CO <sub>2</sub> e	<b>147</b>	<b>646</b>		
<b>DSV-01</b>	Dehydrator 01 Glycol Regenerator Still Vent	GRI-GLYCalc	VOC	<b>1.59</b>	<b>6.97</b>		
		GRI-GLYCalc	n-Hexane	<b>0.02</b>	<b>0.09</b>		
		GRI-GLYCalc	Benzene	<b>0.05</b>	<b>0.24</b>		
		GRI-GLYCalc	Toluene	<b>0.23</b>	<b>1.00</b>		
		GRI-GLYCalc	Ethylbenzene	<b>5.7E-03</b>	<b>0.03</b>		
		GRI-GLYCalc	Xylenes	<b>0.78</b>	<b>3.44</b>		
		GRI-GLYCalc	Tot HAP	<b>1.09</b>	<b>4.78</b>		
		GRI-GLYCalc	CO <sub>2</sub> e	<b>2</b>	<b>7</b>		
<b>RBV-01</b>	Dehydrator 01 Reboiler Vent	AP	NOX	<b>0.02</b>	<b>0.10</b>		
		AP	CO	<b>0.02</b>	<b>0.08</b>		
		AP	VOC	<b>1.2E-03</b>	<b>0.01</b>		
		AP	SO <sub>2</sub>	<b>1.3E-04</b>	<b>5.7E-04</b>		
		AP	PM <sub>10/2.5</sub>	<b>1.7E-03</b>	<b>0.01</b>		
		AP	Tot HAP	<b>4.1E-04</b>	<b>1.8E-03</b>		
		40CFR98	CO <sub>2</sub> e	<b>26</b>	<b>114</b>		



Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
Application for 45CSR13 NSR Modification Permit

**ATTACHMENT L - NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET - Continued**

Notes to **NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET**

1. Enter the appropriate Source Identification Numbers for the glycol dehydration unit Reboiler Vent and glycol Regenerator Still Vent. The glycol dehydration unit Reboiler Vent and glycol Regenerator Still Vent should be designated RBV-1 and RSV-1, respectively. If the compressor station incorporates multiple glycol dehydration units, a Glycol Dehydration Unit Data Sheet shall be completed for each, using Source Identification #s RBV-2 and RSV-2, RBV-3 and RSV-3, etc.

2. Enter the Source Status using the following codes:

- NS = Construction of New Source
- ES = Existing Source
- MS = Modification of Existing Source
- RS = Removal of Source

3. Enter the date (or anticipated date) of the glycol dehydration unit's installation (construction of source), modification or removal.

4. Enter the Air Pollution Control Device (APCD) type designation using the following codes:

- NA = None
- CD = Condenser
- FL = Flare
- CC = Condenser/Combustion Combination
- TO = Thermal Oxidizer

5. Enter the Potential Emissions Data Reference designation using the following codes:

- MD = Manufacturer's Data
- AP = AP-42
- GR = GRI-GLYCalcTM
- OT = Other (please list): \_\_\_\_\_

6. Enter the Reboiler Vent and glycol Regenerator Still Vent Potential to Emit (PTE) for the listed regulated pollutants in lbs per hour and tons per year. The glycol Regenerator Still Vent potential emissions may be determined using the most recent version of the thermodynamic software model GRI-GLYCalcTM (Radian International LLC & Gas Research Institute). Attach all referenced Potential Emissions Data (or calculations) and the GRI-GLYCalc Aggregate Calculations Report to this Glycol Dehydration Unit Data Sheet(s). This PTE data shall be incorporated in the Emissions Summary Sheet.

**Include a copy of the GRI-GLYCalcTM analysis. This includes a printout of the aggregate calculations report, which shall include emissions reports, equipment reports, and stream reports.**

**\*An explanation of input parameters and examples, when using GRI-GLYCalcTM is available on our website.**

Complete this form for any oil and natural gas production or natural gas transmission and storage facility that uses an affected unit under HH/HHH, whether subject or not.

<b>Section A: Facility Description</b>			
Affected facility actual annual average natural gas throughput (scf/day):			<b>5.0 MM</b>
Affected facility actual annual average hydrocarbon liquid throughput: (bbl/day):			<b>na</b>
The affected facility processes, upgrades, or stores hydrocarbon liquids prior to custody transfer.			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
The affected facility processes, upgrades, or stores natural gas prior to the point at which natural gas (NG) enters the NG transmission and storage source category or is delivered to the end user.			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
The affected facility is: <input checked="" type="checkbox"/> prior to a NG processing plant <input type="checkbox"/> a NG processing plant <input type="checkbox"/> prior to the point of custody transfer and there is no NG processing plant			
The affected facility transports or stores natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company).			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
The affected facility exclusively processes, stores, or transfers black oil			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Initial producing gas-to-oil ratio (GOR): _____scf/bbl      API gravity: _____degrees			
<b>Section B: Dehydration Unit (if applicable)<sup>1</sup></b>			
Description: <b>5.0 MMscfd - TEG Dehy 01 (DFT-01 and DSV-01)</b>			
Date of Installation:	<b>2012</b>	Annual Operating Hours:	<b>8,760</b>
		Burner rating (MMbtu/hr):	<b>0.22</b>
Exhaust Stack Height (ft):	<b>na</b>	Stack Diameter (ft):	<b>na</b>
		Stack Temp. (°F):	<b>na</b>
Glycol Type: <input checked="" type="checkbox"/> TEG <input type="checkbox"/> EG <input type="checkbox"/> Other: <b>na</b>			
Glycol Pump Type: <input type="checkbox"/> Electric <input checked="" type="checkbox"/> Gas      If gas, what is the volume ratio?: <b>0.08 acfm/gpm</b>			
Condenser installed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No      Exit Temp: <b>na</b> Condenser Pressure: <b>na</b>			
Incinerator/flare installed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No      Destruction Eff.: <b>na</b>			
Other controls installed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No      Describe: <b>na</b>			
Wet Gas <sup>2</sup> : Gas Temp: <b>60 °F</b> Gas Pressure: <b>1,000 psig</b>			
(Upstream of Contact Tower) Saturated Gas?: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No      If no, water content?: <b>na</b>			
Dry Gas: Gas Flowrate: Actual: <b>5.0 MMscfd</b> Design: <b>5.0 MMscfd</b>			
(Downstream of Contact Tower) Water Content: <b>7.0 lb/MMscf</b>			
Lean Glycol: Circulation rate: Actual <sup>3</sup> : <b>0.67 gpm</b> Maximum <sup>4</sup> : <b>0.67 gpm</b>			
Pump make/model: <b>Kimray 4015</b>			
Glycol Flash Tank (if applicable): Temp: <b>140 °F</b> Pressure: <b>40 psig</b> Vented: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
If no, describe vapor control: <b>Recycle to Reboiler, Otherwise Vented</b>			
Stripping Gas (if applicable): Source of gas: <b>na</b> Rate: <b>na</b>			

**Please attach the following required dehydration unit information:**

1. System map indicating the chain of custody information. See Page 43 of this document for an example of a gas flow schematic. It is not intended that the applicant provide this level of detail for all sources. The level of detail that is necessary is to establish where the custody transfer points are located. This can be accomplished by submitting a process flow diagram indicating custody transfer points and the natural gas flow. However, the DAQ reserves the right to request more detailed information in order to make the necessary decisions.
2. Extended gas analysis from the Wet Gas Stream, including mole percent of C<sub>1</sub>-C<sub>8</sub>, benzene, ethylbenzene, toluene, xylene and n-hexane, using Gas Processors Association (GPA) 2286 (or similar). A sample should be taken from the inlet gas line, downstream from any inlet separator, and using a manifold to remove entrained liquids from the sample and a probe to collect the sample from the center of the gas line. GPA standard 2166 reference method or a modified version of EPA Method TO-14, (or similar) should be used.
3. GRI-GLYCalc Ver. 3.0 aggregate report based on maximum Lean Glycol circulation rate and maximum throughput.
4. Detailed calculations of gas or hydrocarbon flow rate.

**Section C: Facility NESHAPS Subpart HH/HHH status**

Affected facility status: (choose only one)	<input checked="" type="checkbox"/> Subject to Subpart HH -- However, <b><i>EXEMPT</i></b> because the facility is an area source of HAP emissions <b><i>and</i></b> the actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere is < 0.90 megagram per year (1.0 tpy); see 40CFR§63.764(e)(1)(ii).								
	<input type="checkbox"/> Subject to Subpart HHH								
	<table border="0" style="width: 100%;"> <tr> <td style="width: 30%;"><input type="checkbox"/> Not Subject because:</td> <td><input type="checkbox"/> &lt; 10/25 TPY</td> </tr> <tr> <td></td> <td><input type="checkbox"/> Affected facility exclusively handles black oil</td> </tr> <tr> <td></td> <td><input type="checkbox"/> Facility-wide actual annual average NG throughput is &lt; 650 thousand scf/day and facility-wide actual annual average hydrocarbon liquid is &lt; 250 bpd</td> </tr> <tr> <td></td> <td><input type="checkbox"/> No affected source is present</td> </tr> </table>	<input type="checkbox"/> Not Subject because:	<input type="checkbox"/> < 10/25 TPY		<input type="checkbox"/> Affected facility exclusively handles black oil		<input type="checkbox"/> Facility-wide actual annual average NG throughput is < 650 thousand scf/day and facility-wide actual annual average hydrocarbon liquid is < 250 bpd		<input type="checkbox"/> No affected source is present
<input type="checkbox"/> Not Subject because:	<input type="checkbox"/> < 10/25 TPY								
	<input type="checkbox"/> Affected facility exclusively handles black oil								
	<input type="checkbox"/> Facility-wide actual annual average NG throughput is < 650 thousand scf/day and facility-wide actual annual average hydrocarbon liquid is < 250 bpd								
	<input type="checkbox"/> No affected source is present								

## STORAGE TANK DATA SHEET

Source ID # <sup>1</sup>	Status <sup>2</sup>	Content <sup>3</sup>	Volume <sup>4</sup> (gal)	Dia <sup>5</sup> (ft)	Throughput <sup>6</sup> (gal/yr)	Orientation <sup>7</sup>	Ave Liq Ht <sup>8</sup> (Ft)
TK-01		Produced Water	8,820	10	106,000	VERT	8
TK-02		Lube Oil	500	4	6,000	HORZ	2
TK-03		Lube Oil	500	4	6,000	HORZ	2
TK-04		Triethylene Glycol	500	4	6,000	HORZ	2
TK-05		Methanol	325	3	3,900	HORZ	2

### Notes to STORAGE TANK DATA SHEET

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

## Attachment L EMISSIONS UNIT DATA SHEET STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT [www.epa.gov/tnn/tanks.html](http://www.epa.gov/tnn/tanks.html)), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (<http://www.epa.gov/tnn/chief/>).

### I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name SNYDER COMPRESSOR STATION	2. Tank Name 210 BBL PRODUCED WATER
3. Tank Equipment Identification No. (as assigned on <i>Equipment List Form</i> ) TK-01	4. Emission Point Identification No. (as assigned on <i>Equipment List Form</i> ) 8E
5. Date of Commencement of Construction (for existing tanks) na	
6. Type of change <input type="checkbox"/> New Construction <input type="checkbox"/> New Stored Material <input type="checkbox"/> Other Tank Modification	
7. Description of Tank Modification (if applicable) NA	
7A. Does the tank have more than one mode of operation? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (e.g. Is there more than one product stored in the tank?)	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). NA	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): NA	

### II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. <p style="text-align: center;">210 BBL</p>	
9A. Tank Internal Diameter (ft) <p style="text-align: center;">10</p>	9B. Tank Internal Height (or Length) (ft) <p style="text-align: center;">16</p>
10A. Maximum Liquid Height (ft) <p style="text-align: center;">14</p>	10B. Average Liquid Height (ft) <p style="text-align: center;">8</p>
11A. Maximum Vapor Space Height (ft) <p style="text-align: center;">16</p>	11B. Average Vapor Space Height (ft) <p style="text-align: center;">8</p>
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. <p style="text-align: center;">210 BBL</p>	

13A. Maximum annual throughput (gal/yr) 106,000 GAL/YR	13B. Maximum daily throughput (gal/day) 8,000
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 12	
15. Maximum tank fill rate (gal/min) 200 GAL/MIN	
16. Tank fill method <input type="checkbox"/> Submerged <input checked="" type="checkbox"/> Splash <input type="checkbox"/> Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems <input checked="" type="checkbox"/> Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year CONTINUOUS
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof    X vertical    ___ horizontal    flat roof    X cone roof    ___ dome roof ___ other (describe) <input type="checkbox"/> External Floating Roof    ___ pontoon roof    ___ double deck roof <input type="checkbox"/> Domed External (or Covered) Floating Roof <input type="checkbox"/> Internal Floating Roof    ___ vertical column support    ___ self-supporting <input type="checkbox"/> Variable Vapor Space    ___ lifter roof    ___ diaphragm <input type="checkbox"/> Pressurized    ___ spherical    ___ cylindrical <input type="checkbox"/> Underground <input type="checkbox"/> Other (describe)	

**III. TANK CONSTRUCTION & OPERATION INFORMATION** (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction: <input type="checkbox"/> Riveted <input type="checkbox"/> Gunitite lined <input type="checkbox"/> Epoxy-coated rivets <input checked="" type="checkbox"/> Other (describe) WELDED		
20A. Shell Color GREEN	20B. Roof Color GREEN	20C. Year Last Painted na
21. Shell Condition (if metal and unlined): <input checked="" type="checkbox"/> No Rust <input type="checkbox"/> Light Rust <input type="checkbox"/> Dense Rust <input type="checkbox"/> Not applicable		
22A. Is the tank heated? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
22B. If YES, provide the operating temperature (°F) NA		
22C. If YES, please describe how heat is provided to tank. NA		
23. Operating Pressure Range (psig): ATM to 0.7 PSIG		
24. Complete the following section for <b>Vertical Fixed Roof Tanks</b>		<input checked="" type="checkbox"/> Does Not Apply
24A. For dome roof, provide roof radius (ft)		
24B. For cone roof, provide slope (ft/ft)		
25. Complete the following section for <b>Floating Roof Tanks</b>		<input checked="" type="checkbox"/> Does Not Apply
25A. Year Internal Floaters Installed: NA		
25B. Primary Seal Type: <input type="checkbox"/> Metallic (Mechanical) Shoe Seal <input type="checkbox"/> Liquid Mounted Resilient Seal (check one) <input type="checkbox"/> Vapor Mounted Resilient Seal <input type="checkbox"/> Other (describe):		
25C. Is the Floating Roof equipped with a Secondary Seal? <input type="checkbox"/> YES <input type="checkbox"/> NO		
25D. If YES, how is the secondary seal mounted? (check one) <input type="checkbox"/> Shoe <input type="checkbox"/> Rim <input type="checkbox"/> Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? <input type="checkbox"/> YES <input type="checkbox"/> NO		

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks		<input checked="" type="checkbox"/> Does Not Apply
26A. Deck Type: <input type="checkbox"/> Bolted <input type="checkbox"/> Welded		
26B. For Bolted decks, provide deck construction:		
26C. Deck seam:		
<input type="checkbox"/> Continuous sheet construction 5 feet wide <input type="checkbox"/> Continuous sheet construction 6 feet wide <input type="checkbox"/> Continuous sheet construction 7 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 7.5 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 12 feet wide <input type="checkbox"/> Other (describe)		
26D. Deck seam length (ft)	26E. Area of deck (ft <sup>2</sup> )	
For column supported tanks:	26G. Diameter of each column:	
26F. Number of columns:		

**IV. SITE INFORMATION** (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft <sup>2</sup> ·day))
33. Atmospheric Pressure (psia)

**V. LIQUID INFORMATION** (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:			
34A. Minimum (°F)	34B. Maximum (°F)		
35. Average operating pressure range of tank:			
35A. Minimum (psig)	35B. Maximum (psig)		
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)		
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)		
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)		
39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			



Maximum Vapor Pressure 39F. True (psia)			
39G. Reid (psia)			
Months Storage per Year 39H. From			
39I. To			

**VI. EMISSIONS AND CONTROL DEVICE DATA** (required)

40. Emission Control Devices (check as many as apply):  Does Not Apply

- Carbon Adsorption<sup>1</sup>
- Condenser<sup>1</sup>
- Conservation Vent (psig)
  - Vacuum Setting \_\_\_\_\_ Pressure Setting \_\_\_\_\_
- Emergency Relief Valve (psig)
- Inert Gas Blanket of \_\_\_\_\_
- Insulation of Tank with \_\_\_\_\_
- Liquid Absorption (scrubber)<sup>1</sup>
- Refrigeration of Tank
- Rupture Disc (psig)
- Vent to Incinerator<sup>1</sup>
- Other<sup>1</sup> (describe): \_\_\_\_\_

<sup>1</sup> Complete appropriate Air Pollution Control Device Sheet.

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss		Annual Loss (lb/yr)	Estimation Method <sup>1</sup>
		Amount	Units		
Produced Water				268	HYSYS

<sup>1</sup> EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

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

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

Identification Number (as assigned on <i>Equipment List Form</i> ): <b>TLO</b>				
1. Loading Area Name: <b>SNYDER COMPRESSOR STATION (CS)</b>				
2. Type of <b>cargo vessels</b> accommodated at this rack or transfer point (check as many as apply): <input type="checkbox"/> Drums <input type="checkbox"/> Marine Vessels <input type="checkbox"/> Rail Tank Cars <input checked="" type="checkbox"/> Tank Trucks				
3. Loading Rack or Transfer Point Data:				
Number of pumps	1			
Number of liquids loaded	1			
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	1			
4. Does ballasting of <b>marine vessels</b> occur at this loading area? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <b><u>Does not apply</u></b>				
5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point: <b>NA</b>				
6. Are cargo vessels <b>pressure tested</b> for leaks at this or any other location? <b>NA</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <b><u>Does not apply</u></b> If YES, describe: <b>NA</b>				
7. <b>Projected Maximum Operating Schedule</b> (for rack or transfer point as a whole):				
Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	7	7	7	7
weeks/quarter	13	13	13	13

8. Bulk Liquid Data (add pages as necessary):						
Pump ID No.	1					
Liquid Name	Prod. H2O					
Max. daily throughput (1000 gal/day)	8					
Max. annual throughput (1000 gal/yr)	106					
Loading Method <sup>1</sup>	SP					
Max. Fill Rate (gal/min)	200					
Average Fill Time (min/loading)	60					
Max. Bulk Liquid Temperature (°F)	60					
True Vapor Pressure <sup>2</sup>	1.5					
Cargo Vessel Condition <sup>3</sup>	U					
Control Equipment or Method <sup>4</sup>	None					
Minimum control efficiency (%)	N/A					
Maximum Emission Rate (VOC)	Loading (lb/hr)	---				
	Annual (lb/yr)	520				
Estimation Method <sup>5</sup>	EPA					
<sup>1</sup> BF = Bottom Fill    SP = Splash Fill    SUB = Submerged Fill						
<sup>2</sup> At maximum bulk liquid temperature						
<sup>3</sup> B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)						
<sup>4</sup> List as many as apply (complete and submit <i>Air Pollution Control Device Sheets</i> ): CA = Carbon Adsorption, LOA = Lean Oil Adsorption, CO = Condensation, SC = Scrubber (Absorption), CRA = Compressor-Refrigeration-Absorption, TO = Thermal Oxidation or Incineration, CRC = Compression-Refrigeration-Condensation, VB = Dedicated Vapor Balance (closed system), O = other (describe)						
<sup>5</sup> EPA = EPA Emission Factor as stated in AP-42 MB = Material Balance TM = Test Measurement based upon test data submittal O = other (describe)						

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

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

MONITORING

RECORDKEEPING

REPORTING

TESTING

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

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

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

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

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

**NA**

### LEAK SOURCE DATA SHEET

Source Category	Pollutant	Number of Source Components <sup>1</sup>	Number of Components Monitored by Frequency <sup>2</sup>	Average Time to Repair (days) <sup>3</sup>	Estimated Annual Emission Rate (lb/yr) <sup>4</sup>
Pumps <sup>5</sup>	light liquid VOC <sup>6,7</sup>	See Attachment N for Emissions Summary.			
	heavy liquid VOC <sup>8</sup>				
	Non-VOC <sup>9</sup>				
Valves <sup>10</sup>	Gas VOC				
	Light Liquid VOC				
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves <sup>11</sup>	Gas VOC				
	Non VOC				
Open-ended Lines <sup>12</sup>	VOC				
	Non-VOC				
Sampling Connections <sup>13</sup>	VOC				
	Non-VOC				
Compressors	VOC				
	Non-VOC				
Flanges	VOC				
	Non-VOC				
Other	VOC				
	Non-VOC				

**ATTACHMENT M**  
**Air Pollution Control Device Sheet(s)**

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“29. Fill out the **Air Pollution Control Device Sheet(s)** as Attachment M.”

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- NSCR on 225 bhp Cummins GTA-855 Compressor Engine (CE-02)

**Attachment M**  
**Air Pollution Control Device Sheet**  
(Other Collectors)

Control Device ID No. (must match Emission Units Table): 01-NSCR

**Equipment Information**

1. Manufacturer: Miratech Model No. VXC-1610-05 HSG (or equiv.)	2. Control Device Name: Catalytic Converter Type: NSCR
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:  NOx (≥92%) and CO (≥31%)	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: _____ SCFM	10. Capacity: _____
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.    	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse or disposal.    	

**Gas Stream Characteristics**

14. Are halogenated organics present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Are particulates present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Are metals present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
15. Inlet Emission stream parameters:	<b>Maximum</b>	<b>Typical</b>	
Pressure (mmHg):			
Heat Content (BTU/scf):			
Oxygen Content (%):			
Moisture Content (%):			
Relative Humidity (%):			

16. Type of pollutant(s) controlled:		<input type="checkbox"/> SO <sub>x</sub>	<input type="checkbox"/> Odor			
<input type="checkbox"/> Particulate (type):		<input checked="" type="checkbox"/> Other NO <sub>x</sub> and CO				
17. Inlet gas velocity:		ft/sec				
19. Gas flow into the collector:		18. Pollutant specific gravity:				
945 ACFM @ 1304°F and PSIA		Inlet: 1304 °F				
		Outlet: °F				
21. Gas flow rate:		22. Particulate Grain Loading in grains/scf:				
Design Maximum: 945 ACFM		Inlet:				
Average Expected: 945 ACFM		Outlet:				
23. Emission rate of each pollutant (specify) into and out of collector:						
<b>Pollutant</b>	<b>IN Pollutant</b>		<b>Emission Capture Efficiency %</b>	<b>OUT Pollutant</b>		<b>Control Efficiency %</b>
	<b>g/bhp-hr</b>	<b>grains/acf</b>		<b>g/bhp-hr</b>	<b>grains/acf</b>	
NO <sub>x</sub>	12.10		100	1.00		92%
CO	2.90		100	2.00		31%
24. Dimensions of stack:                      Height                      ft.                      Diameter                      ft.						
25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.						

**Particulate Distribution**

26. Complete the table:		<b>Particle Size Distribution at Inlet to Collector</b>	<b>Fraction Efficiency of Collector</b>
<b>Particulate Size Range (microns)</b>		<b>Weight % for Size Range</b>	<b>Weight % for Size Range</b>
0 – 2			
2 – 4			
4 – 6			
6 – 8			
8 – 10			
10 – 12			
12 – 16			
16 – 20			
20 – 30			
30 – 40			
40 – 50			
50 – 60			
60 – 70			
70 – 80			
80 – 90			
90 – 100			
>100			



27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included **Other Collectores Control Device** in the Emissions Points Data Summary Sheet?

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

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

MONITORING:

RECORDKEEPING:

REPORTING:

TESTING:

MONITORING: Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.

RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.

REPORTING: Please describe any proposed emissions testing for this process equipment on air pollution control device.

TESTING: Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

NO<sub>x</sub> (≥92%) and CO (≥31%)

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

# **ATTACHMENT N**

## **Supporting Emissions Calculations**

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“30. Provide all **Supporting Emissions Calculations** as Attachment N.”

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### **Emission Summary Spreadsheets**

- Potential to Emit (PTE)
- Greenhouse Gas (GHG)

### **Unit-Specific Emission Spreadsheets**

- Compressor Engine – 68 bhp Arrow VRG-330-A-54
- Compressor Engine – 225 bhp Cummins GTA-855
- Rod Packing/Crankcase (RPC)
- Startup, Shutdown and Maintenance (SSM)
- Dehydrator – 5.0 MMscfd
- Reboiler – 0.22 MMBtu/hr
- Produced Water Storage Tank – 210 bbl
- Produced Water Truck Load-Out – 2,520 bbl/yr
- Process Piping Fugitives – GAS/VAPOR and WATER/OIL

### **GRI-GLYCalc Analysis**

- Dehydrator – 5.0 MMscfd

### **HYSYS Model Output**

- Produced Water Storage Tank – 210 bbl

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
 Application for 45CSR13 NSR Modification Permit

**Facility Total – Potential to Emit (PTE)**

Unit ID	Point ID	Control ID	Description	NOX		CO		VOC		SO2		PM10/2.5	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	1E	na	68 bhp Arrow VRG-330-A-54 Compressor Engine	2.59	11.35	2.93	12.84	0.02	0.10	4.0E-04	1.7E-03	0.01	0.06
CE-02	2E	01-NSCR	225 bhp Cummins GTA-855 Compressor Engine	0.50	2.17	0.99	4.35	0.17	0.73	1.2E-03	0.01	0.04	0.18
RPC	3E	na	Rod Packing/Crankcase Leaks	---	---	---	---	1.30	5.68	---	---	---	---
SSM	4E	na	Startup/Shutdown/Maintenance (Blowdown (BD))	---	---	---	---	---	4.19	---	---	---	---
DFT-01	5E	na	5.0 MMscfd Dehydrator - Flash Tank	---	---	---	---	2.93	12.83	---	---	---	---
DSV-01	6E	na	5.0 MMscfd Dehydrator - Regenerator/Still Vent	---	---	---	---	1.59	6.97	---	---	---	---
RBV-01	7E	na	0.22 MMBtu/hr Reboiler Vent	0.02	0.10	0.02	0.08	1.2E-03	0.01	1.3E-04	5.7E-04	1.7E-03	0.01
TK-01	8E	na	Produced Water - Storage Tank	---	---	---	---	0.01	0.13	---	---	---	---
TLO	9E	na	Produced Water - Truck Load-Out	---	---	---	---	---	0.26	---	---	---	---

<b>TOTAL PTE (w/o FUG):</b>				<b>3.11</b>	<b>13.61</b>	<b>3.94</b>	<b>17.27</b>	<b>6.02</b>	<b>30.89</b>	<b>1.8E-03</b>	<b>0.01</b>	<b>0.06</b>	<b>0.25</b>
<b>WV-DEP NSR Permit Threshold:</b>				<b>6 lb/hr AND 10 tpy</b>		<b>6 lb/hr AND 10 tpy</b>		<b>6 lb/hr AND 10 tpy</b>		<b>6 lb/hr AND 10 tpy</b>		<b>6 lb/hr AND 10 tpy</b>	
<b>Title V Permit Threshold:</b>				---	<b>100</b>	---	<b>100</b>	---	<b>100</b>	---	<b>100</b>	---	<b>100</b>

FUG	10E	na	Piping and Equipment Fugitives	---	---	---	---	2.10	9.19	---	---	---	---
<b>TOTAL PTE (w/FUG):</b>				<b>3.11</b>	<b>13.61</b>	<b>3.94</b>	<b>17.27</b>	<b>8.12</b>	<b>40.09</b>	<b>1.8E-03</b>	<b>0.01</b>	<b>0.06</b>	<b>0.25</b>

Unit ID	Point ID	Control ID	HCHO		n-Hexane		Benzene		Toluene		Ethylbenzene		Xylenes		Total HAP	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	1E	na	0.02	0.07	---	---	1.1E-03	0.00	3.8E-04	1.7E-03	1.7E-05	7.4E-05	1.3E-04	5.8E-04	0.02	0.10
CE-02	2E	01-NSCR	0.04	0.19	---	---	3.3E-03	0.01	1.2E-03	0.01	5.3E-05	2.3E-04	4.1E-04	1.8E-03	0.07	0.30
RPC	3E	na	9.4E-04	4.1E-03	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02	0.02	0.11
SSM	4E	na	---	---	---	0.06	---	1.7E-03	---	3.3E-03	---	1.7E-03	---	0.01	---	0.08
DFT-01	5E	na	---	---	0.06	0.25	5.8E-03	2.6E-02	0.02	0.07	2.3E-03	1.0E-02	0.02	0.10	0.11	0.46
DSV-01	6E	na	---	---	0.02	0.09	0.05	0.24	0.23	1.00	5.7E-03	2.5E-02	0.78	3.44	1.09	4.78
RBV-01	7E	na	1.6E-05	7.2E-05	3.9E-04	1.7E-03	4.6E-07	2.0E-06	7.4E-07	3.2E-06	---	---	---	---	4.1E-04	1.8E-03
TK-01	8E	na	---	---	5.6E-04	2.7E-03	5.6E-04	2.7E-03	5.6E-04	2.7E-03	5.6E-04	2.7E-03	2.7E-03	2.7E-03	1.4E-02	0.01
TLO	9E	na	---	---	---	0.01	---	0.01	---	0.01	---	0.01	---	0.01	---	0.06

<b>PTE (w/o FUG):</b>			<b>0.06</b>	<b>0.27</b>	<b>0.08</b>	<b>0.43</b>	<b>0.07</b>	<b>0.32</b>	<b>0.25</b>	<b>1.12</b>	<b>0.01</b>	<b>0.07</b>	<b>0.82</b>	<b>3.58</b>	<b>1.33</b>	<b>5.91</b>
<b>WV-DEP:</b>			<b>2 lb/hr OR 0.5 tpy</b>		<b>2 lb/hr OR 5 tpy</b>		<b>2 lb/hr OR 0.5 tpy</b>		<b>2 lb/hr OR 5 tpy</b>		<b>2 lb/hr OR 5 tpy</b>		<b>2 lb/hr OR 5 tpy</b>		<b>2 lb/hr OR 5 tpy</b>	
<b>Title V:</b>			---	10	---	10	---	10	---	10	---	10	---	10	---	25

FUG	10E	na	---	---	0.10	0.45	0.03	0.12	0.03	0.12	0.03	0.12	0.03	0.12	0.24	1.06
<b>PTE (w/FUG):</b>			<b>0.06</b>	<b>0.27</b>	<b>0.18</b>	<b>0.88</b>	<b>0.10</b>	<b>0.44</b>	<b>0.28</b>	<b>1.24</b>	<b>0.04</b>	<b>0.20</b>	<b>0.84</b>	<b>3.70</b>	<b>1.57</b>	<b>6.97</b>

- Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr; except TLO and SSM are infrequent.  
 2 - VOC is volatile organic compounds, as defined by EPA, and includes HCHO (formaldehyde).  
 3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.  
 4 - HCHO is formaldehyde; Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP (i-octane), acetaldehyde, acrolein, and methanol.

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**Greenhouse Gas (GHG) Potential-to-Emit (PTE)**

Unit ID	Point ID	Control ID	Description	Heat Input MMBtu/hr (HHV)	Hours of Operation hr/yr	kg/MMBtu: 53.06 GWP: 1 CO2 tpy CO2e tpy	kg/MMBtu: 1.00E-03 GWP: 25 CH4 tpy CO2e tpy	kg/MMBtu: 1.00E-04 GWP: 298 N2O tpy CO2e tpy	TOTAL CO2e tpy			
CE-01	1E	na	68 bhp Arrow VRG-330-A-54 Compressor Engine	0.68	8,760	512	512	1	25	9.7E-04	0.3	538
CE-02	2E	01-NSCR	225 bhp Cummins GTA-855 Compressor Engine	2.12	8,760	1,366	1,366	2	53	2.0E-03	1	1,420
RPC	3E	na	Rod Packing/Crankcase Leaks	---	8,760	30	30	19	480	---	---	510
SSM	4E	na	Startup/Shutdown/Maintenance (Blowdown (BD))	---	8,760	---	---	14	354	---	---	354
DFT-01	5E	na	5.0 MMscfd Dehydrator - Flash Tank	---	8,760	---	---	26	646	---	---	646
DSV-01	6E	na	5.0 MMscfd Dehydrator - Regenerator/Still Vent	---	8,760	---	---	0.3	7	---	---	7
RBV-01	7E	na	0.22 MMBtu/hr Reboiler Vent	0.22	8,760	114	114	0.00	0.1	2.1E-04	0.1	114
TK-01	8E	na	Produced Water - Storage Tank	---	8,760	---	---	---	---	---	---	---
TLO	9E	na	Produced Water - Truck Load-Out	---	---	---	---	---	---	---	---	---

<b>TOTAL FACILITY-WIDE PTE (w/o FUG):</b>	<b>2,022</b>		<b>63</b>		<b>0.00</b>		<b>3,589</b>
<b>NSR/PSD Threshold:</b>	<b>250</b>	- OR -	<b>250</b>	- OR -	<b>250</b>	- AND -	<b>100,000</b>
<b>Title V Major Source Threshold:</b>	<b>na</b>		<b>na</b>		<b>na</b>		<b>100,000</b>

FUG	10E	na	Piping and Equipment Fugitives	---	8,760	---	---	24	595	---	---	595
<b>TOTAL FACILITY-WIDE PTE (w/ FUG):</b>						<b>2,022</b>		<b>86</b>		<b>0.00</b>		<b>4,184</b>

- Notes: 1 - Emissions are based on operation at 100% of rated load.  
 2 - Engine CO2 and CH4 emissions are based on vendor specifications.  
 3 - Fugitive CH4 emissions are based on EPA Fugitive Emission Factors for Oil and Gas Production Operations.

- 4 - All other GHG emissions are based on default values in 40CFR98, Subpart C, Table C-1.  
 5 - High Heat Value (HHV) = Low Heat Value (LHV) / 0.90.  
 6 - GHG NSR/PSD Thresholds and Title V Major Source Thresholds are applicable only if other regulated air pollutants exceed the corresponding Thresholds.

Williams Ohio Valley Midstream LLC (OVM)  
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**Compressor Engine – 68 bhp Arrow VRG-330-A-54**

Unit ID	Description	Reference	Pollutant	Pre-Controlled Emissions			Control Efficiency	Controlled Emissions		
				g/bhp-hr	lb/hr	tpy		g/bhp-hr	lb/hr	tpy
CE-01	<b>Engine 01</b>  <b>Arrow (4SRB)</b> <b>VRG-330-A-54</b> <b>68 bhp</b> 1,800 rpm (AFRC)  <b>8,760 hr/yr</b>  January 3, 2003 Pre-NSPS JJJJ "Existing" NESHAP ZZZZ 920 Btu/scf (LHV) 1,020 Btu/scf (HHV) <b>9,000 Btu/bhp-hr (LHV)</b> 9,978 Btu/bhp-hr (HHV) 0.61 MMBtu/hr (LHV) 0.68 MMBtu/hr (HHV) 665 scf/hr 5.83 MMscf/yr	Vendor Data (+20% sf)	NOX	17.28	2.59	11.35	0.0%	17.28	2.59	11.35
		Vendor Data (+20% sf)	CO	19.56	2.93	12.84	0.0%	19.56	2.93	12.84
		AP-42 Table 3.2-3	THC	1.62	0.24	1.06	0.0%	1.62	0.24	1.06
		AP-42 Table 3.2-3	NMHC	0.58	0.09	0.38	0.0%	0.58	0.09	0.38
		Vendor Data (+20% sf)	NMNEHC	0.05	0.01	0.03	0.0%	0.05	0.01	0.03
		NMNEHC+HCHO	VOC	0.16	0.02	0.10	0.0%	0.16	0.02	0.10
		AP-42 Table 3.2-3	SO2	2.7E-03	4.0E-04	1.7E-03	0.0%	2.7E-03	4.0E-04	1.7E-03
		AP-42 Table 3.2-3	PM10/2.5	0.09	0.01	0.06	0.0%	0.09	0.01	0.06
		Vendor Data (+20% sf)	HCHO	0.11	0.02	0.07	0.0%	0.11	0.02	0.07
		AP-42 Table 3.2-3	n-Hexane	---	---	---	0.0%	---	---	---
		AP-42 Table 3.2-3	Benzene	0.01	1.1E-03	0.00	0.0%	0.01	1.1E-03	4.7E-03
		AP-42 Table 3.2-3	Toluene	2.5E-03	3.8E-04	1.7E-03	0.0%	2.5E-03	3.8E-04	1.7E-03
		AP-42 Table 3.2-3	Ethylbenzene	1.1E-04	1.7E-05	7.4E-05	0.0%	1.1E-04	1.7E-05	7.4E-05
		AP-42 Table 3.2-3	Xylenes	8.8E-04	1.3E-04	5.8E-04	0.0%	8.8E-04	1.3E-04	5.8E-04
		AP-42 Table 3.2-3	2,2,4-TMP	---	---	---	0.0%	---	---	---
		AP-42 Table 3.2-3	Other HAP	0.04	0.01	0.03	0.0%	0.04	0.01	0.03
		Sum	Total HAP	0.16	0.02	0.10	0.0%	0.16	0.02	0.10
		AP-42 Table 3.2-3	CO2	529	117	512	0.0%	529	117	512
		AP-42 Table 3.2-3	CH4	1.04	0.23	1.01	0.0%	1.04	0.23	1.01
		40CFR98 - Table C-2	N2O	1.0E-03	2.2E-04	9.7E-04	0.0%	1.0E-03	2.2E-04	9.7E-04
40CFR98 - Table A-1	CO2e	556	123	538	0.0%	556	123	538		

- Notes:
- 1 - The emissions are based on operation at 100% of rated load for 8,760 hrs/yr.
  - 2 - As per vendor specifications, THC, NMHC, and NMNEHC (non-methane/non-ethane hydrocarbon) do not include HCHO. VOC is the sum of NMNEHC and HCHO.
  - 3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5
  - 4 - HCHO is formaldehyde; Total HAP includes, but not limited to, HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP, acetaldehyde, acrolein, and MeOH.
  - 5 - The fuel heating value will vary, 920 Btu/scf (LHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate.
  - 6 - **Vendor data are not representative of Not-to-Exceed values.** The vendor recommends a "nominal percentage" be added to the emissions factors to allow for operational flexibility and variation in fuel gas composition.
  - 7 - **Emission factors in AP-42 are NOT EPA-recommended emission limits.** Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
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**Compressor Engine – 225 bhp Cummins GTA855**

Unit ID	Description	Reference	Pollutant	Pre-Controlled Emissions			Control Efficiency	Controlled Emissions		
				g/bhp-hr	lb/hr	tpy		g/bhp-hr	lb/hr	tpy
CE-02	<b>Engine 02</b>  <b>Cummins</b> <b>GTA-855 (4SRB)</b> <b>225 bhp</b> 1,800 rpm NSCR <b>8,760 hr/yr</b>  Manufactured: 01/01/15 NSPS JJJJ "New" NESHAP ZZZZ 920 Btu/scf (LHV) 1,020 Btu/scf (HHV) <b>8,496 Btu/bhp-hr (LHV)</b> 9,420 Btu/bhp-hr (HHV) 1.91 MMBtu/hr (LHV) 2.12 MMBtu/hr (HHV) 2,078 scf/hr 18.20 MMscf/yr	Vendor Data	NOX	12.10	6.00	26.29	92%	1.00	0.50	2.17
		Vendor Data	CO	2.90	1.44	6.30	31%	2.00	0.99	4.35
		Vendor Data	THC	1.43	0.71	3.11	0%	1.43	0.71	3.11
		AP-42 Table 3.2-3	NMHC	0.55	0.27	1.19	0%	0.55	0.27	1.19
		AP-42 Table 3.2-3	NMNEHC	0.25	0.12	0.53	0%	0.25	0.12	0.53
		NMNEHC + HCHO	VOC	0.33	0.17	0.73	0%	0.33	0.17	0.73
		AP-42 Table 3.2-3	SO2	2.5E-03	1.2E-03	5.5E-03	0%	2.5E-03	1.2E-03	0.01
		AP-42 Table 3.2-3	PM10/2.5	8.3E-02	0.04	0.18	0%	0.08	0.04	0.18
		AP-42 Table 3.2-3	HCHO	0.09	0.04	0.19	0%	0.09	0.04	0.19
		AP-42 Table 3.2-3	n-Hexane	---	---	---	0%	---	---	---
		AP-42 Table 3.2-3	Benzene	0.01	3.3E-03	0.01	0%	0.01	3.3E-03	0.01
		AP-42 Table 3.2-3	Toluene	2.4E-03	1.2E-03	0.01	0%	2.4E-03	1.2E-03	0.01
		AP-42 Table 3.2-3	Ethylbenzene	1.1E-04	5.3E-05	2.3E-04	0%	1.1E-04	5.3E-05	2.3E-04
		AP-42 Table 3.2-3	Xylenes	8.3E-04	4.1E-04	1.8E-03	0%	8.3E-04	4.1E-04	1.8E-03
		AP-42 Table 3.2-3	2,2,4-TMP	---	---	---	---	---	---	---
		AP-42 Table 3.2-3	Other HAP	0.04	0.02	0.09	0%	0.04	0.02	0.09
		Sum	Total HAP	0.14	0.07	0.30	0%	0.14	0.07	0.30
		Vendor Data	CO2	629	312	1,366	0%	629	312	1,366
		AP-42 Table 3.2-3	CH4	0.98	0.49	2.14	0%	0.98	0.49	2.14
		40CFR98 - Table C-2	N2O	9.4E-04	4.7E-04	0.00	0%	9.4E-04	4.7E-04	2.0E-03
40CFR98 - Table A-1	CO2e	525	324	1,420	0%	525	324	1,420		

- Notes:
- 1 - The emissions are based on operation at 100% of rated load for 8,760 hrs/yr.
  - 2 - As per vendor specifications, THC, NMHC, and NMNEHC (non-methane/non-ethane hydrocarbon) do not include HCHO. VOC is the sum of NMNEHC and HCHO.
  - 3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5
  - 4 - HCHO is formaldehyde; Total HAP includes, but not limited to, HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP, acetaldehyde, acrolein, and MeOH.
  - 5 - The fuel heating value will vary, 920 Btu/scf (LHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate.
  - 6 - **Emission factors in AP-42 are NOT EPA-recommended emission limits.** Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

Williams Ohio Valley Midstream LLC (OVM)  
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**Rod Packing/Crankcase (RPC)**

Unit Description	Number of Compressors	Cylinders per Compressor	scfh per Cylinder	Contingency	Total Fugitive Leak Rate MMscf/yr	VOC		HCHO		n-Hex, BTEX (Each)		Total HAP		CO2		CH4		CO2e	
						12,500		na		45		225		155		42,275		1,057,030	
						lb/MMscf	tpy	lb/MMscf	tpy	lb/MMscf	tpy	lb/MMscf	tpy	lb/MMscf	tpy	lb/MMscf	tpy	lb/MMscf	tpy
Rod Packing Emissions (Gas)	1	4	15	15%	0.60	0.86	3.78	na	na	3.1E-03	0.01	0.02	0.07	0.01	0.05	3	13	73	319
Rod Packing Emissions (Gas)	1	2	15	15%	0.30	0.43	1.89	na	na	1.6E-03	0.01	0.01	0.03	0.01	0.0	1	6	36	160

Unit Description	Total Effective (Prorated for hr/yr) Horsepower (bhp)	Crankcase Leak Rate 0.50 scf/bhp-hr MMscf/yr	Safety Factor	VOC		HCHO		n-Hex, BTEX (Each)		Total HAP		CO2		CH4		CO2e	
				9.75		2.56		0.29		4.03		18,379		29		19,097	
				lb/MMscf	tpy	lb/MMscf	tpy	lb/MMscf	tpy	lb/MMscf	tpy	lb/MMscf	tpy	lb/MMscf	tpy	lb/MMscf	tpy
Crankcase Emissions (Exhaust)	293	1.28	250%	3.6E-03	0.02	9.4E-04	4.1E-03	1.1E-04	4.7E-04	1.5E-03	0.01	7	29	0.01	0.05	7	31

Total RPC Emissions:	VOC		HCHO		n-Hex, BTEX (Each)		Total HAP		CO2		CH4		CO2e	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
	1.30	5.68	9.4E-04	4.1E-03	4.8E-03	0.02	0.02	0.11	7	30	4	19	116	510

- Notes:
- 1 - Fugitive equipment leaks from misc. equipment is a broad category covering leaks of natural gas from sealed surfaces, such as packing and gaskets, resulting from the wear of mechanical joints, seals, and rotating surfaces over time.
  - 2 - Emission are based upon 40CFR98, Subpart W and manufacturer's data.
  - 3 - To be conservative, and to account for potential future changes, the following "worst-case" gas characteristics were assumed:

Pollutant	Representative Gas Analysis	Worst-Case Assumption
CO2	128 lb/MMscf	155 lb/MMscf
CH4	31,975 lb/MMscf	42,275 lb/MMscf
VOC	10,410 lb/MMscf	12,500 lb/MMscf
n-Hex, BTEX (ea)	34 lb/MMscf	45 lb/MMscf
Total HAP	172 lb/MMscf	225 lb/MMscf

4 - Total Facility-Wide bhp is determined as follows:

Unit ID	BHP	Hr/Yr	Prorated
CE-01	68	8,760	68
CE-02	225	8,760	225
<b>TOTAL</b>	<b>293</b>	<b>---</b>	<b>293</b>

- 5 - Total Rod Packing Emissions (Gas) Leak Rate (scf/yr)  
 = No. of Compressors \* Cylinders/Compressor \* scfh/Cylinder \* 8,760 hr/yr \* (1 + Contingency)
- 6 - Engine crankcase emissions are based on vendor data: "As a general rule, blow-by (i.e., crankcase emissions) on a new engine is approximately 0.5 scf/bhp-hr." A "safety factor" is used to account for increasing blow-by as the engines "wear".
- 7 - Crankcase emissions are estimated as follows:

(Data from **Cummins GTA855** Data Sheet and Emissions Calculation Spreadsheet.)

Total Engine Exhaust (TEEx) (Volume)	945 ft3/min (acf/min)	148.67 MMscf/yr TEEx*
Pollutant	Cummins GTA855	Crankcase Emission Factor**
Crankcase THC emissions (Mass)	3.11 tpy THC	41.80 lb THC / MMscf TEEx
Crankcase VOC emissions (Mass)	0.73 tpy VOC	9.75 lb VOC / MMscf TEEx
Crankcase HCHO emissions (Mass)	0.19 tpy HCHO	2.56 lb HCHO / MMscf TEEx
Crankcase n-Hex, BTEX (ea) emissions (Mass)	0.02 tpy n-Hex, BTEX (ea)	0.29 lb n-Hex, BTEX (ea) / MMscf TEEx
Crankcase HAP emissions (Mass)	0.30 tpy HAP	4.03 lb HAP / MMscf TEEx
Crankcase CO2 emissions (Mass)	1,366 tpy CO2	18,379 lb CO2 / MMscf TEEx
Crankcase CH4 emissions (Mass)	2.14 tpy CH4	28.72 lb CH4 / MMscf TEEx
Crankcase CO2e emissions (Mass)	1,420 tpy CO2e	19,105 lb CO2e / MMscf TEEx

\* Conversion from acf/min to scf/yr based on 8,760 hr/yr, 1,304 oF exhaust temp, and 68 oF std temp.

\*\* Crankcase Emission Factor = PTE (tpy) from a Cummins GTA855 Engine ÷ Total Engine Exhaust (TEEx) (MMsf/yr).

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**Startup, Shutdown and Maintenance (SSM)**

Unit ID	Description	No of Units	Total bhp	a. "Cold-Start" Gas		b. Blowdown Gas		Site-Wide SSM Events SSM/yr	Total Gas Vented MMscf/yr
				scf/Unit	scf/SSM	scf/bhp	scf/SSM		
SSM	a. Cold-Start Engine	2	na	700	1,400	na	na	208	0.29
	b. Compressor Blowdown	2	293	na	na	6.22	1,821	208	0.38

Unit ID	Description	CH4	CO2e	VOC	n-Hexane	Benzene	Toluene	E-benzene	Xylenes	Total HAP
		42,275 lb/MMscf tpy	1,056,875 lb/MMscf tpy	12,500 lb/MMscf tpy	180.00 lb/MMscf tpy	5.00 lb/MMscf tpy	10.00 lb/MMscf tpy	5.00 lb/MMscf tpy	20.00 lb/MMscf tpy	225.00 lb/MMscf tpy
SSM	a. Cold-Start Engine	6	154	1.82	0.03	7.3E-04	1.5E-03	7.3E-04	2.9E-03	0.03
	b. Compressor Blowdown	8	200	2.37	0.03	9.5E-04	1.9E-03	9.5E-04	3.8E-03	0.04

<b>TOTAL FACILITY-WIDE SSM EMISSIONS:</b>	<b>14</b>	<b>354</b>	<b>4.19</b>	<b>0.06</b>	<b>1.7E-03</b>	<b>3.3E-03</b>	<b>1.7E-03</b>	<b>0.01</b>	<b>0.08</b>
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- Notes:
- 1 - SSM Emissions are the sum of:
    - a. Unburned fuel resulting from "cold-start" of the idle gas-fired engine; and
    - b. Natural gas that is purged (aka blowdown) from the compressor and associated piping and equipment.
  - 2 - Starting gas quantity and blowdown (B-D) gas quantity as per engineering department. (e.g., 8,577 scf/B-D of a compressor with a 1,380 bhp engine equals 6.22 scf/bhp/B-D.)
  - 3 - To be conservative, the following gas characteristics were assumed:

Pollutant	Analysis	Assumed
CH4	31,975 lb/MMscf	42,275 lb/MMscf
VOC	10,410 lb/MMscf	12,500 lb/MMscf
n-Hexane	148.74 lb/MMscf	180.00 lb/MMscf
Benzene	2.26 lb/MMscf	5.00 lb/MMscf

Pollutant	Analysis	Assumed
Toluene	6.80 lb/MMscf	10.00 lb/MMscf
E-benzene	0.14 lb/MMscf	5.00 lb/MMscf
Xylenes	13.71 lb/MMscf	20.00 lb/MMscf
Total HAP	171.80 lb/MMscf	225.00 lb/MMscf

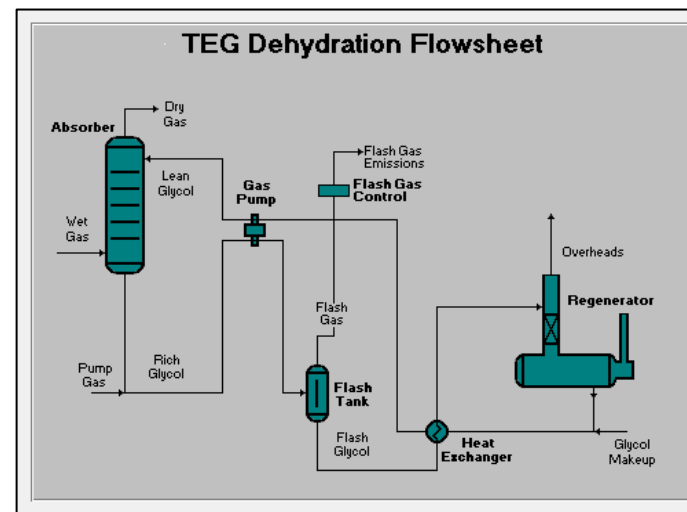
- 4 - To be conservative, these SSM estimates are based on 4.0 facility-wide blowdowns each week.
- 5 - This estimate of SSM emissions is sufficient to account for other infrequent and (often) de-minimis emissions from various activities at the facility that are not necessarily associated with compressor blowdowns.



**Tri-Ethylene Glycol (TEG) Dehydrator – 5.0 MMscfd**

Unit ID	Description	Capacity	Reference	Pollutant	GRI-GLYCalc Pre-Control Emission		"Worst-Case" Pre-Control Emissions		Control Efficiency %	Controlled Emissions	
					lb/hr	tpy	lb/hr	tpy		lb/hr	tpy
DFT-01	Tri-Ethylene Glycol (TEG) Dehydrator 01 Flash Tank Vent (≥ 50% Recycle)	Flow Rate 5.0 MMscfd  8,760 hr/yr	GRI-GLYCalc 4.0	VOC	2.44	10.69	2.93	12.83	0.0%	2.93	12.83
			GRI-GLYCalc 4.0	n-Hexane	0.05	0.21	0.06	0.25	0.0%	0.06	0.25
			GRI-GLYCalc 4.0	Benzene	0.00	0.02	0.01	0.03	0.0%	0.01	0.03
			GRI-GLYCalc 4.0	Toluene	0.01	0.06	0.02	0.07	0.0%	0.02	0.07
			GRI-GLYCalc 4.0	Ethylbenzene	2.1E-04	9.0E-04	2.3E-03	0.01	0.0%	2.3E-03	0.01
			GRI-GLYCalc 4.0	Xylenes	0.02	0.08	0.02	0.10	0.0%	0.02	0.10
			GRI-GLYCalc 4.0	2,2,4-TMP	3.7E-04	1.6E-03	2.3E-03	0.01	0.0%	2.3E-03	0.01
			GRI-GLYCalc 4.0	Tot HAP	0.08	0.37	0.11	0.46	0.0%	0.11	0.46
			GRI-GLYCalc 4.0	CH4	4.92	21.53	5.90	25.84	0.0%	5.90	25.84
40CFR98 - Table A-1	CO2e	123	538	147	646	0.0%	147	646			
DSV-01	Tri-Ethylene Glycol (TEG) Dehydrator 01 Regenerator/Still Vent	Flow Rate 5.0 MMscfd  8,760 hr/yr	GRI-GLYCalc 4.0	VOC	1.33	5.81	1.59	6.97	0.0%	1.59	6.97
			GRI-GLYCalc 4.0	n-Hexane	0.02	0.07	0.02	0.09	0.0%	0.02	0.09
			GRI-GLYCalc 4.0	Benzene	0.04	0.20	0.05	0.24	0.0%	0.05	0.24
			GRI-GLYCalc 4.0	Toluene	0.19	0.83	0.23	1.00	0.0%	0.23	1.00
			GRI-GLYCalc 4.0	Ethylbenzene	0.00	0.02	5.7E-03	0.03	0.0%	5.7E-03	0.03
			GRI-GLYCalc 4.0	Xylenes	0.65	2.86	0.78	3.44	0.0%	0.78	3.44
			GRI-GLYCalc 4.0	2,2,4-TMP	1.4E-04	6.0E-04	2.3E-03	0.01	0.0%	2.3E-03	0.01
			GRI-GLYCalc 4.0	Tot HAP	0.91	3.99	1.09	4.78	0.0%	1.09	4.78
			GRI-GLYCalc 4.0	CH4	0.05	0.24	0.07	0.29	0.0%	0.07	0.29
40CFR98 - Table A-1	CO2e	1	6	2	7	na	2	7			

- Notes:
- 1 - Used GRI-GLYCalc V4.0 to calculate combined regenerator vent/flash gas emissions.
  - 2 - GRI-GLYCalc 4.0 Model Results are based on the following input:
    - Wet Gas: 60 oF and 1,000 psig, H2O Saturated (17.03 lb-H2O/MMscf)
    - Gas Analysis: See Attachment I
    - Dry Gas: 5.0 MMscfd, 7.0 lb-H2O/MMscf
    - Lean Glycol: 1.5 wt% H2O, 0.67 gpm (11.75 gal/lb-H2O)
    - Glycol Pump: Gas Injection, Kimray 4015
    - Flash Tank: 140 oF, 40 psig, 50% Recycle (354 scfh)
    - Stripping Gas: None
    - Regen Control: None (79 scfh)
  - 3 - Total HAP includes n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), and other components.
  - 4 - A 20% contingency has been added to the GRI-GLYCalc model results to account for potential future changes in gas quality.



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**Reboiler – 0.22 MMBtu/hr**

Unit ID	Description	Reference	Pollutant	Emission Factor		Pre-Controlled Emissions		Control Efficiency %	Controlled Emissions	
				lb/MMscf	lb/MMBtu	lb/hr	tpy		lb/hr	tpy
RBV-01	<b>Reboiler 01</b>  8,760 hr/yr  0.20 MMBtu/hr (LHV) <b>0.22 MMBtu/hr (HHV)</b>  920 Btu/scf (LHV) 1,020 Btu/scf (HHV)  1,752 MMBtu/yr (LHV) 1,947 MMBtu/yr (HHV)  218 scf/hr 1.91 MMscf/yr	EPA AP-42 Table 1.4-1	NOX	100.00	0.10	0.02	0.10	na	0.02	0.10
		EPA AP-42 Table 1.4-1	CO	84.00	0.08	0.02	0.08	na	0.02	0.08
		EPA AP-42 Table 1.4-2	VOC	5.50	0.01	0.00	0.01	na	0.00	0.01
		EPA AP-42 Table 1.4-2	SO2	0.60	5.9E-04	1.3E-04	5.7E-04	na	1.3E-04	5.7E-04
		EPA AP-42 Table 1.4-2	PM10/2.5	7.60	0.01	0.00	0.01	na	0.00	0.01
		EPA AP-42 Table 1.4-3	HCHO	0.08	7.4E-05	1.6E-05	7.2E-05	na	1.6E-05	7.2E-05
		EPA AP-42 Table 1.4-3	n-Hexane	1.80	1.8E-03	3.9E-04	1.72E-03	na	3.9E-04	1.7E-03
		EPA AP-42 Table 1.4-3	Benzene	2.1E-03	2.1E-06	4.6E-07	2.0E-06	na	4.6E-07	2.0E-06
		EPA AP-42 Table 1.4-3	Toluene	3.4E-03	3.3E-06	7.4E-07	3.2E-06	na	7.4E-07	3.2E-06
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	---	---	---	---	---
		EPA AP-42 Table 1.4-3	Xylenes	---	---	---	---	---	---	---
		EPA AP-42 Table 1.4-3	2,2,4-TMP	---	---	---	---	---	---	---
		EPA AP-42 Table 1.4-3	Other HAP	1.9E-03	1.9E-06	4.1E-07	1.8E-06	na	4.1E-07	1.8E-06
		EPA AP-42 Table 1.4-3	Tot HAP	1.88	1.8E-03	4.1E-04	1.8E-03	na	4.1E-04	1.8E-03
40CFR98 - Table C-1	CO2	119,317	117	26	114	na	26	114		
40CFR98 - Table C-2	CH4	2.25	2.2E-03	4.9E-04	2.1E-03	na	4.9E-04	2.1E-03		
40CFR98 - Table C-2	N2O	0.22	2.2E-04	4.9E-05	2.1E-04	na	4.9E-05	2.1E-04		
40CFR98 - Table A-1	CO2e	119,440	117	26	114	na	26	114		

- Notes:
- 1 - The combustion emission factors are based on a default fuel heat content of 1,020 Btu/scf (HHV).
  - 2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.
  - 3 - HCHO is formaldehyde; Total HAP includes, but not limited to, HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP, acetaldehyde, acrolein, and MeOH.
  - 4 - **Emission factors in AP-42 are NOT EPA-recommended emission limits.** Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

**Produced Water Storage Tank**

**Storage Tank PTE Calculations - Working, Breathing and Flashing Emissions**

Unit ID	Tank ID	Material Stored	Capacity		Turnovers per Year	Throughput		EPA-450/3-85-001a VOC Emission Factor (Working and Breathing Losses)	HYSYS VOC Emission Factor (Flashing Losses)	VOC		n-Hex, BTEX (Ea)		Total HAP	
			gal	bbl		gal/yr	bbl/yr			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
T01	Tank 01	Produced Water	8,820	210	12	105,840	2,520	0.03889 lb/bbl	0.000 lb/bbl	0.01	0.05	5.6E-04	2.5E-03	2.8E-03	0.01

**Storage Tank PTE Calculations - Blanket Gas Emissions**

Unit ID	Tank ID	Material Stored	Capacity		Turnovers per Year	Storage Tank Volume	Storage Tank Blanket Gas Volume	Methane (CH4)		VOC		n-Hex, BTEX (Ea)		Total HAP	
			gal	bbl				42,275 lb/MMscf	lb/hr	tpy	12,500 lb/MMscf	lb/hr	tpy	45 lb/MMscf	lb/hr
T01	Tank 01	Produced Water	8,820	210	12	1,100 scf	13,195 scf	---	0.28	---	0.08	---	3.0E-04	---	1.5E-03

Methane (CH4)		VOC		n-Hex, BTEX (Ea)		Total HAP	
lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
---	0.28	0.01	0.13	5.6E-04	2.7E-03	2.8E-03	0.01

**TOTAL TANK EMISSIONS:**

- Notes: 1 - EPA-450/3-85-001a – "Volatile Organic Compound Emissions from Petroleum Refinery Wastewater Systems - Background Information for Proposed Standards" is a reasonable protocol for estimating potential produced water storage tank working and breathing losses. EPA-450/3-85-001a, page 3-39, gives a VOC emission factor of 420 kg/MMgal wastewater produced in an oil-water separator. (0.420 g/gal \* 0.0022 lb/g \* 42 gal/bbl = 0.03889 lb/bbl)
- 2 - These emission estimates are nearly 4X more conservative than emission factors required by the TCEQ on the Barnett Shale produced water tanks at gas-only sites. (<http://www.tceq.texas.gov/assets/public/implementation/air/ie/pseiforms/producedwaterstoragetank.pdf>):

**Table 1. Produced Water Storage Tank Flash Loss Emissions Factors for Barnett Shale Special Inventory Purposes ONLY**

Pollutant	Average Produced Water Emission Factor (lb/bbl)	
	Gas Production Only Sites	Liquid Hydrocarbon and Gas Production Sites
VOC	0.01	0.0402
Benzene	0.0001	0.000054
Toluene	0.0003	0.000130
Ethylbenzene	0.000006	0.000003
Xylene(s)	0.00006	0.000049
n-Hexane	NA	0.000987

- 3 - Total HAP is estimated at 25.0% of VOC emissions. This is a very conservative estimate based on an investigation of other produced water emission estimating protocols, as exemplified above (e.g., (0.0001+0.0003+0.000006+0.00006)/0.01 = 4.7%).
- 4 - The HYSYS Simulation software was used to estimate flashing losses from the produced water storage tank. Results were 0.000 lb-VOC/bbl.
- 5 - A natural gas blanket will be used on the produced water tank to prevent air from entering the tank and causing an explosion. Field natural gas will be used as the blanket gas.

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**Produced Water/Condensate – Truck Load-Out**

Unit ID	Description	S sat. fac.	P psia	MW lb/lb-mol	T °R	CE %	L <sub>L</sub> lb/kgal	T-Put kgal/yr	VOC AP-42 Sect 5.2 tpy	n-Hex, BTEX (ea) 5.00% of VOC tpy	Total HAP 25.00% of VOC tpy
TLO	Truck Load-Out	1.45	1.5	92	510	0.0%	4.90	106	0.26	0.01	0.06
							<b>bbl/yr:</b>	<b>2,520</b>	518.20		

Notes: 1 - Emission factors and formulas are from AP-42 Section 5.2 "Transportation and Marketing of Petroleum Liquids":

$$L_L = 12.46 \times S \times P \times MW / T \times (1 - CE)$$

where:

- L<sub>L</sub> = Loading loss, lb/1000 gal of liquid loaded.
- S = Saturation factor, use 1.45 for "splash loading".
- P = True vapor pressure of liquid loaded, psia. Estimated at 1.5 psia.
- MW = molecular weight of vapors, lb/lb-mol. (Assumed MW of toluene as it has similar RVP and density as anticipated liquids.)
- T = Temperature of bulk liquid loaded, °R = °F + 460. (Conservatively assumed 50 °F.)
- CE = Overall emission reduction efficiency (collection efficiency x control efficiency).

3 - It is estimated that each tank will be emptied up to: 

12
----

 times per year.

4 - The total storage tank capacity at the facility is: 

210
-----

 bbl.

5 - **Emission factors in AP-42 are NOT EPA-recommended emission limits.** Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

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**Attachment N - Supporting Emissions Calculations**

**Piping and Equipment Fugitives - Gas & Water/Oil**

Unit ID (Point ID)	Description	Component (Unit) Type (Gas)	Unit Count	THC Factor lb/hr/Unit	LDAR Control Credit	Hydrocarbons (THC)		VOC 22.50 Wgt%		n-Hexane 0.27 Wgt%		BTEX, TMP-ea 0.03 Wgt%		Total HAP 0.40 Wgt%		CO2 0.28 Wgt%		CH4 100.00 Wgt%		CO2e GWP = 25		
						lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr
FUG-G (10E)	Process Piping Fugitives (Gas)	Valves	386	0.00992	0%	3.82	16.75	0.86	3.77	0.01	0.04	1.0E-03	0.00	0.02	0.07	0.01	0.05	3.82	16.75	96	419	
		Pump Seals	0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		Other	45	0.01940	0%	0.87	3.82	0.20	0.86	2.3E-03	0.01	2.4E-04	1.0E-03	3.5E-03	0.02	2.4E-03	0.01	0.87	3.82	22	96	
		Connectors	1,106	0.00044	0%	0.49	2.13	0.11	0.48	1.3E-03	0.01	1.3E-04	5.9E-04	2.0E-03	0.01	1.4E-03	0.01	0.49	2.13	12	53	
		Flanges	180	0.00086	0%	0.15	0.68	0.03	0.15	4.1E-04	1.8E-03	4.2E-05	1.9E-04	6.3E-04	2.7E-03	4.3E-04	1.9E-03	0.15	0.68	4	17	
		Open-ended	21	0.00441	0%	0.09	0.41	0.02	0.09	2.5E-04	1.1E-03	2.5E-05	1.1E-04	3.7E-04	1.6E-03	2.6E-04	1.1E-03	0.09	0.41	2	10	
			<b>1,737</b>	<b>Pre-Control:</b>		5.43	23.79	1.22	5.35	0.01	0.06	1.5E-03	6.5E-03	0.02	0.10	0.02	0.07	5.43	23.79	136	595	
				<b>Controlled:</b>		<b>5.43</b>	<b>23.79</b>	<b>1.22</b>	<b>5.35</b>	<b>0.01</b>	<b>0.06</b>	<b>1.5E-03</b>	<b>6.5E-03</b>	<b>0.02</b>	<b>0.10</b>	<b>0.02</b>	<b>0.07</b>	<b>5.43</b>	<b>23.79</b>	<b>136</b>	<b>595</b>	

Unit ID (Point ID)	Description	Component (Unit) Type (Water/Oil)	Unit Count	THC Factor lb/hr/Unit	LDAR Control Credit	Hydrocarbons (THC)		VOC 100.00 Wgt%		n-Hexane 10.00 Wgt%		BTEX, TMP-ea 3.00 Wgt%		Total HAP 25.00 Wgt%		CO2 --- Wgt%		CH4 --- Wgt%		CO2e GWP = 25	
						lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
FUG-W (10E)	Process Piping Fugitives (Water/Oil)	Valves	193	0.00022	0%	0.04	0.18	0.04	0.18	4.2E-03	1.8E-02	1.2E-03	5.5E-03	1.0E-02	4.6E-02	---	---	---	---	---	---
		Pump Seals	4	0.00005	0%	2.1E-04	9.3E-04	2.1E-04	9.3E-04	2.1E-05	9.3E-05	6.3E-06	2.8E-05	5.3E-05	2.3E-04	---	---	---	---	---	---
		Other	23	0.03086	0%	0.69	3.04	0.69	3.04	6.9E-02	3.0E-01	2.1E-02	9.1E-02	1.7E-01	7.6E-01	---	---	---	---	---	---
		Connectors	553	0.00024	0%	0.13	0.59	0.13	0.59	1.3E-02	5.9E-02	4.0E-03	1.8E-02	3.4E-02	0.15	---	---	---	---	---	---
		Flanges	90	0.00001	0%	5.8E-04	2.5E-03	5.8E-04	2.5E-03	5.8E-05	2.5E-04	1.7E-05	7.6E-05	1.4E-04	6.3E-04	---	---	---	---	---	---
		Open-ended	11	0.00055	0%	5.8E-03	0.03	5.8E-03	0.03	5.8E-04	2.5E-03	1.7E-04	7.6E-04	1.4E-03	6.3E-03	---	---	---	---	---	---
			<b>873</b>	<b>Pre-Control:</b>		0.88	3.84	0.88	3.84	8.8E-02	3.8E-01	2.6E-02	0.12	0.22	0.96	---	---	---	---	---	---
				<b>Controlled:</b>		<b>0.88</b>	<b>3.84</b>	<b>0.88</b>	<b>3.84</b>	<b>8.8E-02</b>	<b>0.38</b>	<b>0.03</b>	<b>0.12</b>	<b>0.22</b>	<b>0.96</b>	---	---	---	---	---	---

<b>TOTAL PRE-CONTROL FUGITIVE EMISSIONS:</b>	<b>6.31</b>	<b>27.63</b>	<b>2.10</b>	<b>9.19</b>	<b>0.10</b>	<b>0.45</b>	<b>0.03</b>	<b>0.12</b>	<b>0.24</b>	<b>1.06</b>	<b>0.02</b>	<b>0.07</b>	<b>5.43</b>	<b>23.79</b>	<b>136</b>	<b>595</b>
<b>TOTAL CONTROLLED FUGITIVE EMISSIONS:</b>	<b>6.31</b>	<b>27.63</b>	<b>2.10</b>	<b>9.19</b>	<b>0.10</b>	<b>0.45</b>	<b>0.03</b>	<b>0.12</b>	<b>0.24</b>	<b>1.06</b>	<b>0.02</b>	<b>0.07</b>	<b>5.43</b>	<b>23.79</b>	<b>136</b>	<b>595</b>

Notes: 1 - Assumed 8,760 hours per year of fugitive emissions.

2 - Gas and Water/Oil emissions calculated using EPA Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Nov 1995.

3 - Component in Gas Service are based on GRI-HAPCalc estimates, plus a

4 - Components in Water/Oil Service are based on Gas Component count, times a

5 - "Other" components include compressor seals, relief valves, diaphragms, drains, meters, etc.

6 - To be conservative, the following gas characteristics were assumed:

<b>50%</b>	margin
<b>50%</b>	reduction

TABLE 2.4 O&G PROD (AVE)	Gas		Water/Oil	
	kg/hr	lb/hr	kg/hr	lb/hr
Valves	4.5E-03	0.00992	9.8E-05	0.00022
Pump Seals	na	na	2.4E-05	0.00005
Others	8.8E-03	0.01940	1.4E-02	0.03086
Connectors	2.0E-04	0.00044	1.1E-04	0.00024
Flanges	3.9E-04	0.00086	2.9E-06	0.00001
Open-Ended Lines	2.0E-03	0.00441	2.5E-04	0.00055

Pollutant	Gas		Water/Oil	
	Analysis	Estimated	Analysis	Estimated
Carbon Dioxide	0.23 Wgt%	0.28 Wgt%	--- Wgt%	--- Wgt%
Methane	57.55 Wgt%	100.00 Wgt%	--- Wgt%	--- Wgt%
VOC	18.74 Wgt%	22.50 Wgt%	--- Wgt%	100.00 Wgt%
n-Hexane	0.27 Wgt%	0.27 Wgt%	--- Wgt%	10.00 Wgt%
BTEX, TMP-ea	0.01 Wgt%	0.03 Wgt%	--- Wgt%	3.00 Wgt%
Total HAP	0.31 Wgt%	0.40 Wgt%	--- Wgt%	25.00 Wgt%

Potentially Applicable  
**AP-42 and GHG EMISSION FACTORS**  
(Preferentially use test data or vendor data where available)

Pollutant		GAS-FIRED ENGINES			GAS-FIRED TURBINES		
		AP-42 Table 3.2-1; 3.2-2; 3.2-3 07/00			AP-42 Table 3.1-1; 3.1-2a; 3.1-3 04/00		
		2SLB lb/MMBtu	4SLB lb/MMBtu	4SRB lb/MMBtu	Uncontrolled lb/MMBtu	Water Injection lb/MMBtu	Lean Pre-Mix# lb/MMBtu
CRITERIA	NOX (≥ 90% Load)	3.17E+00	4.08E+00	2.21E+00	3.20E-01	1.30E-01	9.90E-02
	CO (≥ 90% Load)	3.86E-01	3.17E-01	3.72E+00	8.20E-02	3.00E-02	1.50E-02
	THC (TOC)	1.64E+00	1.47E+00	3.58E-01	1.10E-02	1.10E-02	1.10E-02
	NMHC (THC-CH4)	1.90E-01	2.20E-01	1.28E-01	2.40E-03	2.40E-03	2.40E-03
	NMNEHC (NMHC-C2H6)	1.19E-01	1.15E-01	5.76E-02	2.10E-03	2.10E-03	2.10E-03
	VOC	1.20E-01	1.18E-01	2.96E-02	2.10E-03	2.10E-03	2.10E-03
	SO2*** (2,000 gr-S/MMscf)	5.88E-04	5.88E-04	5.88E-04	5.88E-04	5.88E-04	5.88E-04
	PM10/2.5 (Filter+Cond)	4.83E-02	9.99E-03	1.94E-02	6.60E-03	6.60E-03	6.60E-03
HAPS	Benzene	1.94E-03	4.40E-04	1.58E-03	1.20E-05	1.20E-05	9.10E-07
	Ethylbenzene	1.08E-04	3.97E-05	2.48E-05	3.20E-05	3.20E-05	3.20E-05
	Formaldehyde (HCHO)	5.52E-02	5.28E-02	2.05E-02	7.10E-04	7.10E-04	2.00E-05
	n-Hexane	4.45E-04	1.11E-03	---	---	---	---
	Toluene	9.63E-04	4.08E-04	5.58E-04	1.30E-04	1.30E-04	1.30E-04
	TMP, 2,2,4- (i-Octane)	8.46E-04	2.50E-04	---	---	---	---
	Xylenes	2.68E-04	1.84E-04	1.95E-04	6.40E-05	6.40E-05	6.40E-05
	Other HAPs	1.96E-02	1.69E-02	9.42E-03	1.06E-04	1.06E-04	1.06E-04
GHG	CO2**** (GWP=1)	1.17E+02	1.17E+02	1.17E+02	1.17E+02	1.17E+02	1.17E+02
	CH4 (GWP=25)	1.45E+00	1.25E+00	2.30E-01	8.60E-03	8.60E-03	8.60E-03
	N2O (GWP=298)	2.20E-04	2.20E-04	2.20E-04	3.00E-03	3.00E-03	3.00E-03
	CO2e	1.53E+02	1.48E+02	1.23E+02	1.18E+02	1.18E+02	1.18E+02

(#Lean Pre-Mix - aka: Dry Low Emissions (DLE or DLN) and SoLoNOX)

Pollutant		GAS-FIRED EXTERNAL COMBUSTION			FLARES	DIESEL ENGINES
		AP-42 Table 1.4-1; 1.4-2; 1.4-3 (<100 MMBtu/hr) 07/98			13.5-1 01/95	3.3-1; 3.3-2 10/96
		Uncontrolled lb/MMBtu	LoNOX Burners lb/MMBtu	Flue Gas Recirc lb/MMBtu	(Combustion) lb/MMBtu	Uncontrolled lb/MMBtu
CRITERIA	NOX	9.80E-02	4.90E-02	3.14E-02	6.80E-02	4.41E+00
	CO	8.24E-02	8.24E-02	8.24E-02	3.70E-01	9.50E-01
	THC (TOC)	1.08E-02	1.08E-02	1.08E-02	1.40E-01	3.60E-01
	NMHC (THC-CH4)	8.53E-03	8.53E-03	8.53E-03	1.38E-01	3.53E-01
	NMNEHC (NMHC-C2H6)	5.49E-03	5.49E-03	5.49E-03	5.49E-03	3.50E-01
	VOC	5.39E-03	5.39E-03	5.39E-03	5.39E-03	3.60E-01
	SO2 (2,000 gr-S/MMscf)	5.88E-04	5.88E-04	5.88E-04	5.88E-04	2.90E-01
	PM10/2.5 (Filter+Condense)	7.45E-03	7.45E-03	7.45E-03	7.45E-03	3.10E-01
HAPS	Benzene	2.06E-06	2.06E-06	2.06E-06	2.06E-06	9.33E-04
	Ethylbenzene	---	---	---	---	---
	HCHO (Formaldehyde)	7.35E-05	7.35E-05	7.35E-05	7.35E-05	1.18E-03
	n-Hexane	1.76E-03	1.76E-03	1.76E-03	1.76E-03	---
	Toluene	3.33E-06	3.33E-06	3.33E-06	3.33E-06	4.09E-04
	2,2,4-TMP (i-Octane)	---	---	---	---	---
	Xylenes	---	---	---	---	2.85E-04
	Other HAPs	1.86E-06	1.86E-06	1.86E-06	1.86E-06	1.05E-03
GHG	CO2 (GWP=1)	1.18E+02	1.18E+02	1.18E+02	1.18E+02	1.64E+02
	CH4 (GWP=25)	2.25E-03	2.25E-03	2.25E-03	2.25E-03	6.61E-03
	N2O (GWP=298)	2.16E-03	6.27E-04	6.27E-04	2.16E-03	1.32E-03
	CO2e	1.18E+02	1.18E+02	1.18E+02	1.18E+02	1.65E+02

**40 CFR 98 - DEFAULT EMISSION FACTORS**

Fuel Type	Table C-1 to Subpart C of Part 98	Table C-2 to Subpart C of Part 98		
	Default HHV	Carbon Dioxide lb CO2/MMBtu	Methane lb CH4/MMBtu	Nitrous Oxide lb N2O/MMBtu
Fuel Oil No. 2 (Diesel)	0.138 MMBtu/gal	1.61E+02	6.61E-03	1.32E-03
Natural Gas	1,028 MMBtu/scf	1.17E+02	2.20E-03	2.20E-04

Global Warming Potential (100 Yr) (GWP)		
Table A-1 to Subpart A of Part 98		
CO2	CH4*	N2O#
1	25	298

#Revised by EPA on 11/29/13

**Conversion Factors**

<http://www.onlineconversion.com/>

1.0 lb =	453.5924 g
1.0 kg =	2.2046 lb
1.0 hp =	2,544.4332 Btu/hr
1.0 hp =	745.6999 Watt
1.0 kW =	3,412.1416 Btu/hr
1.0 kW-hr =	1.3400 hp-hr
1.0 cf =	7.4805 gal
1.0 gal H2O =	8.3378 lb
1.0 cf H2O =	62.3711 lb
1.0 m =	3.2808 ft
1.0 km =	0.6214 mi
1.0 acre =	43,560.1742 ft2
1.0 °F =	(°C*9/5)+32
1.0 °R =	°F+459.67
1.0 % =	10,000 ppm
UGC (stp) = 379.48 scf/lb-mol	

\*Converted Ext Comb Emission Factors to lb/MMBtu by dividing lb/MMscf by AP-42 default HHV of 1,020 Btu/scf.

\*\*Converted GHG Emission Factors to lb/MMBtu by multiplying kg/MMBtu by 2.2046 lb/kg.

\*\*\*Assumes 100% conversion of fuel sulfur to SO2 (2,000 gr/MMscf).

\*\*\*\*Assumes 99.5% conversion of fuel carbon to CO2 for natural gas.

GRI-GLYCalc VERSION 4.0 - EMISSIONS SUMMARY

Case Name: OVM Snyder TEG Dehydrator

File Name: C:\Users\Clyde Rhodes\Desktop\000 - EcoLogic LLC\10.513 - OVM - Snyder CS -

NSR - 06.25.14\00 - Att-Nb - Snyder CS - NSR - Dehy-01 GLYCalc - 06.27.14.ddf

Date: June 26, 2014

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0550	1.319	0.2408
Ethane	0.0889	2.133	0.3892
Propane	0.0959	2.302	0.4200
Isobutane	0.0209	0.502	0.0916
n-Butane	0.0642	1.541	0.2812
Isopentane	0.0164	0.393	0.0717
n-Pentane	0.0235	0.564	0.1029
n-Hexane	0.0163	0.391	0.0714
Cyclohexane	0.0322	0.772	0.1408
Other Hexanes	0.0151	0.363	0.0663
Heptanes	0.0402	0.965	0.1760
Methylcyclohexane	0.0328	0.788	0.1438
2,2,4-Trimethylpentane	0.0001	0.003	0.0006
Benzene	0.0448	1.076	0.1963
Toluene	0.1903	4.568	0.8336
Ethylbenzene	0.0048	0.114	0.0209
Xylenes	0.6537	15.688	2.8631
C8+ Heavies	0.0756	1.815	0.3312
Total Emissions	1.4707	35.297	6.4417
Total Hydrocarbon Emissions	1.4707	35.297	6.4417
Total VOC Emissions	1.3269	31.845	5.8117
Total HAP Emissions	0.9100	21.841	3.9859
Total BTEX Emissions	0.8936	21.446	3.9140

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	5.3374	128.097	23.3776
Ethane	2.4789	59.495	10.8578
Propane	1.3137	31.529	5.7540
Isobutane	0.1926	4.622	0.8435
n-Butane	0.4568	10.964	2.0009
Isopentane	0.1045	2.509	0.4578
n-Pentane	0.1210	2.904	0.5299
n-Hexane	0.0468	1.124	0.2052
Cyclohexane	0.0231	0.553	0.1010
Other Hexanes	0.0578	1.386	0.2530
Heptanes	0.0568	1.362	0.2486
Methylcyclohexane	0.0186	0.446	0.0814
2,2,4-Trimethylpentane	0.0004	0.009	0.0016
Benzene	0.0049	0.117	0.0213
Toluene	0.0135	0.323	0.0589
Ethylbenzene	0.0002	0.005	0.0009
Xylenes	0.0190	0.457	0.0834
C8+ Heavies	0.0110	0.264	0.0483

Page: 2

Total Emissions	10.2569	246.166	44.9253
Total Hydrocarbon Emissions	10.2569	246.166	44.9253
Total VOC Emissions	2.4406	58.574	10.6898
Total HAP Emissions	0.0848	2.035	0.3714
Total BTEX Emissions	0.0376	0.901	0.1645

## FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	10.6747	256.193	46.7553
Ethane	4.9579	118.989	21.7156
Propane	2.6274	63.057	11.5080
Isobutane	0.3852	9.244	1.6870
n-Butane	0.9137	21.928	4.0018
Isopentane	0.2091	5.017	0.9157
n-Pentane	0.2420	5.807	1.0598
n-Hexane	0.0937	2.249	0.4104
Cyclohexane	0.0461	1.107	0.2020
Other Hexanes	0.1155	2.773	0.5060
Heptanes	0.1135	2.725	0.4973
Methylcyclohexane	0.0372	0.892	0.1628
2,2,4-Trimethylpentane	0.0008	0.018	0.0033
Benzene	0.0097	0.234	0.0426
Toluene	0.0269	0.646	0.1179
Ethylbenzene	0.0004	0.009	0.0017
Xylenes	0.0381	0.914	0.1668
C8+ Heavies	0.0220	0.529	0.0965
Total Emissions	20.5138	492.332	89.8505
Total Hydrocarbon Emissions	20.5138	492.332	89.8505
Total VOC Emissions	4.8812	117.149	21.3797
Total HAP Emissions	0.1696	4.070	0.7427
Total BTEX Emissions	0.0751	1.803	0.3290

## COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	5.3923	129.416	23.6184
Ethane	2.5678	61.628	11.2470
Propane	1.4096	33.830	6.1740
Isobutane	0.2135	5.124	0.9352
n-Butane	0.5210	12.505	2.2822
Isopentane	0.1209	2.902	0.5296
n-Pentane	0.1445	3.468	0.6329
n-Hexane	0.0631	1.515	0.2766
Cyclohexane	0.0552	1.325	0.2418
Other Hexanes	0.0729	1.750	0.3193
Heptanes	0.0970	2.327	0.4247
Methylcyclohexane	0.0514	1.234	0.2252
2,2,4-Trimethylpentane	0.0005	0.012	0.0022
Benzene	0.0497	1.193	0.2176
Toluene	0.2038	4.891	0.8926
Ethylbenzene	0.0050	0.119	0.0217
Xylenes	0.6727	16.145	2.9465
C8+ Heavies	0.0866	2.079	0.3795



	Total Emissions	11.7276	281.463	Page: 3 51.3670
Total Hydrocarbon Emissions		11.7276	281.463	51.3670
Total VOC Emissions		3.7675	90.419	16.5016
Total HAP Emissions		0.9948	23.876	4.3573
Total BTEX Emissions		0.9312	22.348	4.0785

## GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: OVM Snyder TEG Dehydrator

File Name: C:\Users\Clyde Rhodes\Desktop\000 - EcoLogic LLC\10.513 - OVM - Snyder CS -  
NSR - 06.25.14\00 - Att-Nb - Snyder CS - NSR - Dehy-01 GLYCalc - 06.27.14.ddf

Date: June 26, 2014

## DESCRIPTION:

-----

Description: 5 MMscfd TEG Dehydrator  
Snyder extended inlet gas analysis dated  
08-06-2013. Flash tank with 50% of offgas  
used as reboiler fuel. No still vent  
controls.

Annual Hours of Operation: 8760.0 hours/yr

## WET GAS:

-----

Temperature: 60.00 deg. F  
Pressure: 1000.00 psig  
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
-----	-----
Carbon Dioxide	0.1104
Nitrogen	0.4088
Methane	75.6365
Ethane	16.0305
Propane	5.3458
Isobutane	0.5509
n-Butane	1.1803
Isopentane	0.2271
n-Pentane	0.2357
n-Hexane	0.0655
Cyclohexane	0.0144
Other Hexanes	0.0905
Heptanes	0.0552
Methylcyclohexane	0.0111
2,2,4-Trimethylpentane	0.0005
Benzene	0.0011
Toluene	0.0028
Ethylbenzene	0.0000
Xylenes	0.0049
C8+ Heavies	0.0285

## DRY GAS:

-----

Flow Rate: 5.0 MMSCF/day  
Water Content: 7.0 lbs. H2O/MMSCF

## LEAN GLYCOL:

-----

Glycol Type: TEG  
Water Content: 1.5 wt% H2O  
Flow Rate: 0.7 gpm

PUMP:

-----  
Glycol Pump Type: Gas Injection  
Gas Injection Pump Volume Ratio: 0.080 acfm gas/gpm glycol

FLASH TANK:

-----  
Flash Control: Combustion device  
Flash Control Efficiency: 50.00 %  
Temperature: 140.0 deg. F  
Pressure: 40.0 psig

## GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: OVM Snyder TEG Dehydrator

File Name: C:\Users\Clyde Rhodes\Desktop\000 - EcoLogic LLC\10.513 - OVM - Snyder CS -  
NSR - 06.25.14\00 - Att-Nb - Snyder CS - NSR - Dehy-01 GLYCalc - 06.27.14.ddf

Date: June 26, 2014

## DESCRIPTION:

Description: 5 MMscfd TEG Dehydrator  
Snyder extended inlet gas analysis dated  
08-06-2013. Flash tank with 50% of offgas  
used as reboiler fuel. No still vent  
controls.

Annual Hours of Operation: 8760.0 hours/yr

## EMISSIONS REPORTS:

## UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0550	1.319	0.2408
Ethane	0.0889	2.133	0.3892
Propane	0.0959	2.302	0.4200
Isobutane	0.0209	0.502	0.0916
n-Butane	0.0642	1.541	0.2812
Isopentane	0.0164	0.393	0.0717
n-Pentane	0.0235	0.564	0.1029
n-Hexane	0.0163	0.391	0.0714
Cyclohexane	0.0322	0.772	0.1408
Other Hexanes	0.0151	0.363	0.0663
Heptanes	0.0402	0.965	0.1760
Methylcyclohexane	0.0328	0.788	0.1438
2,2,4-Trimethylpentane	0.0001	0.003	0.0006
Benzene	0.0448	1.076	0.1963
Toluene	0.1903	4.568	0.8336
Ethylbenzene	0.0048	0.114	0.0209
Xylenes	0.6537	15.688	2.8631
C8+ Heavies	0.0756	1.815	0.3312
<b>Total Emissions</b>	<b>1.4707</b>	<b>35.297</b>	<b>6.4417</b>
<b>Total Hydrocarbon Emissions</b>	<b>1.4707</b>	<b>35.297</b>	<b>6.4417</b>
<b>Total VOC Emissions</b>	<b>1.3269</b>	<b>31.845</b>	<b>5.8117</b>
<b>Total HAP Emissions</b>	<b>0.9100</b>	<b>21.841</b>	<b>3.9859</b>
<b>Total BTEX Emissions</b>	<b>0.8936</b>	<b>21.446</b>	<b>3.9140</b>

## FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	5.3374	128.097	23.3776
Ethane	2.4789	59.495	10.8578
Propane	1.3137	31.529	5.7540
Isobutane	0.1926	4.622	0.8435
n-Butane	0.4568	10.964	2.0009
Isopentane	0.1045	2.509	0.4578

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n-Pentane	0.1210	2.904	0.5299
n-Hexane	0.0468	1.124	0.2052
Cyclohexane	0.0231	0.553	0.1010
Other Hexanes	0.0578	1.386	0.2530
Heptanes	0.0568	1.362	0.2486
Methylcyclohexane	0.0186	0.446	0.0814
2,2,4-Trimethylpentane	0.0004	0.009	0.0016
Benzene	0.0049	0.117	0.0213
Toluene	0.0135	0.323	0.0589
Ethylbenzene	0.0002	0.005	0.0009
Xylenes	0.0190	0.457	0.0834
C8+ Heavies	0.0110	0.264	0.0483
-----			
Total Emissions	10.2569	246.166	44.9253
Total Hydrocarbon Emissions	10.2569	246.166	44.9253
Total VOC Emissions	2.4406	58.574	10.6898
Total HAP Emissions	0.0848	2.035	0.3714
Total BTEX Emissions	0.0376	0.901	0.1645

## FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	10.6747	256.193	46.7553
Ethane	4.9579	118.989	21.7156
Propane	2.6274	63.057	11.5080
Isobutane	0.3852	9.244	1.6870
n-Butane	0.9137	21.928	4.0018
Isopentane	0.2091	5.017	0.9157
n-Pentane	0.2420	5.807	1.0598
n-Hexane	0.0937	2.249	0.4104
Cyclohexane	0.0461	1.107	0.2020
Other Hexanes	0.1155	2.773	0.5060
Heptanes	0.1135	2.725	0.4973
Methylcyclohexane	0.0372	0.892	0.1628
2,2,4-Trimethylpentane	0.0008	0.018	0.0033
Benzene	0.0097	0.234	0.0426
Toluene	0.0269	0.646	0.1179
Ethylbenzene	0.0004	0.009	0.0017
Xylenes	0.0381	0.914	0.1668
C8+ Heavies	0.0220	0.529	0.0965
-----			
Total Emissions	20.5138	492.332	89.8505
Total Hydrocarbon Emissions	20.5138	492.332	89.8505
Total VOC Emissions	4.8812	117.149	21.3797
Total HAP Emissions	0.1696	4.070	0.7427
Total BTEX Emissions	0.0751	1.803	0.3290

## COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	5.3923	129.416	23.6184
Ethane	2.5678	61.628	11.2470
Propane	1.4096	33.830	6.1740
Isobutane	0.2135	5.124	0.9352
n-Butane	0.5210	12.505	2.2822
Isopentane	0.1209	2.902	0.5296

n-Pentane	0.1445	3.468	0.6329
n-Hexane	0.0631	1.515	0.2766
Cyclohexane	0.0552	1.325	0.2418
Other Hexanes	0.0729	1.750	0.3193
Heptanes	0.0970	2.327	0.4247
Methylcyclohexane	0.0514	1.234	0.2252
2,2,4-Trimethylpentane	0.0005	0.012	0.0022
Benzene	0.0497	1.193	0.2176
Toluene	0.2038	4.891	0.8926
Ethylbenzene	0.0050	0.119	0.0217
Xylenes	0.6727	16.145	2.9465
C8+ Heavies	0.0866	2.079	0.3795
-----			
Total Emissions	11.7276	281.463	51.3670
Total Hydrocarbon Emissions	11.7276	281.463	51.3670
Total VOC Emissions	3.7675	90.419	16.5016
Total HAP Emissions	0.9948	23.876	4.3573
Total BTEX Emissions	0.9312	22.348	4.0785

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	46.9961	23.6184	49.74
Ethane	22.1048	11.2470	49.12
Propane	11.9280	6.1740	48.24
Isobutane	1.7787	0.9352	47.42
n-Butane	4.2831	2.2822	46.72
Isopentane	0.9874	0.5296	46.37
n-Pentane	1.1628	0.6329	45.57
n-Hexane	0.4818	0.2766	42.59
Cyclohexane	0.3428	0.2418	29.46
Other Hexanes	0.5723	0.3193	44.21
Heptanes	0.6733	0.4247	36.93
Methylcyclohexane	0.3066	0.2252	26.55
2,2,4-Trimethylpentane	0.0039	0.0022	42.44
Benzene	0.2390	0.2176	8.92
Toluene	0.9515	0.8926	6.19
Ethylbenzene	0.0226	0.0217	3.81
Xylenes	3.0300	2.9465	2.75
C8+ Heavies	0.4277	0.3795	11.28
-----			
Total Emissions	96.2923	51.3670	46.66
Total Hydrocarbon Emissions	96.2923	51.3670	46.66
Total VOC Emissions	27.1914	16.5016	39.31
Total HAP Emissions	4.7287	4.3573	7.85
Total BTEX Emissions	4.2430	4.0785	3.88

EQUIPMENT REPORTS:

-----  
 ABSORBER  
 -----

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages: 1.25  
 Calculated Dry Gas Dew Point: 0.62 lbs. H2O/MMSCF

Temperature: 60.0 deg. F  
 Pressure: 1000.0 psig  
 Dry Gas Flow Rate: 5.0000 MMSCF/day  
 Glycol Losses with Dry Gas: 0.0341 lb/hr  
 Wet Gas Water Content: Saturated  
 Calculated Wet Gas Water Content: 17.03 lbs. H2O/MMSCF  
 Calculated Lean Glycol Recirc. Ratio: 11.75 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	3.63%	96.37%
Carbon Dioxide	99.75%	0.25%
Nitrogen	99.98%	0.02%
Methane	99.98%	0.02%
Ethane	99.95%	0.05%
Propane	99.94%	0.06%
Isobutane	99.91%	0.09%
n-Butane	99.89%	0.11%
Isopentane	99.90%	0.10%
n-Pentane	99.86%	0.14%
n-Hexane	99.79%	0.21%
Cyclohexane	98.97%	1.03%
Other Hexanes	99.84%	0.16%
Heptanes	99.64%	0.36%
Methylcyclohexane	98.98%	1.02%
2,2,4-Trimethylpentane	99.86%	0.14%
Benzene	88.58%	11.42%
Toluene	84.81%	15.19%
Ethylbenzene	82.44%	17.56%
Xylenes	75.93%	24.07%
C8+ Heavies	99.78%	0.22%

FLASH TANK

Flash Control: Combustion device  
 Flash Control Efficiency: 50.00 %  
 Flash Temperature: 140.0 deg. F  
 Flash Pressure: 40.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.44%	0.56%
Carbon Dioxide	5.26%	94.74%
Nitrogen	0.50%	99.50%
Methane	0.51%	99.49%
Ethane	1.76%	98.24%
Propane	3.52%	96.48%
Isobutane	5.15%	94.85%
n-Butane	6.57%	93.43%
Isopentane	7.46%	92.54%
n-Pentane	9.08%	90.92%

n-Hexane	15.07%	84.93%
Cyclohexane	42.74%	57.26%
Other Hexanes	12.05%	87.95%
Heptanes	26.41%	73.59%
Methylcyclohexane	48.77%	51.23%
2,2,4-Trimethylpentane	15.74%	84.26%
Benzene	83.04%	16.96%
Toluene	88.58%	11.42%
Ethylbenzene	93.17%	6.83%
Xylenes	95.20%	4.80%
C8+ Heavies	79.15%	20.85%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	62.62%	37.38%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	2.81%	97.19%
n-Pentane	2.69%	97.31%
n-Hexane	1.96%	98.04%
Cyclohexane	6.58%	93.42%
Other Hexanes	4.36%	95.64%
Heptanes	1.35%	98.65%
Methylcyclohexane	7.22%	92.78%
2,2,4-Trimethylpentane	4.64%	95.36%
Benzene	5.95%	94.05%
Toluene	8.84%	91.16%
Ethylbenzene	11.09%	88.91%
Xylenes	13.50%	86.50%
C8+ Heavies	9.60%	90.40%

STREAM REPORTS:

WET GAS STREAM

Temperature: 60.00 deg. F  
 Pressure: 1014.70 psia  
 Flow Rate: 2.08e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	3.59e-002	3.55e+000
Carbon Dioxide	1.10e-001	2.67e+001



Nitrogen	4.09e-001	6.29e+001
Methane	7.56e+001	6.66e+003
Ethane	1.60e+001	2.65e+003
Propane	5.34e+000	1.29e+003
Isobutane	5.51e-001	1.76e+002
n-Butane	1.18e+000	3.77e+002
Isopentane	2.27e-001	9.00e+001
n-Pentane	2.36e-001	9.34e+001
n-Hexane	6.55e-002	3.10e+001
Cyclohexane	1.44e-002	6.66e+000
Other Hexanes	9.05e-002	4.28e+001
Heptanes	5.52e-002	3.04e+001
Methylcyclohexane	1.11e-002	5.99e+000
2,2,4-Trimethylpentane	5.00e-004	3.14e-001
Benzene	1.10e-003	4.72e-001
Toluene	2.80e-003	1.42e+000
Ethylbenzene	5.00e-005	2.92e-002
Xylenes	4.90e-003	2.86e+000
C8+ Heavies	2.85e-002	2.67e+001
-----		
Total Components	100.00	1.16e+004

DRY GAS STREAM

-----  
 Temperature: 60.00 deg. F  
 Pressure: 1014.70 psia  
 Flow Rate: 2.08e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	1.30e-003	1.29e-001
Carbon Dioxide	1.10e-001	2.66e+001
Nitrogen	4.09e-001	6.29e+001
Methane	7.56e+001	6.66e+003
Ethane	1.60e+001	2.65e+003
Propane	5.34e+000	1.29e+003
Isobutane	5.51e-001	1.76e+002
n-Butane	1.18e+000	3.76e+002
Isopentane	2.27e-001	8.99e+001
n-Pentane	2.35e-001	9.33e+001
n-Hexane	6.54e-002	3.09e+001
Cyclohexane	1.43e-002	6.59e+000
Other Hexanes	9.04e-002	4.28e+001
Heptanes	5.50e-002	3.03e+001
Methylcyclohexane	1.10e-002	5.92e+000
2,2,4-Trimethylpentane	4.99e-004	3.13e-001
Benzene	9.75e-004	4.18e-001
Toluene	2.38e-003	1.20e+000
Ethylbenzene	4.12e-005	2.40e-002
Xylenes	3.72e-003	2.17e+000
C8+ Heavies	2.84e-002	2.66e+001
-----		
Total Components	100.00	1.16e+004

LEAN GLYCOL STREAM

-----  
 Temperature: 60.00 deg. F

Flow Rate: 6.70e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	3.71e+002
Water	1.50e+000	5.66e+000
Carbon Dioxide	1.79e-012	6.76e-012
Nitrogen	3.23e-013	1.22e-012
Methane	9.15e-018	3.45e-017
Ethane	1.49e-007	5.62e-007
Propane	9.04e-009	3.41e-008
Isobutane	1.19e-009	4.50e-009
n-Butane	2.82e-009	1.06e-008
Isopentane	1.26e-004	4.74e-004
n-Pentane	1.73e-004	6.51e-004
n-Hexane	8.64e-005	3.26e-004
Cyclohexane	6.01e-004	2.27e-003
Other Hexanes	1.83e-004	6.90e-004
Heptanes	1.46e-004	5.50e-004
Methylcyclohexane	6.77e-004	2.55e-003
2,2,4-Trimethylpentane	1.72e-006	6.50e-006
Benzene	7.52e-004	2.84e-003
Toluene	4.90e-003	1.85e-002
Ethylbenzene	1.58e-004	5.95e-004
Xylenes	2.71e-002	1.02e-001
C8+ Heavies	2.13e-003	8.03e-003
Total Components	100.00	3.77e+002

## RICH GLYCOL AND PUMP GAS STREAM

Temperature: 60.00 deg. F  
 Pressure: 1014.70 psia  
 Flow Rate: 7.26e-001 gpm  
 NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.22e+001	3.71e+002
Water	2.26e+000	9.08e+000
Carbon Dioxide	2.64e-002	1.06e-001
Nitrogen	2.58e-002	1.04e-001
Methane	2.66e+000	1.07e+001
Ethane	1.25e+000	5.05e+000
Propane	6.76e-001	2.72e+000
Isobutane	1.01e-001	4.06e-001
n-Butane	2.43e-001	9.78e-001
Isopentane	5.61e-002	2.26e-001
n-Pentane	6.61e-002	2.66e-001
n-Hexane	2.74e-002	1.10e-001
Cyclohexane	2.00e-002	8.05e-002
Other Hexanes	3.26e-002	1.31e-001
Heptanes	3.83e-002	1.54e-001
Methylcyclohexane	1.80e-002	7.26e-002
2,2,4-Trimethylpentane	2.21e-004	8.90e-004
Benzene	1.43e-002	5.74e-002
Toluene	5.85e-002	2.36e-001
Ethylbenzene	1.43e-003	5.76e-003

Xylenes	1.97e-001	7.94e-001
C8+ Heavies	2.62e-002	1.06e-001
-----		
Total Components	100.00	4.03e+002

FLASH TANK OFF GAS STREAM

Temperature: 140.00 deg. F  
 Pressure: 54.70 psia  
 Flow Rate: 3.54e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	3.02e-001	5.07e-002
Carbon Dioxide	2.46e-001	1.01e-001
Nitrogen	3.95e-001	1.03e-001
Methane	7.13e+001	1.07e+001
Ethane	1.77e+001	4.96e+000
Propane	6.39e+000	2.63e+000
Isobutane	7.10e-001	3.85e-001
n-Butane	1.69e+000	9.14e-001
Isopentane	3.11e-001	2.09e-001
n-Pentane	3.60e-001	2.42e-001
n-Hexane	1.17e-001	9.37e-002
Cyclohexane	5.87e-002	4.61e-002
Other Hexanes	1.44e-001	1.16e-001
Heptanes	1.21e-001	1.14e-001
Methylcyclohexane	4.06e-002	3.72e-002
2,2,4-Trimethylpentane	7.04e-004	7.50e-004
Benzene	1.34e-002	9.73e-003
Toluene	3.13e-002	2.69e-002
Ethylbenzene	3.97e-004	3.93e-004
Xylenes	3.85e-002	3.81e-002
C8+ Heavies	1.39e-002	2.20e-002
-----		
Total Components	100.00	2.08e+001

FLASH TANK GLYCOL STREAM

Temperature: 140.00 deg. F  
 Flow Rate: 6.80e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
-----		
TEG	9.72e+001	3.71e+002
Water	2.37e+000	9.03e+000
Carbon Dioxide	1.47e-003	5.60e-003
Nitrogen	1.37e-004	5.22e-004
Methane	1.44e-002	5.50e-002
Ethane	2.33e-002	8.89e-002
Propane	2.51e-002	9.59e-002
Isobutane	5.48e-003	2.09e-002
n-Butane	1.68e-002	6.42e-002
Isopentane	4.41e-003	1.69e-002
n-Pentane	6.33e-003	2.42e-002
n-Hexane	4.35e-003	1.66e-002
Cyclohexane	9.01e-003	3.44e-002
Other Hexanes	4.14e-003	1.58e-002

Heptanes	1.07e-002	4.07e-002
Methylcyclohexane	9.27e-003	3.54e-002
2,2,4-Trimethylpentane	3.67e-005	1.40e-004
Benzene	1.25e-002	4.77e-002
Toluene	5.47e-002	2.09e-001
Ethylbenzene	1.40e-003	5.36e-003
Xylenes	1.98e-001	7.56e-001
C8+ Heavies	2.19e-002	8.37e-002
-----		
Total Components	100.00	3.82e+002

FLASH GAS EMISSIONS

Flow Rate: 8.58e+002 scfh  
 Control Method: Combustion Device  
 Control Efficiency: 50.00

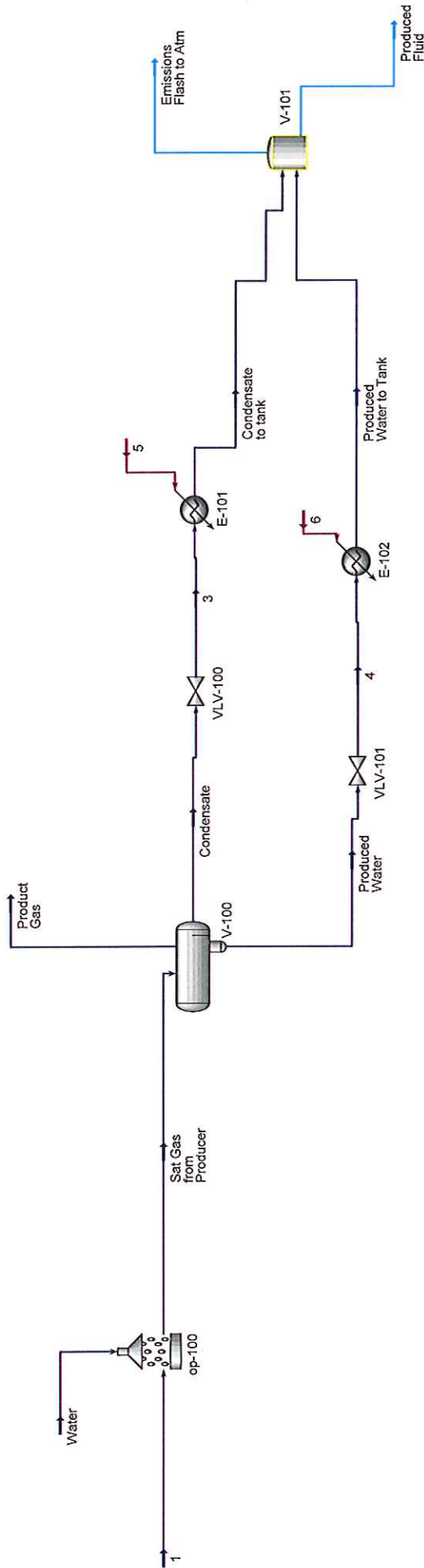
Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	4.99e+001	2.03e+001
Carbon Dioxide	2.95e+001	2.94e+001
Nitrogen	1.63e-001	1.03e-001
Methane	1.47e+001	5.34e+000
Ethane	3.65e+000	2.48e+000
Propane	1.32e+000	1.31e+000
Isobutane	1.47e-001	1.93e-001
n-Butane	3.48e-001	4.57e-001
Isopentane	6.41e-002	1.05e-001
n-Pentane	7.42e-002	1.21e-001
n-Hexane	2.40e-002	4.68e-002
Cyclohexane	1.21e-002	2.31e-002
Other Hexanes	2.96e-002	5.78e-002
Heptanes	2.51e-002	5.68e-002
Methylcyclohexane	8.37e-003	1.86e-002
2,2,4-Trimethylpentane	1.45e-004	3.75e-004
Benzene	2.75e-003	4.87e-003
Toluene	6.46e-003	1.35e-002
Ethylbenzene	8.20e-005	1.97e-004
Xylenes	7.93e-003	1.90e-002
C8+ Heavies	2.86e-003	1.10e-002
-----		
Total Components	100.00	6.01e+001

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F  
 Pressure: 14.70 psia  
 Flow Rate: 7.93e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	8.97e+001	3.38e+000
Carbon Dioxide	6.09e-002	5.60e-003
Nitrogen	8.91e-003	5.22e-004
Methane	1.64e+000	5.50e-002
Ethane	1.41e+000	8.89e-002
Propane	1.04e+000	9.59e-002

Isobutane	1.72e-001	2.09e-002
n-Butane	5.29e-001	6.42e-002
Isopentane	1.09e-001	1.64e-002
n-Pentane	1.56e-001	2.35e-002
n-Hexane	9.05e-002	1.63e-002
Cyclohexane	1.83e-001	3.22e-002
Other Hexanes	8.40e-002	1.51e-002
Heptanes	1.92e-001	4.02e-002
Methylcyclohexane	1.60e-001	3.28e-002
2,2,4-Trimethylpentane	5.60e-004	1.34e-004
Benzene	2.75e-001	4.48e-002
Toluene	9.88e-001	1.90e-001
Ethylbenzene	2.15e-002	4.77e-003
Xylenes	2.95e+000	6.54e-001
C8+ Heavies	2.12e-001	7.56e-002
-----	-----	-----
Total Components	100.00	4.85e+000



**J-W MEASUREMENT COMPANY**  
 Shreveport, LA Tyler, TX Fairfield, TX Victoria, TX  
 Godley, TX Broussard, LA Zapata, TX  
 WWW.JWOPERATING.COM  
 888-226-9110

G

<b>J-WMC Number</b> : 2074420111117	<b>Date Sampled</b> : 09/01/2011
<b>Customer</b> : CAIMAN ENERGY LLC	<b>Date Analyzed</b> : 09/06/2011
<b>Station ID</b> : 1111117	<b>Effective Date</b> : 09/01/2011
<b>Station Name</b> : WITZGALL 1H	<b>Pressure</b> : 645.0
<b>Area</b> : MOUNDSVILLE	<b>Temperature (F)</b> : 70.0
<b>County/Parish</b> : MARSHALL	<b>Cylinder ID</b> : 3104
<b>State</b> : WV	<b>Sampled by</b> : DB
<b>Property Cd</b> :	

<u>COMPONENT</u>	<u>MOL %</u>	<u>GPM @ 14.73(PSIA)</u>
Methane	75.9917	0.000
Ethane	15.5466	4.157
Propane	5.4225	1.494
Iso-Butane	0.4637	0.152
Normal-Butane	1.1854	0.374
Iso-Pentane	0.1943	0.071
Normal-Pentane	0.2479	0.090
Hexanes++	0.2540	0.110
Nitrogen	0.5653	0.000
Carbon-Dioxide	0.1265	0.000
Oxygen	0.0020	0.000
Hydrogen Sulfide	0.0002	0.000
<b>TOTAL</b>	<b>100.0000</b>	<b>6.447</b>

Compressibility Factor (Z) @ 14.696 PSIA @ 60 DEG. F = 0.9964

Real Gravity: 0.727

Ideal Gravity: 0.725

<u>BTU @ (PSIA)</u>	<u>@14.65</u>	<u>@14.696</u>	<u>@14.73</u>	<u>@15.025</u>
<b>GPM</b>	6.412	6.432	6.447	6.576
<b>Ideal BTU Dry</b>	1259.61	1263.57	1266.49	1291.86
<b>Ideal BTU Sat</b>	1237.57	1241.53	1244.45	1269.82
<b>Real BTU Dry</b>	1264.17	1268.16	1271.10	1296.65
<b>Real BTU Sat</b>	1242.46	1246.45	1249.39	1274.95

**Comments:**

**METHOD: GPA 2261-00**

Note: Calibration, Standards, and testing procedures are archived pursuant to GPA regulations.

This Analysis Report is not intended for submission to Louisiana Department of Environmental Quality.

*Deborah Murphy*  
 J-W ANALYST





WILLIAMS ENERGY SERVICES  
Burlington, MA  
USA

Case Name: Hazlett Hysys.hsc

Att N - Tank (TK-01) - HYSYS - Page 3 of 4

Unit Set: Field

Also Snyder CS

Date/Time: Fri Mar 15 10:02:38 2013

# Workbook: Case (Main)

## Material Streams

Fluid Pkg:

All

Name	1	Water	Sat Gas from Product	Produced Water	Condensate
Vapour Fraction	1.0000	0.0000	1.0000	0.0000	0.0000
Temperature (F)	50.00 *	40.00 *	50.00	50.00	50.00
Pressure (psia)	1115 *	119.7 *	1115	1115	1115
Molar Flow (lbmole/hr)	549.0 *	0.1267	549.2	0.0000	0.0000
Mass Flow (lb/hr)	1.151e+004	2.282	1.151e+004	0.0000	0.0000
Liquid Volume Flow (barrel/day)	2306	0.1566	2306	0.0000	0.0000
Heat Flow (Btu/hr)	-1.957e+007	-1.567e+004	-1.958e+007	-0.0000	-0.0000
Name	Product Gas	3	4	Condensate to tank	Produced Water to T
Vapour Fraction	1.0000	0.6794	0.0000	1.0000	0.0000
Temperature (F)	50.00	-78.63	53.05	75.00 *	75.00 *
Pressure (psia)	1115	14.70 *	14.70 *	14.70	14.70
Molar Flow (lbmole/hr)	549.2	0.0000	0.0000	0.0000	0.0000
Mass Flow (lb/hr)	1.151e+004	0.0000	0.0000	0.0000	0.0000
Liquid Volume Flow (barrel/day)	2306	0.0000	0.0000	0.0000	0.0000
Heat Flow (Btu/hr)	-1.958e+007	-0.0000	-0.0000	-0.0000	-0.0000
Name	Produced Fluid	Emissions Flash to A			
Vapour Fraction	0.0000	1.0000			
Temperature (F)	---	---			
Pressure (psia)	14.70	14.70			
Molar Flow (lbmole/hr)	---	---			
Mass Flow (lb/hr)	---	---			
Liquid Volume Flow (barrel/day)	---	---			
Heat Flow (Btu/hr)	---	---			

## Compositions

Fluid Pkg:

All

Name	1	Water	Sat Gas from Product	Produced Water	Condensate
Master Comp Mass Flow (Methane) (lb/hr)	6693.4085 *	0.0000	6693.4085	0.0000	0.0000
Master Comp Mass Flow (H2O) (lb/hr)	0.0000 *	2.2820	2.2820	0.0000	0.0000
Master Comp Mass Flow (Nitrogen) (lb/hr)	86.9435 *	0.0000	86.9435	0.0000	0.0000
Master Comp Mass Flow (CO2) (lb/hr)	30.5659 *	0.0000	30.5659	0.0000	0.0000
Master Comp Mass Flow (n-Hexane) (lb/hr)	120.1788 *	0.0000	120.1788	0.0000	0.0000
Master Comp Mass Flow (n-Pentane) (lb/hr)	98.2013 *	0.0000	98.2013	0.0000	0.0000
Master Comp Mass Flow (i-Pentane) (lb/hr)	76.9686 *	0.0000	76.9686	0.0000	0.0000
Master Comp Mass Flow (n-Butane) (lb/hr)	378.2846 *	0.0000	378.2846	0.0000	0.0000
Master Comp Mass Flow (i-Butane) (lb/hr)	147.9759 *	0.0000	147.9759	0.0000	0.0000
Master Comp Mass Flow (Propane) (lb/hr)	1312.8252 *	0.0000	1312.8252	0.0000	0.0000
Master Comp Mass Flow (Ethane) (lb/hr)	2566.6444 *	0.0000	2566.6444	0.0000	0.0000
Master Comp Mass Flow (H2S) (lb/hr)	0.0374 *	0.0000	0.0374	0.0000	0.0000
Master Comp Mass Flow (Oxygen) (lb/hr)	0.0351 *	0.0000	0.0351	0.0000	0.0000
Name	Product Gas	3	4	Condensate to tank	Produced Water to T
Master Comp Mass Flow (Methane) (lb/hr)	6693.4085	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (H2O) (lb/hr)	2.2820	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (Nitrogen) (lb/hr)	86.9435	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (CO2) (lb/hr)	30.5659	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (n-Hexane) (lb/hr)	120.1788	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (n-Pentane) (lb/hr)	98.2013	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (i-Pentane) (lb/hr)	76.9686	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (n-Butane) (lb/hr)	378.2846	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (i-Butane) (lb/hr)	147.9759	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (Propane) (lb/hr)	1312.8252	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (Ethane) (lb/hr)	2566.6444	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (H2S) (lb/hr)	0.0374	0.0000	0.0000	0.0000	0.0000
Master Comp Mass Flow (Oxygen) (lb/hr)	0.0351	0.0000	0.0000	0.0000	0.0000





WILLIAMS ENERGY SERVICES  
Burlington, MA  
USA

Case Name: Hazlett Hysys.hsc Att N - Tank (TK-01) - HYSYS - Page 4 of 4  
Unit Set: Field  
Date/Time: Fri Mar 15 10:02:38 2013

## Workbook: Case (Main) (continued)

### Compositions (continued)

Fluid Pkg: All

Name	Produced Fluid	Emissions Flash to A			
Master Comp Mass Flow (Methane) (lb/hr)	---	---			
Master Comp Mass Flow (H2O) (lb/hr)	---	---			
Master Comp Mass Flow (Nitrogen) (lb/hr)	---	---			
Master Comp Mass Flow (CO2) (lb/hr)	---	---			
Master Comp Mass Flow (n-Hexane) (lb/hr)	---	---			
Master Comp Mass Flow (n-Pentane) (lb/hr)	---	---			
Master Comp Mass Flow (i-Pentane) (lb/hr)	---	---			
Master Comp Mass Flow (n-Butane) (lb/hr)	---	---			
Master Comp Mass Flow (i-Butane) (lb/hr)	---	---			
Master Comp Mass Flow (Propane) (lb/hr)	---	---			
Master Comp Mass Flow (Ethane) (lb/hr)	---	---			
Master Comp Mass Flow (H2S) (lb/hr)	---	---			
Master Comp Mass Flow (Oxygen) (lb/hr)	---	---			

### Energy Streams

Fluid Pkg: All

Name	5	6			
Heat Flow (Btu/hr)	-0.0000	-0.0000			

### Unit Ops

Operation Name	Operation Type	Feeds	Products	Ignored	Calc Level
op-100	Saturate with water	1	Sat Gas from Producer	No	500.0 *
		Water			
V-100	3 Phase Separator	Sat Gas from Producer	Condensate	No	500.0 *
			Product Gas		
			Produced Water		
VLV-100	Valve	Condensate	3	No	500.0 *
VLV-101	Valve	Produced Water	4	No	500.0 *
E-101	Heater	3	Condensate to tank	No	500.0 *
		5			
E-102	Heater	4	Produced Water to Tank	No	500.0 *
		6			
V-101	Tank	Condensate to tank	Produced Fluid	No	500.0 *
		Produced Water to Tank	Emissions Flash to Atm		

## ATTACHMENT O

### Monitoring/Recordkeeping/Reporting/Testing Plans

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“31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as Attachment O.”

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- Monitoring/Recordkeeping/Reporting/Testing Plans
  - A. Monitoring and Recordkeeping
  - B. Notification and Reporting
  - C. Testing

**ATTACHMENT O**  
**Monitoring/Recordkeeping/Reporting/Testing Plans**

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
Application for 45CSR13 NSR Modification Permit

Williams Ohio Valley Midstream LLC (OVM) proposes the following monitoring, recordkeeping, reporting and testing requirements at the Snyder CS.

Monitoring

1. Monitor and record quantity of natural gas combusted in the engines.
2. Monitor and record quantity of natural gas treated in the TEG dehydrator.
3. Monitor and record quantity of produced water transferred from the storage tank.

Recordkeeping

1. Maintain records of the amount of natural gas consumed and hours of operation for the compressor engines.
2. Maintain records of the amount of natural gas treated in the TEG dehydrator.
3. Maintain records of the amount of produced water transferred from the storage tanks.
4. Maintain a record of all potential to emit (PTE) HAP calculations for the entire facility. These records shall include the natural gas compressor engine, dehydration unit and ancillary equipment.
5. The records shall be maintained on site or in a readily available off-site location for a period of five (5) years.

Testing

No testing is required.

## **ATTACHMENT P**

### **Public Notice**

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“32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and Example Legal Advertisement for details). Please submit the **Affidavit of Publication** as Attachment P immediately upon receipt.”

The applicant shall cause such legal advertisement to 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.

Types and amounts of pollutants discharged must include all regulated pollutants (PM, PM10, VOC, SO2, Xylene, etc.) and their potential to emit or the permit level being sought in units of tons per year (including fugitive emissions).

- 
- Legal Advertisement (as shown) will be placed in a newspaper of general circulation in the area where the source is located (See 45CSR§13-8.3 thru 45CSR§13-8.5).
  - An Affidavit of Publication shall be submitted immediately upon receipt.

Williams Ohio Valley Midstream LLC (OVM)  
**SNYDER COMPRESSOR STATION (CS)**  
Application for 45CSR13 NSR Modification Permit

**ATTACHMENT P**  
**Public Notice**

**AIR QUALITY PUBLIC NOTICE**  
**Notice of Application**

Notice is given that Williams Ohio Valley Midstream LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a 45CSR13 NSR Modification Permit for an existing natural gas compressor station off McCreary's Ridge Rd, approximately 5.4 mi E-NE of Moundsville, in Marshall County, West Virginia.

The latitude and longitude coordinates are 39.9419 degrees North and -80.6289 degrees West.

The applicant estimates the increase/(decrease) in the potential to discharge the following regulated air pollutants will be:

- (29.38) tons of nitrogen oxides per year
- (3.21) tons of carbon monoxide per year
- 5.72 tons of volatile organic compounds per year
- 0.00 tons of sulfur dioxide per year
- 0.00 tons of particulate matter per year
- 0.00 tons of formaldehyde per year
- 0.12 tons of xylenes per year
- 0.99 tons of total hazardous air pollutants per year
- 210 tons of carbon dioxide equivalent per year

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 of \_\_\_\_\_ 2015.

By: Mr. Don Wicburg, Vice President and General Manager  
Williams Ohio Valley Midstream LLC  
100 Teletech Drive, Suite 2  
Moundsville, WV 26041

**ATTACHMENT Q**  
**Business Confidential Claims**  
**(NOT APPLICABLE)**

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also

**ATTACHMENT R**  
**Authority Forms**  
**(NOT APPLICABLE)**

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also

**ATTACHMENT S**  
**Title V Permit Revision Information**  
**(NOT APPLICABLE)**

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# APPLICATION FEE

## NSR Modification Permit

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- Include a check payable to WVDEP – Division of Air Quality.
- As per WV Rule 22 (45CSR22) filed on May 6, 1991, a **minimum fee of \$1,000** must be submitted for each 45CSR13 permit application filed with the WVDEP-DAQ.
- Additional charges may apply, depending on the nature of the application as outlined in Section 3.4.b. of Regulation 22, and shown below:
- **NSPS Requirements:                    \$1,500 (JJJJ and OOOO)**

Total application fee is **\$2,500** [= \$1,000 minimum fee + \$1,500 additional fees]

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\*\*\*\*\* End of Application for 45CSR13 NSR Permit \*\*\*\*\*





WILLIAMS FIELD SERVICES GROUP, INC  
 PO BOX 21218  
 TULSA, OK 74121-1218

COMPANY NUMBER: 4000  
 CHECK NUMBER: 4000109009

PAY DATE	SUPPLIER NO.	SUPPLIER NAME	CHECK TOTAL
21-MAY-15	401733	STATE OF WEST VIRGINIA	2,500.00

Invoice Date	Invoice Or Credit Memo / Invoice Description	Gross	Discount	Net
19-MAY-15	19-MAY-2015A / AIR PERMIT APPLICATION FEE FOR SNYD	2,500.00	0.00	2,500.00

Supplier Support 1-866-778-2665

Page Totals	0.00	2,500.00
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WILLIAMS FIELD SERVICES GROUP, INC  
 PO BOX 21218  
 TULSA, OK 74121-1218  
 Company Number: 4000

JPMorgan Chase Bank, N.A. 70-2322/719  
 Chicago, IL

Check Number: 4000109009  
 Check Date: 21-MAY-15

Two Thousand Five Hundred Dollars And Zero Cents

Pay To The Order Of:

STATE OF WEST VIRGINIA  
 WV DEP - DIVISION OF AIR QUALITY  
 601 57TH ST SE  
 CHARLESTON, WV 25304 United States

PAY (USD) \$2,500.00

*Donna R. Chappel*  
 Authorized Signature

⑈4000 109009⑈ ⑆071923226⑆

00940 1167⑈

From: (412) 787-4197  
 Daniel Zawaski  
 WILLIAMS  
 2000 Commerce Drive  
 Park Place 2  
 Pittsburgh, PA 15275

Origin ID: OLA



Ship Date: 27MAY15  
 ActWgt: 1.0 LB  
 CAD: 104269589/NET3610

Delivery Address Bar Code

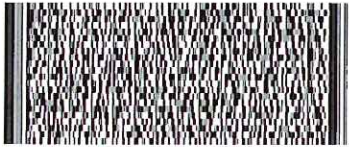


SHIP TO: (304) 926-8499 X 1260 BILL SENDER  
 Beverly McKeone  
 WV Div of Air Quality - Permitting  
 601 57th Street, SE  
 Charleston, WV 25304

Ref # 60000006200060034.6228.8325  
 Invoice #  
 PO #  
 Dept #

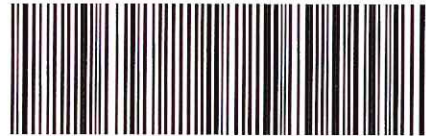
FRI - 29 MAY AA  
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